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Watershed management benefits in a hypothetical, real intention and real willingness to pay approach

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Abstract

Despite growing knowledge of a disparity between stated and actual willingness to engage in pro-environmental behavior, little is known about the cognitive or attitudinal factors explaining the disparity. In the context of water quality improvement in a river basin, we address the disparity issue by applying two approaches: a typical valuation question with a hypothetical option of voluntary payment and a valuation question with a real option of voluntary payment. The latter treatment allows for further analysis of the respondents who committed to a real payment. We show empirical evidence on the psychological factors explaining the disparity between the treatments and its relationship with response uncertainty. The extent of learning from the survey about water management of the watershed increased

the likelihood of stating the willingness to contribute, either with certainty or uncertainty. In turn, a previous contribution to the environmental issue, higher income, belief in the scenario, and responding to the hypothetical treatment increased the likelihood of stating certain willingness to contribute. Our findings indicate that the factors influencing the decision on the maximum payment differ between treatments. Cognitive factors, such as perceiving the valuation scenario as plausible, learning from the questionnaire, and in which mailing round the respondent completed the survey, only explained the stated amount for the willingness to pay in the treatment with a hypothetical option for voluntary payment. In the real option treatment, a higher stated willingness to pay was more likely if the respondent actually made the payment and had a higher household income.

Keywords: Contingent valuation, freshwater management, hypothetical bias, preference certainty, field study, real donation

1 Introduction

The contingent valuation method (CVM) has been applied in many environmental contexts to estimate the monetary value of changes in non-marketed environmental quality or quantity. The method is based on the theory of utility maximization of consumers (see e.g. Alberini and Kahn 2006; Mitchell and Carson 1993), and allows for the elicitation of willingness to pay (WTP) for a particular environmental change, such as an improvement in the water quality of a watershed. WTP is elicited with the help of a survey and a hypothetical market setting. The hypothetical market refers to

the definition of the water quality improvement (a good for sale), the actual measures that would provide the improvement in a specified water basin, and the type of payment. The maximum WTP reflects the benefit derived by the respondent from the environmental improvement (Alberini and Kahn 2006).

In a stated preferences valuation question, especially in a CVM survey, respondents are not actually bound to paying the amount they state they are willing to pay. This may introduce hypothetical bias if a respondent perceives the valuation scenario to be too hypothetical or unrealistic and acts accordingly (Kling et al. 2012; Moser et al. 2014; Newell and Swallow 2013; Schlapfer and Fischhoff 2012). The validity of hypothetical stated WTPs has been tested for private or public goods in field and laboratory settings by offering one subsample of respondents an option for real payments and another subsample an option for standard hypothetical payments, and then comparing the results (Foster et al. 1997; List and Gallet 2001; Little and Berrens 2004; Murphy et al. 2005). As the majority of previous studies have been implemented in laboratory settings and/or focused on a private instead of a public good (e.g. Blumenschein et al. 1997; Frykblom 1997; Neill et al. 1994; Spencer et al. 1998), less information is available on the comparison of real and hypothetical willingness to pay estimates related to a public or quasi-public good,

76 performed under field circumstances. In addition, little research
77 has been conducted on whether this hypothetical bias influences
78 people differently (Bishop and Barber 2014; Murphy and
79 Stevens 2004).

80 Meta-analyses of hypothetical bias (List and Gallet
81 2001; Little and Berrens 2004; Murphy et al. 2005) have
82 reported that respondents overstate their willingness to pay by a
83 factor of 2 to 3 in hypothetical compared to real settings. The
84 underlying reasons for the divergence between real and
85 hypothetical WTP have been investigated since the 1990s. For
86 instance, it has been argued that hypothetical bias may stem
87 from free-riding behavior, where respondents rely on others to
88 pay, even though they positively value the good and would pay
89 something given the knowledge that the good would definitely
90 not be provided without such payment (Brown et al. 1996).
91 Hence, regarding voluntary contributions, for example, an
92 initial “yes” response in a hypothetical survey helps to set up a
93 later opportunity to free ride with respect to the actual
94 contribution (Carson and Groves 2007). In the case of a non-
95 voluntary payment (e.g. tax) in combination with a single
96 dichotomous choice question, hypothetical bias may occur if the
97 respondent thinks that the outcome of the survey will have no
98 influence (inconsequentiality, see e.g. Vossler et al. 2012;
99 Vossler and Watson 2013).

