An Experimental Investigation of the Impacts of Persuasion and Information Acquisition on Non-Use Values for Climate Change Adaptation

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Abstract

Focusing on the estimation of WTP for climate change adaptation projects in vulnerable areas around the world, this study explores the divergence between economic non-use values produced using a standard CV survey approach, and those produced using a persuasive' CV survey in which most sources of informational bias are systematically exploited to maximise expressed WTP. We interact the persuasion analysis with a cross-cutting treatment involving optional information access. It is proposed that allowing respondents to voluntarily access added information emulates rather more closely consumer pre-purchase behaviour in the market. We examine information acquisition using two treatments: a pre-set default option (the default is "no added information wanted") versus an "active decision" option ("would you like added information?"). The interactions produce an eight-cell experimental design. We find that, contrary to expectations, the persuasion treatment has a negative influence on WTP. We also find that persuasive information appears to dissuade respondents from accessing added information when this is offered as an opt-in default. Effort spent accessing added information has a strong influence on WTP but the sign on the coefficient varies depending on how the information was offered to respondents.

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Introduction

Despite its wide usage to estimate non-market values, the validity of the contingent valuation method is still under debate, especially with regards to the measurement of non-use values, for which people generally lack stable, well-defined preferences. CV survey respondents have been found to 'construct' their preferences for the environmental or public good being valued during the course of the survey. This is problematic because constructed preferences are unstable and highly reactive to information and context. Indeed, this is the case for all novel goods, whether public or private: the more unfamiliar the good, the less stable the preferences associated with it.

As a result, the CV method is subjected to a variety of procedures in order to obtain as stable, well-articulated and unbiased values as possible. Rigorous control is exerted over the type, extent and order of presentation of the information and valuation questions; attitudinal statements are used to isolate warm-glow motivation, social desirability bias and lexicographic preferences, and sources of bias are minimised using recommendations specified in Arrow et al. (1993) and Bateman et al. (2001). In sum, the demands on CV are extremely high.

However, whilst CV valuation struggles to produce values that are aligned with theory, the market appears to do quite the opposite. One has only to watch advertising on television or go shopping to observe how suppliers of private goods actively exploit all of the sources of bias that appear to plague CV. Suppliers of private goods actively provide biased information about the products, anchor prices to other product prices, focus on the particular rather than the overall and all in all, capitalise on bounded rationality to inflate prices and demand. This is not only true of private goods, but of charitable goods too. Charities raising funds for the preservation of whales, pandas and other issues with major non-use components use emotive images and persuasive information to stimulate potential donors into parting with their money.

Considering that CV aims to elicit preferences via hypothetical markets, we ask ourselves: *what would the information look like if provided in a real market?* And more importantly: how would this information affect WTP? Focusing on the estimation of WTP for climate change adaptation projects in vulnerable areas around the world, this study explores the divergence between economic non-use values produced using a standard CV survey

approach, and those produced using a 'persuasive' CV survey in which sources of bias are systematically exploited to maximise expressed WTP[2].

Keeping in line with the '*do it like the market does it*' approach taken in this study, we interact the persuasion analysis with a cross-cutting treatment involving optional information access. Our intention is to explore information search behaviour in a CV setting and the effects of this behaviour on WTP. CV studies typically present set amounts of information to respondents and based on this information asks for their willingness to pay. Although CV practitioners acknowledge the artificiality of this process, there has been little effort to make the information acquisition process resemble 'real' information gathering, a process which is usually incremental and proportional to the intention to purchase (a notable exception is Berrens et al., 2004). It is proposed that allowing respondents to voluntarily access added information emulates rather more closely consumer pre-purchase behaviour in the market. This is in line with a similar proposal made by Schlapfer (2008) in which he advocates allowing respondents to access outside sources of information in order to produce more credible CV estimates.

We examine information access using two treatments: a pre-set default option (the default is 'no added information') versus an "active decision" option ("would you like added information?") The interactions essentially produce an eight-cell experimental design (see Section XX). To the best of our knowledge, there have been no studies investigating the influence of default options on the decision to access information. All reviewed studies focus on the influence of the default option on the final decision (e.g. product purchase, organ donation, WTP). Given that information is such a major determinant of WTP in CV studies (e.g. Boyle, 2003), we consider it valuable to investigate how a modest variation in the *way information is offered* may influence information access and hence, ultimately, WTP.

This paper is organised as follows: in the following section we briefly review the evidence regarding impacts of information acquisition on WTP as well as the literature on the influence of persuasive information on WTP. We generate some broad hypotheses based on this literature. Section 3 presents a simple conceptual framework, Section 4 describes the study design, Section 5 presents the results and final conclusions are drawn in Section 6.

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[2] We focus on positive persuasive information, noting that in the market there might also be negative persuasive information provided by competitors and disgruntled consumers.