Although an extensive body of literature provides clues to some of the factors contributing to hypothetical bias in relation to public goods and field studies (see e.g. Little and Berrens 2004; Murphy et al. 2005), few studies have explored explanatory factors with regression models, simultaneously for actual payment and contingent donation treatments. Champ and Bishop (2001) modeled the factors affecting the decision to hypothetically donate, finding them to be similar to those affecting the decision to make a real donation. Furthermore, they demonstrated the elimination of hypothetical bias when the positive responses of less certain respondents were recoded to negative responses. Brown et al. (1996) observed that WTP for the removal of roads on the North Rim of the Grand Canyon was lower among older people in the hypothetical treatment alone, and was higher among people who had visited the Grand Canyon only in the actual treatment. Loomis et al. (1996) reminded participants to act as if they were in a real market situation with a real budget, and this aided them in behaving more like they would do in an actual cash market.

Ways of reducing hypothetical bias have also been examined by different approaches that aim to control preference uncertainty (see e.g. Blomquist et al. 2009; Little and Berrens 2004; Ready et al. 2010), since it has been shown that more certain WTP responses are closer to real WTP. Determinants of the sources of respondent uncertainty about their true values

have included insufficient interest or the amount of mental effort respondents have put into responding (Hanley et al. 2009; Svedsater 2007), the bid level (Brouwer 2011; Loomis and Ekstrand 1998), prior knowledge or familiarity with the resource (Hanley et al. 2009; Loomis and Ekstrand 1998; Voltaire et al. 2013), believing in the good and/or policy instrument proposed (Akter et al. 2009; Voltaire et al. 2013), and household income (Brouwer 2011; Hanley et al. 2009; Voltaire et al. 2013).

Despite growing knowledge of a disparity between stated and actual willingness to engage in pro-environmental behavior, there is a need to understand the cognitive and attitudinal factors explaining this disparity and its relation to response uncertainty. This paper contributes to current knowledge on these factors affecting willingness to contribute and the stated WTP amounts in different survey contexts. The empirical field experiment was designed to derive benefit estimates related to an improvement in the water quality¹ and hydrology of a river basin resulting from the implementation of a river basin management plan according to the European Water Framework Directive (WFD, European Parliament 2000). The empirical data consist of watershed valuation information collected in three ways: through hypothetical donations with either a hypothetical or a real option to pay, and through

¹ With the objective to achieve a good ecological and chemical status to protect human health, the water supply, natural ecosystems, and biodiversity.

observable, real donations. This allowed us to analyze the effect of factors specific to the valuation question on the stated WTP amounts and actual payments, and thus to shed more light on the relationship between the real and hypothetical WTP and related uncertainty. Moreover, the actual payments were compared with the stated WTP in hypothetical and real option settings.

The following section presents the empirical application and the data collection. The third section presents the results of the models, and the final section discusses our findings and concludes.

2 The application

2.1 Study area

The study area, the River Kalimenjoki watershed in the region of North Ostrobothnia in Finland, is covered by a national water management plan. The river is 35 kilometers long, originating in the southeastern peat production areas of the region and flowing into the Gulf of Bothnia, the northern part of the Baltic Sea (see Figure 1). Due to the high concentration of phosphorus and occasional acidity, the ecological status of the river is classified as poor. The River Kalimenjoki is defined as a valuable small watercourse mostly located in a peri-urban area

and with 12,000 people living in the watershed. Sixty percent of the watershed area of 224 km² is comprised of forestland. Of the 27 lakes in the area, the two largest are Hämeenjärvi (1.04 km²) and Jäälinjärvi (0.93 km²).

[Figure 1 near here]

Fig. 1

Map of the study area.

2.2 Questionnaire and valuation questions

The questionnaire included sections describing major concerns in relation to water management, the current water state and a description of the proposed restoration option for the Kalimenjoki river basin in 2021 (valuation scenario), value elicitation questions, and follow-up and debriefing questions about the idea of contributing, possible difficulties in choosing the payments, and belief in the presented scenario. The final part of the survey contained questions about

respondents' socio-demographic and economic household characteristics. Two scenarios for the demand assessment were defined based on the sub-basin management plan and in cooperation with two local water management associations recently established in the river basin area. The survey was pretested in a pilot phase with 13 respondents, resulting in minor changes to the final questionnaire.

The valuation research frame involved two treatments. Treatment 1 represented a traditional contingent valuation question that offered the respondents a hypothetical option to make a "voluntary water management payment". In treatment 2, households had an option to make a real payment. At the beginning of the valuation section, the households were asked whether they would be willing to pay a one-time water management payment to one of the two water management associations with the following question:

Q8. Would you be willing to pay a water management donation for the Kellonkylä association OR the Kiiminki-Jääli water management association to implement the formerly presented water improvement plans (i.e. visions)?