Background and Hypotheses

2.1 Persuasive Information

In this paper, we use the definition by DellaVigna and Glentzkow (2009, p.5), which says that persuasive information is "a message provided by one agent (a sender) with at least a potential interest in changing the behaviour of another agent (a receiver)." This type of information is differentiated from that provided by CV surveys in which the aim is elicit existing preferences - or at the very least, to assist respondents in constructing preferences in as unbiased a manner as possible. Thus, although CV involves some element of persuasion (just by the very fact of asking people to read information about and value a non-market good), the aim is not persuasion.

As noted in the introduction, our rationale for evaluating the impact of persuasive information on WTP is based on the fact that existing market values for non-use goods have been generated using persuasive information. Consider the "sponsor-a-child" strategy adopted by many poverty-alleviation charities. It is well known that framing the donation solicitation in these intimate terms helps establish a sense of personal contact between the donor and the needy, which in turn increases donation likelihood and size (Micklewright and Wright, 2008). This is confirmed by a number of experimental studies that find that giving behaviour in contribution games increases when dictators are told that contributions will go to the Red Cross (Eckel and Grossman, 1996), to impoverished recipients (Brañas-Garza, 2007) or to recipients needing medicine (Aguiar et al., 2008)[3].

Charities - and indeed, suppliers of fair-trade and other socially-responsible goods - clearly recognize the value of framing their activities in terms of particular individuals, communities or species that will benefit from the donation/purchase. These donations reflect non-use values, as donors are unlikely to have any direct contact with the sponsored child (except, perhaps through the occasional letter). Similarly, charities raising funds for the preservation

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[3] Various explanations have been posited for these findings. One argument is that that we are not morally motivated to give to statistical entities such as faceless "receivers" in a dictator game (Eika, 2011), which suggests that altruism may play a significant part in such behavior. Another explanation is that experiential information (such as a person's name) has a stronger influence on behavior than analytic-type information (such as numbers of affected people), independent of moral considerations.

of whales, pandas, Siberian tigers and other threatened species use the up-close-and-personal approach to stimulate potential donors into parting with their money. The same goes for fair-trade products, in which the premium reflects preferences for fair working conditions for farmers on the other side of the globe. These products rarely ply us with statistics, detailed information and reminders of substitutes. Rather, they tell us that "*José can now send his two daughters to school thanks to fair trade*", or something along these lines.

These market non-use values are generated by focusing on 'experiential information processing'. Experiential processing involves comprehension through direct experience, recollections of experience and access to other people's experiences. As noted in Marx et al. (2007, p.49), "*The skill to combine the personal experiences of many into statistical summaries is a powerful evolutionary accomplishment that dramatically increases our aptitude to learn in less costly ways.*" There have been numerous experimental studies that find that anecdotal and personal information overwhelms analytic-type information (involving data, statistics, hard facts) in comprehension and memory (e.g. Tversky and Kahnemann, 1974; Weber et al., 2004).

Another feature of persuasive information is *strong wording*. Empirical studies on the effect of strong wording on WTP are rather thin on the ground. Notably, Ajzen et al. (1997) explores the influence of "strong" versus "weak" messages on WTP, in interaction with a personal relevance priming treatment. They find that "strong" messages influence WTP only when respondents have been primed to perceive the good as having high personal relevance. However, we note that the good being valued under the "strong" wording treatment has different attributes from that valued under the "weak" wording treatment, so we are hesitant to make any conclusions based on this study. Another study by Clarke et al. (1999) find that positive versus neutral information presentation did not affect mean WTP, although it had an influence on attitudes.

Finally, persuasive communications never include reminders of substitutes or reminders of budgetary constraints, which are typically used to produce as reduce hypothetical bias in CV. The influence of these scripts on WTP has been studied extensively. Generally, mean WTP decreases when respondents are reminded of substitutes (Bergstrom et al., 1989; Whitehead and Blomquist, 1991) or when the survey includes a "cheap talk script" in which they are informed as to the hypothetical nature of typical valuations (Aadland and Caplan, 2006; List, 2001; Cummings and Taylor, 1999).

Based on the empirical literature, we expect that the combination of stronger wording, more experiential-type information and the lack of a cheap talk scripts and reminders of substitutes in our 'persuasive survey' (described in detail in Section 4.4) will drive WTP upwards. Thus we hypothesise that:

H01: the persuasive information treatment will produce higher WTP estimates overall

2.2 Information acquisition

There have been a number of studies exploring the impact of different amounts of information on CV responses. Additional information tends to increases WTP (e.g. Bateman and Mawby, 2004; Samples et al., 1986), although too much information can lead to information overload and result in unreliable estimates (Bateman et al., 2002). Thus, the question of how much the 'optimal' amount of information is remains unanswered. Schlapfer (2008) suggests that CV studies should allow respondents optional access to additional sources of information in order to obtain more credible estimates. We concur that this would reflect more accurately the behaviour of individuals in real markets and other decision-making contexts.