- ☐ Yes
- ☐ Yes, possibly
- ☐ No ► *You may proceed directly to question number 11.*

Up to this point, the questionnaires for the two treatments were similar. In the second part of the valuation question, only applying to those respondents who responded 'Yes' or 'Yes, possibly' to the previous question, the respondents

were provided two alternative ways of stating their willingness to pay: a classic single-value open-ended question and, in order to reduce valuation uncertainty and to produce confidence intervals for the willingness to pay, an interval open-ended question (see e.g. Hakansson 2008). The valuation questions were identical, with the exception that in the hypothetical (HYPO) treatment, the recipient was asked “**if** your household had the possibility to make a one-time donation...”, while in the REAL OPTION treatment, the question was framed as “**now** your household has the possibility to make a one-time donation...” Moreover, in the REAL OPTION treatment, the respondents were given practical instructions on how to make the donation (see Appendix A).

The treatments were designed to have as many similar settings as possible, for instance the time periods for the behavioral intent (the HYPO subsample) and for the actual behavior (the REAL OPTION subsample and those who actually paid). Donation has been proposed as a practical payment vehicle, as it offers a plausible means of providing small-scale public goods (Byrnes et al. 1999) and makes validation against actual behavior relatively easier (Champ and Bishop 2001). However, its incentive compatibility has been questioned (Carson and Groves 2007). As a consequence of free-riding, i.e. when the respondent perceives that the cost will be covered by other donations, the actual cash donations will underestimate Hicksian measures of WTP (Macmillan et al.

1999). The one-time payment vehicle was chosen because of practicality: it was seen as the most realistic and policy-relevant means for comparing the hypothetical and real WTP for the two water management associations².

Although the open-ended (OE) WTP question format is not preferred over dichotomous choice (DC) or other formats³, it has been shown to provide a more accurate prediction of actual behavior than the DC question format (Hakansson 2008; Poe and Vossler 2002). Hence, both the single-value and interval OE question formats were chosen as the methods for eliciting WTP. As we applied the same question format to elicit the hypothetical and real WTP, the difference in WTP should be due to the hypothetical nature of the contingent valuation method.

The mail survey was sent by post out to 1,632 randomly selected households across the Kalimenjoki river basin in October 2012. Both treatments included 816 households. The survey practice followed Dillman's (2007) "total design method", involving a booklet questionnaire and four contacts, including the first mailing of the questionnaire, a postcard reminder, a second mailing of the questionnaire, and an additional follow-up questionnaire to those respondents in the REAL OPTION treatment who stated that they were willing to contribute, but did

² Several studies have investigated donation payment mechanisms (see e.g. Brown et al. 1996; Byrnes et al. 1999; Duffield and Patterson 1992; Navrud 1992).

³ See, for example, the opinion of the famous blue-ribbon panel - assembled by NOAA- who assessed the reliability of CV methods (Arrow et al. 1993).

not actually do so. The sampling was carried out by the Finnish Environment Institute and the Finnish Population Register Centre based on Finnish Census data from 2011.

3 Results

The final response rate was similar in both treatments, 31%, as the data collection ended with 505 complete responses: 253 in the HYPO subsample and 252 in the REAL OPTION subsample. Hence, and interestingly, giving the respondents a real option to pay did not have a decreasing effect on the response rate. Although response rates were moderate, they were very close to our prior expectation: the desired number of responses ($N = 263$ per treatment) was calculated using a confidence level of 95%, a margin of error 5%, and population of 12,000.

3.1 Descriptive statistics for the data

Table 1 presents descriptive statistics for the data with regard to socio-demographic information, experience, and answering of the valuation questions, and a comparison of respondents in the treatments with the independent samples t-tests and nonparametric tests. The proportion of females, average age of the respondents, household income, and the average distance of the respondents' homes from the nearest lake or river did not differ statistically significantly between the HYPO and REAL OPTION treatments. Regarding the experience of water

resources or their management and the socio-demographic characteristics, the data sets were similar. The majority of respondents (53% and 52% in hypothetical and real intention treatments, respectively) learnt from the questionnaire about freshwater management in the area (*LEARN*). Almost half of the respondents (46/43%) had visited a lake or riverside for recreational purposes (*USER*). A clear minority (9%/8%) had participated in voluntary water management work (*VOLUN*) and/or paid a subscription fee to the water management association (11%/11%) (*SUBSCRIPT*). In conclusion, the respondents were fairly familiar with the public good being valued, and the similarity between the data sets in socio-demographic terms was sufficient to allow a comparison of the WTP results between treatments.

Some statistically significant differences were found in relation to the answers to valuation questions. Although the share of respondents who responded in the first mailing round was similar (68% and 71% in hypothetical and real intention treatments, respectively), stating the maximum donation was perceived as easier (*EASE*) in the REAL OPTION treatment (60%) than in the HYPO treatment (48%). A larger share of respondents in the hypothetical treatment (51%) than in the real option treatment (41%) perceived the scenario to be plausible (*TRUST*). Moreover, a larger share of respondents in the HYPO treatment (33%) than in the REAL OPTION treatment

(29%) expressed uncertainty over whether to contribute to the program (*UNCERT*), but this difference was not statistically significant.

As only a fraction of REAL OPTION participants actually paid, statistical comparisons based on the descriptive statistics should be interpreted with caution. However, the results indicated several statistically significant differences in relation to the third subsample, i.e. actual donors (Table 1).

Table 1
Descriptive statistics of subsamples

Variable		HYPOTHETICAL N=253	REAL OPTION N=252	REAL N=19
<u>SOCIO-DEMOGRAPHICS</u>				
<i>FEMALE</i>	Proportion of females	45%	43%	42%
<i>AGE</i>	Average age	50	52	54
<i>SHORE</i>	Living near the shore of a lake or river	42%	42%	47%
<i>INCOME</i>	Ten classes: 1=<€1,000;...; 10=>€7,800	5.9	5.8	6.7
<u>EXPERIENCE</u>				
<i>HEARD</i>	Had already heard about management projects in the area: 1=yes; 2=no	1.8	1.8	1.8
<i>USER</i>	Recreational user	46%	43%	58%
<i>VOLUN</i>	Has taken part in voluntary work	9%	8%	11%
<i>SUBSCRIPT</i>	Pays a subscription fee for to management association and is willing to donate a one-time payment	11%	11%	21%
<u>ANSWERING</u>				
<i>FIRSTROUND</i>	Responded in the first mailing round	68%	71%	84%
<i>EASE</i>	Ease of defining the sum of WTP	48%	60%	31%
<i>LEARN</i>	Learnt from the questionnaire	53%	52%	65%
<i>UNCERT</i>	Stated being "possibly" willing to contribute (Q8)	33%	29%	42%
<i>TRUST</i>	Perceived the scenario as plausible	51%	41%	28%

3.2 Willingness to contribute in hypothetical and real intention settings

In the pooled data set for the two treatments, the majority of the respondents (55%) refused to pay ($n_{\text{yes}} = 60$, $n_{\text{yes, possibly}} = 151$, $n_{\text{no}} = 259$). Table 2 presents the proportions of respondents who were willing to contribute to the association (Question 8 in the questionnaire), those who stated their WTP in euros (Question 9 in the questionnaire, see Appendix A), and the share of actual payments in the REAL OPTION treatment. The number of respondents stating willingness to contribute was higher in the HYPO (15%) than in the REAL OPTION treatment (9%). In addition, 33% and 29% of respondents in the HYPO and REAL OPTION treatments, respectively, stated that they were possibly willing to contribute. Almost two-fifths (38%) of the respondents in the HYPO sample and one-fifth (21%) in the REAL OPTION treatment stated their WTP in euros. Only 8% of the respondents in the REAL OPTION treatment actually donated the payment through a bank transfer. Although these respondents had quite evenly answered “yes” (YES) or “yes, possibly” (PYES) to question 8, this proportion was close to the share of those respondents who were without a doubt ready to contribute (9%). The decision to state a positive payment varied among “yes, possibly” contributors in the two treatments: 71% and 40% of these respondents in the HYPO and REAL OPTION treatments, respectively, stated a positive payment.

Table 2

The proportions of respondents willing to contribute and stating a positive payment out of all respondents in the HYPO and REAL OPTION treatments and in the pooled data set

Treatment	Willingness to contribute (Q8)		Out of the "contributors" (Q8) who chose to pay (Q9)	Real payment
	YES ¹	PYES ¹	Stated a payment	Made the payment
HYPO (n=253)	15 %	33%	38%	n.a.
REAL OPTION (n=252)	9%	29%	21%	8%
REAL (n=19)	58%	42%	100%	100 %
POOLED (n=505)	12 %	31%	30%	n.a.

¹⁾ Being a respondent who expressed willingness to contribute (yes/yes, possibly) a one-time donation to the Kellonkylä association and/or Kiiminki-Jääli water management association.