To the best of our knowledge, only one study has investigated the influence of optional information acquisition on WTP. In this study, Berrens et al. (2004) found that the more additional information a respondent chose to read in the context of an internet survey, and the longer they spent reading this added information, the higher their WTP for climate change policies. There have been other more recent studies exploring the relationship between effort and WTP - where effort is measured in terms of time spent on a survey. For example, in a conjoint analysis study, Holmes (1998) found that WTP for rainforest conservation was positively related to effort. Vista et al. (2009) however found no influence of effort on WTP in a choice experiment survey of stream restoration.

Given the inconclusiveness of the literature, we propose the following hypothesis in the most tentative terms:

H02: respondents who choose to read added information will have higher WTP

We make no claims, however, about the direction of causality in H02. If H02 is not rejected, the question is which comes first? The demand for information or the higher (expected) WTP? In other words: did respondents acquire more information *because* they

were likely to value the proposed programmes more? Or did they value the proposed programme more *because* they had read more information? If the latter is true, then the question is: what drove them to read more information? We explore this chicken-and-egg question later in the analysis.

As noted in the introduction, we examine information access using two treatments: a pre-set default option (the default is 'no added information') versus an "active decision" option ("would you like added information?").

Recently, there has been a surge of interest in the impact of pre-set default options on behaviour, which took off with the ground-breaking paper on organ donation by Johnson and Goldstein (2003). This famous study showed huge increases in donation rates when the option to donate was presented as an opt-out default (i.e. individuals had to tick a box *not* to donate their organs). The study of defaults on decisions has been applied to a range of decisions such as car option purchases (Park et al., 2000), pension saving (Carroll et al., 2009), consent to receive e-mail marketing (Johnson et al, 2002), and more recently, to explore WTP towards carbon offsets for flights taken by conference attendees (Lofgren et al, 2012; Araña and Leon, 2012). Generally, the influence of defaults is considered to be either a consequence of human inertia (Samson and Wood, 2010), or due to individuals' interpretation of the default as the recommended course of action (Beshears et al., 2006). Whatever the explanation, the evidence overwhelmingly indicates that pre-set defaults have huge effects on decision behaviour.

Based on the above, we hypothesise that:

H03: fewer respondents will read added information if it is offered using a default opt-in question frame (where the default is 'no information')

We are also interested in examining how persuasive information will affect the demand for more information, if at all and how this affects mean WTP for climate change adaptation.

Study Design

The data for this study was collected using an online CV survey that was distributed to a panel of respondents by a professional survey company (Pure Profile). Four versions of this

survey tool were used to implement the various treatments (see below). However, all the survey versions had the same basic structure: an initial set of screening questions (for purposes of sample selection) followed by questions on attitudes and beliefs regarding climate change, followed by information about climate change (specifically covering background, impacts and adaptation options), the valuation scenario and the payment question. Debriefing questions elicited reasons for WTP, degree of certainty regarding payment, perceptions of the information provided, as well as statements intended to capture extent of hypothetical bias and extent to which WTP was 'constructed' during the survey. Socio-economic data was collected at the end of the survey[4].

3.1 Elicitation format

Survey respondents were asked to state their WTP for CC adaptation programmes around the world. The valuation question specifically read:

"Suppose there was a Worldwide Adaptation Fund - an international institution responsible for overseeing the implementation and management of Adaptation Programmes across the globe. These Adaptation Programmes would be designed to alleviate the negative impacts of climate change on nature and the environment, agriculture, human health and the built environment. Funding for these Adaptation Programmes would come from all individual countries as a percentage of their GDP. This means that everyone would have to pay a little more income tax. Industries would pay extra taxes, as well as households.

On the following page, we describe four Adaptation Programmes that would be implemented by the Worldwide Adaptation Fund. I'd like you to think how much these programmes are worth to you. Then please consider whether you would be willing to pay a surcharge on your household income tax, even if it were only a very small amount, to support these worldwide Adaptation Programmes."

We also included a paragraph emphasising the trustworthiness, transparency and accountability of the Worldwide Adaptation Fund (WAF). Lack of trust accounted for a

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[4] The data reported in this paper are from the first half of the survey, which focused on WTP for climate change adaptation. The second part focused on WTP for adaptation programmes specifically targeted at UK historic buildings. This data is currently being analysed, and will appear in another publication in the near future.

major number of protest responses in the pilot surveys. This added paragraph was designed to reassure respondents and minimise protests. Positive amounts were elicited using a payment ladder (with a maximum value of £2000 per year).