3.3 Factors associated with willingness to contribute and related response uncertainty

Two logit models (see e.g. Gujarati 2004) for a detailed description of the model) were constructed with the aim to reveal the factors associated with the stated willingness to contribute and related response uncertainty. The dependent variables referred to whether the respondent was willing (YES) or possibly willing (UNCERT) to make a non-zero payment. In the first model, the dependent variables take the value of one when the respondent is definitely willing to contribute ("yes, possibly" and "no" respondents counted as not willing to pay), and in the second model when the respondent is uncertain, i.e. only possibly willing to contribute ("yes" and "no" respondents

counted as not having uncertainty in the decision to pay). Table 3 presents the results estimated using the statistical software NLOGIT5.

The results of the first logit model show that definite willingness to contribute significantly correlated with six variables: already paying a subscription fee for a water management association (*SUBSCRIPTION*), a higher household income (*HHINCOME*), learning from the questionnaire (*LEARN*), not responding in the REAL OPTION treatment (*REAL OPTION*), perceiving the scenario to be plausible (*TRUST*), and having difficulty in defining the maximum sum of WTP (*EASE*).

The results of the second logit model for factors influencing uncertainty related in the decision to make a positive payment are also reported in Table 3. Notably, higher uncertainty was significantly correlated with the stated difficulty in revealing the household's WTP (*EASE*) indicating an increasing amount of mental effort put into responding. Responding in the first mailing round (*FIRSTROUND*), and learning from the questionnaire (*LEARN*) also increased the uncertainty of respondents. However, the household's income and whether the respondent answered in either the HYPO or REAL OPTION treatment, or being a member of a water management association, did not influence the respondent's uncertainty (*HHINCOME*, *REAL OPTION*, *SUBSCRIPTION*).

These results partly contradict those of Hanley et al. (2009), who showed that experience of the good, a higher income, and an increasing amount of mental effort put into responding may explain increased uncertainty over the value people place on public goods.

Table 3

Estimated coefficients for two logit models of i) the definite certainty of a respondent in being willing to make a one-time donation to the water management association and ii) related response uncertainty

Variable descriptions		YES (0-1)	UNCERT (0-1)
		Coefficient (Std. Error)	Coefficient (Std. Error)
Constant		-2.24 (1.47)	-1.14 (1.01)
<i>GENDER</i>	Female (1); male (2)	-0.09 (0.01)	0.10 (0.25)
<i>AGE</i>	18-75 yrs	-0.01 (0.01)	-0.01 (0.01)
<i>USEVALUE</i>	Uses waters for recreation (1); otherwise (0)	0.56 (0.40)	0.33 (0.26)
<i>HHINCOME</i>	Household's average monthly income, ten classes	0.17(0.08)**	-0.01 (0.01)
<i>KNOWLEDGE</i>	Had already heard about the river basin management plan (1); otherwise (0)	-0.37 (0.46)	0.18 (0.32)
<i>SUBSCRIPTION</i>	Pays a subscription fee to a water management association (1); otherwise (0)	1.12(0.44)**	-0.48 (0.37)
<i>ATTITUDE</i>	Restoration of small waters: very important (1),...,very unimportant (5)	-0.37 (0.46)	0.04 (0.22)
<i>INTEREST</i>	Detached the first page (information about the water management associations) of the survey to her/himself (1); otherwise (0)	-0.01 (0.37)	0.05 (0.26)
<i>REAL OPTION</i>	Responded in the REAL OPTION treatment (1); in the HYPO treatment (0)	- 0.81(0.38)**	0.16 (0.25)
<i>FIRSTROUND</i>	Responded in the first mailing round (1); otherwise (0)	0.02 (0.41)	0.65(0.28)**
<i>TRUST</i>	Perceived the scenario to be plausible (1); otherwise (0)	0.78(0.39)**	0.16 (0.26)
<i>LEARN</i>	Learnt from the questionnaire (1); otherwise (0)	0.91(0.42)**	0.57(0.27)**
<i>EASE</i>	Ease of defining the sum of WTP (1); otherwise (0)	-0.68 (0.39)*	-1.38(0.26)***
N		337	337
Chi squared [13 d.f.]		60.50***	52.49***
McFadden pseudo R ²		0.22	0.12

Note: *** p < 0.001, ** p < 0.05, * p < 0.1

3.4 Factors associated with higher WTP

Another regression analysis was carried out to investigate the factors that influence the size of the payment stated by the respondent. The majority (72%) of the respondents who reported willingness to contribute stated their payment with a single-value open-ended (OE) valuation question, while the rest chose the alternative type, i.e. an interval OE valuation question. Examining this issue from the actual payment viewpoint, the majority of respondents who actually made the payment in the REAL OPTION treatment had stated their maximum WTP with the single-value OE question, and those who stated their payment with the interval open-ended question paid along their upper bound payment. Therefore, the mean WTPs were calculated using the payments stated with the single-value OE answers and the upper bound payments of an interval OE question.

The effect of socio-economic and attitudinal factors on the stated WTP was analyzed with a linear OLS regression model. The type of valuation question and motivational factors were accounted for in the fourth model (POOLED, $WTP > 0$). The results of the models are presented in Table 4.

Table 4
Linear OLS regression analysis of the factors affecting single-value and interval OE statements for WTP. Dependent variable: $\ln(WTP+1)$

Variable	Model			
	HYPO	REAL OPTION	REAL	POOLED, $WTP > 0$

	t	t	t	t
Constant	2.55**	1.47	0.64	3.28***
<i>GENDER</i>	0.18	-0.98	-	0.21
<i>AGE</i>	-2.24	-0.63	-0.22	0.20
<i>USEVALUE</i>	0.77	0.78	-0.64	1.16
<i>HHINCOME</i>	1.27	2.22**	-0.15	1.68*
<i>KNOWLEDGE</i>	-0.46	0.00	-0.64	0.56
<i>SUBSCRIPTION</i>	2.16**	2.28**	4.09***	1.40
<i>ATTITUDE</i>	-1.58	0.10	-0.64	-1.52
<i>INTEREST</i>	0.93	-0.93	-1.11	1.80*
<i>REAL OPTION</i>	-	-	-	-1.77*
<i>FIRSTROUND</i>	1.91*	1.60	0.77	0.47
<i>TRUST</i>	2.68***	1.45	-1.23	1.16
<i>LEARN</i>	2.32**	-0.05	1.36	-0.35
-	-	-	-	-
<i>EASE</i>	4.47***	-6.23***	3.32**	-0.92
<i>PAID</i>	-	6.59***	-	-
<i>INTERVAL</i>	-	-	-0.32	2.31***
<i>WATERQUALITY</i>	-	-	-0.57	-1.04
<i>IMPORTANCE</i>	-	-	-0.58	2.25**
N	164	120	19	124
R ²	0.43	0.62	0.98	0.32

Note: ***p < 0.001, **p < 0.01, *p < 0.05

Two statistically significant variables associated with a higher willingness to pay statement are common between the HYPO and REAL OPTION treatments. First, the negative coefficient of the variable *EASE* indicated that respondents who perceived the maximum sum of WTP as being difficult to define were more likely willing to pay a higher sum than those who perceived this to be easy. This factor was also significant for the likelihood of being willing to contribute. Second, the positive sign of the variable *SUBSCRIPTION* indicated that those respondents who were already members of either river management association were more willing to pay a higher sum than non-members.

Interestingly, the respondent's gender or age, using waters for recreation (*USEVALUE*), and attitude towards the restoration of small waters (*ATTITUDE*) were not related to the amount of the payment in regression models for either treatment. Cognitive factors, e.g. perceiving the valuation scenario as plausible (*TRUST*), learning from the questionnaire (*LEARN*), and the mailing round in which the participant responded to the survey (*FIRSTROUND*), explained the stated amount for the WTP only in the HYPO treatment. In the REAL OPTION treatment, a higher stated WTP more probably resulted if the respondent actually made the payment (*PAID*) and had a higher household income (*HHINCOME*).

The results from the fourth pooled model with positive WTPs indicated that the stated amount for the WTP increased with the use of an interval OE WTP valuation question (*INTERVAL*) and when validating the positive payment with the importance of the valuation scenario (*IMPORTANCE*). Furthermore, responding in the HYPO treatment (*REAL OPTION*), a higher household income (*HHINCOME*), and greater interest (*INTEREST*) associated with a higher WTP.

3.5 Mean WTP amounts, ratios, and aggregation of the benefits

On average, the respondents were willing to pay €33 in the HYPO treatment and €17 in the REAL OPTION

treatment, including the respondents who stated zero WTP. Thus, the hypothetical to real intention ratio is 1.9. Before the analysis, two outliers, identified as having paid amounts that exceeded €999, were removed. There was statistical evidence of an overall difference in the mean donations between the HYPO and REAL OPTION treatments (independent-samples t-test: $t = 3.229$, $p = 0.001$; $t = 2.435$, $p = 0.015$). Out of 252 respondents for the REAL OPTION treatment, 51 stated some positive payment in the survey. Of these, 19 (37%) actually made a donation. Next, we compared the stated amounts of WTP in the REAL OPTION treatment with those payments actually made to the associations. The REAL OPTION:REAL ratio was 2.8, whereas the HYPO:REAL ratio was 5.5. Table 5 reports the mean WTPs for the two treatments and the average of the actually paid donations for those who responded in the REAL OPTION treatment.

Table 5

The mean willingness to pay estimates (EUR per household in October 2012) for the HYPO and REAL OPTION treatments and the average of the actually paid donations in the REAL treatment (and standard deviations of the mean WTPs in parentheses)

Treatment	Stated willingness to pay		Actual payment	
	Per contributor	Per respondent	Per contributor	Per respondent
HYPO	€75 (106.9)	€33 (80.0)	n.a.	n.a.
REAL OPTION	€60 (77.8)	€17 (49.4)	€80 (115.5)	€6 (27.3)

An aggregate benefit estimate was calculated by multiplying the pooled average household WTP estimate by the number of households in the municipality of the study area, i.e.

5,600. When determining the sample mean WTP, the mean WTP values of non-respondents were assumed to be 49% of the values for respondents. This was due to the difference in the data, as the mean WTP differed between respondents replying to the first and second mailing (64%/36%, the variable *FIRSTROUND*), being €31.7 and €12.5, respectively. Thus, households of the region would be willing to pay a one-time water management payment of EUR 93,000 in total to the water associations of Kellonkylä or Kiiminki-Jääli.

3.6 Inconsequentiality

To investigate the reasons underlying the hypothetical bias and whether inconsequentiality had played any role in it, the motivations for not paying are investigated with a follow-up questionnaire including seven alternative options explaining the difference in the stated willingness to pay and the actual payment. The follow-up questionnaire (see Appendix B) was sent to the 34 respondents in the REAL OPTION treatment who had not actually paid. Based on 13 (38%) completed and returned questionnaires, the following reasons were identified: some respondents had paid the annual subscription to the local association, other respondents first wanted to be sure that the other residents would also pay, and one respondent had changed his mind because he thought that polluters should pay all the costs of water management. Furthermore, two respondents paid the donation later. Based on this analysis, we cannot identify a lack of belief in the influence of the survey on policy makers among the majority of respondents.

4 Discussion

Offering respondents a possibility for real payment makes a valuation scenario more realistic, as it allows respondents to contribute in real monetary terms. Moreover, a more careful consideration of whether to state a positive

willingness to pay could be expected, with a consequent reduction in hypothetical bias. The analysis in this paper confirmed this expectation, reflected by a lower proportion of stated contributions among respondents in the REAL OPTION treatment (9–21%) in comparison to the HYPO treatment (15–38%). Using the proportion of YES responses out of all responses (including possible YES responses and NO responses) to the question concerning willingness to contribute (Q8) offered a simple way to estimate the minimum number of welfare gainers, since only 8% of the respondents actually donated a water management payment⁴ in the REAL OPTION treatment.

This paper provides new empirical evidence on the explanatory factors of the willingness to contribute and the related response certainty. The extent of learning about water management from the survey increased the likelihood of stating a willingness to contribute, either with certainty or uncertainty. In turn, responding immediately to the survey (during the first mailing round) and the perceived difficulty in stating the WTP amount (implying the difficulty of the task for the respondent) increased the likelihood of stating an uncertain willingness to contribute. In turn, previous contribution to the environmental issue, a higher income, belief in the scenario, and responding to

⁴ However, not every *yes* response revealed actual payment, and there were also actual payers among the “*yes, possibly*” responses.

the HYPO treatment increased the likelihood of stating a certain willingness to contribute.

Earlier studies have indicated a clear divergence between hypothetical willingness to pay and actual payments in stated preference valuation in both laboratory studies and field circumstances (e.g. Foster et al. 1997; List and Gallet 2001). Based on a meta-analysis, Murphy et al. (2005) argued that the calibration factor varies between two and three. The calibration factor calculated from this study, 1.9 in the hypothetical and real intention payment treatments, is close to their findings. When only including the actual payers of our sample in comparisons, the calibration factor between the average WTP in the HYPO treatment and the actual payment was 5.5. These results are in line with earlier studies and closest to the results presented by Brown et al. (1996).

Consistent with the outcome obtained by Duffield and Patterson (1992), the mean WTPs of the respondents with a positive WTP were rather similar across hypothetical (€75) and real (€60) treatments. Interestingly, the mean WTP estimate of actual contributors in the REAL OPTION treatment (€80) exceeded the mean WTP in the REAL OPTION treatment (€60). This result suggests that the respondents having a positive WTP had a true incentive to state their maximum WTP. It is also notable that a large share of all actual contributors

stated that they were “possibly” willing to contribute some positive payment.

However, to obtain “real” sample WTP estimates closer to the Hicksian value (see e.g. Newell and Swallow 2013), methods adding realism in the “water management market” should be considered. Furthermore, the usefulness of adding questions on self-reported implementation intentions, i.e. planning when and where to pay, could be considered to define the number of “true” contributors. According to Gollwitzer (1993), individual intentions are more likely to be translated into action when an individual develops a clear scenario of the circumstances under which the pursued action is to be performed.

5 Conclusions

This paper provides estimates of the benefits from the improvement of water quality according to the European Union WFD using two treatments: a typical hypothetical contingent valuation question (HYPO) and a contingent valuation question with a real payment intention (REAL OPTION). Our paper compares real and hypothetical WTP estimates and dependent factors related to the improvement of freshwater quality, performed under field circumstances. The novelty of this paper is in probing the cognitive and attitudinal factors that might explain this disparity

between stated and actual willingness to engage in pro-environmental behaviors. The results demonstrated a difference between the hypothetical and real intention WTP: the subtle wording changes and some instructions about paying via an Internet or local bank may move the individuals one step closer to a commitment to pay when they say they will pay.

In the water management context, further studies comparing real with hypothetical payments involving a reasonable sample size to enable statistical analyses within the real treatment would be desirable. In addition, there appears to be a common interest among cognitive psychologists and environmental economists in exploring the effect of the wording of valuation questions.

Our study, while revealing the divergences in results gathered from real intention and hypothetical treatments, did not challenge the feasibility of the contingent valuation method in valuing environmental amenities as such. However, the results highlight the need for a more thorough assessment of which respondent-related factors are associated with hypothetical bias. Although challenging to implement, further split sample and real world case studies on this subject with sufficient sample sizes are encouraged.

When provided an option to make a real payment, survey respondents stated their valuation realistically compared to their average actual donation, adding more realism to the valuation scenario. The divergence between the hypothetical and real

willingness to pay evidenced in this study does not indicate whether the WTP is overstated in the hypothetical or understated in the real option treatment. Acknowledging the difference in WTP estimates in these two treatments provides an opportunity to use either estimate of the aggregate WTP as a useful measure of the actual behavioral intentions of individuals or the environmental benefits derived from water quality improvement when estimating society's demand for water quality improvements.

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Appendix A. Valuation question in the two separate questions

Treatment I: Hypothetical WTP	Treatment II: Real WTP
<p>Q9. If your household had the possibility to make a one-time donation to the Kellonkylä association and/or Kiiminki-Jääli water management association, what is the highest payment you would be willing to make?</p> <p>Funds would be gathered through bank transfer to the bank account of the association and the funds would be used for planning and as widely as possible for the implementation of a water vision.</p> <p>☐ My household would be ready to donate _____ euros at most as a water management lump sum to the Kellonkylä association* in order to implement the water vision of Kello.</p> <p>OR</p> <p>☐ My household would be ready to donate _____ - _____ euros as a water management lump sum to the Kellonkylä association* in order to implement the water vision of Kello.</p>	<p>Q9. Now your household has the possibility to make a one-time donation to the Kellonkylä association and/or Kiiminki-Jääli water management association: how large a payment are you willing to make?</p> <p>Funds will be gathered through bank transfer to the bank account of the association and the funds will be used for planning and the widest possible implementation of a water vision. You can pay via Internet bank or at your bank with the following information.</p> <p>☐ My household is ready to donate _____ euros at most as a water management lump sum to the Kellonkylä association* in order to implement the water vision of Kello.</p> <p>OR</p> <p>☐ My household is ready to donate _____ - _____ euros as a water management lump sum to the Kellonkylä association* in order to implement the water vision of Kello.</p>

*) The same questions were also used for the Kiiminki-Jääli water management association. The respondent could choose to donate to one or both of the associations.

785 Appendix B. Questionnaire to those who expressed willingness to pay, but who did not pay
786

787 **1. I didn't pay because**

788 *(Choose the most suitable alternative and mark it with 1, and the second best alternative with 2):*

789

790 ☐ I changed my mind about paying.

791 ☐ I couldn't afford to pay.

792 ☐ I forgot.

793 ☐ I wanted to consider the matter further.

794 ☐ I felt that I didn't support this project enough to pay for it.

795 ☐ I preferred voluntary work to donation.

796 ☐ Some other reason, what? _____

797