3.2 Optional information acquisition treatment ('effort')

We examine optional information acquisition (from here on, 'effort') using two question frames: an "active" question frame ("would you like added information?") and a pre-set default frame ("if you would like more information, click here.") Respondents had the option of accessing either two or three additional pages of information, depending on whether they received a survey with the persuasive information treatment or whether they received the standard CV survey (see below). Surveys with a "persuasive information" treatment provided three optional pages of information (specifically on: Climate Change Background Information, Climate Change Impacts and Climate Change Adaptation) whilst the CV survey provided two optional pages of information (on: Climate Change Impacts and Climate Change Adaptation).

About half of the total sample completed a survey with the default question frame and half completed the survey with active question frame. These sub-samples are further divided down (Table 1) according to whether they received persuasive information or standard unbiased information in the survey. This treatment is described below.

3.3 Persuasive information treatment

The design of this survey[5] was based on a review of over twenty websites for charitable organisations raising funds for predominantly non-use goods (e.g. poverty alleviation and environmental causes in developing countries). It was considered that these organisations would be well-versed in persuasive techniques for attracting funds, especially with regards to non-use values. As a result of this review, the following features were manipulated in the final survey:

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[5] The full survey can be obtained from the authors on request.

<u>Experiential-type information</u>

In our review of charity websites, a consistent feature was the framing of the information and donation solicitation in personal terms, often referring to specific individuals or communities in need. Thus the persuasive survey presented specific examples of species, communities and farming areas that have been affected by climate change, as well as three short pieces on communities that have successfully developed adaptation strategies to deal with climate change. The CV survey, however, presented more neutral and generic information on impacts predicted by the IPCC, indicating the levels of statistical confidence that these events will happen. It also explained adaptation, and listed (in broad terms) high-risk areas where adaptation interventions were most needed as well as the adaptation options available. For example, in the optional information section on CC impacts, under the Built Environment heading, it reads:

"Scientists predict with "very high confidence" (i.e. at least a 9 out of 10 chance of being correct) that flooding of low-lying coastal areas will increase, causing displacement of large numbers of coastal communities, especially in small island states as well as the mega-deltas of Asia and Africa."

In the persuasive information survey, this paragraph has been omitted and in its place is a paragraph that reads:

"Already, two of the islands that make up Kiribati (a Pacific island nation) have gone under the waves, and in early 2005 others were flooded by a high spring tide that washed away farmland, contaminated wells with salt water, and flooded homes and a hospital. Flooding and coastal erosion has become a fact of life for the Kiribati people, who are currently seeking relocation options abroad.

<u>Wording</u>

A standard requirement of CV surveys is that the information and scenario is worded in as neutral and unbiased terms as possible. This was applied to the standard CV survey. The persuasive information treatment involved strong and emotive wording on the first page of information (starting with the opening sentence: *"Our planet is in peril"*), as well as in the

optional information sections[6]. The full text of the opening pages for both information treatments can be obtained from the authors upon request.

Reminder of substitutes and cheap talk

The CV survey included a paragraph in the "Climate Change Impacts" section that reminded respondents that:

"Climate change is not the only threat to nature and the environment, agriculture, human health and the built environment. Other threats include: pollution, overpopulation, bad governance, war, resource scarcity and poverty."

These paragraphs were not included in the persuasive survey. In addition, respondents in the CV survey are reminded to consider all other substitutes – including other development and aid goals – before making their valuation. Finally, they are asked to "*think about what you would really contribute – as if the increase in income tax were to be made effective as of today*". The persuasive survey omits these scripts.

1.4 Experimental design and data collection

The information treatments were interacted with the information acquisition treatments. From henceforth, we will label these combinations as follows:

CV-Act: standard CV survey, active optional information access question

CV-Def: standard CV survey, default optional information access question

P-Act: persuasive information treatment survey, active optional information access question

P-Def: persuasive information treatment survey, default optional information access question

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[6] The information provided on climate change impacts and adaptation was the same in both information treatments. This is based on our review of charity websites, in which we observed that strong emotive wording and images mostly feature on the charity's homepage, whilst subsequent pages contain more moderate content. We suggest this might be done in order to avoid compassion-fatigue.

Table 1: Experimental design

	CV	P	Total
Active	n=491	n=101	n=592
Default	n=103	n=575	n=678
Total	n=594	n=676	n=1270

If we factor in the decision to read added information, then these subsamples are further subdivided into two groups: effort=1 (subsample that did not choose to read the added information) and effort>1 (subsample that did choose to read at least one piece of added information). All treatments and effects considered, this produces an 8-cell design.

A total of 1,270 online surveys were completed by UK residents between September and December 2012. The average completion time was 15 minutes (surveys that had been completed in less than 5 minutes were dropped from the final analysis). Sample sizes for each treatment are shown in Table 1. As we can see, sample sizes are quite different for each treatment. To avoid undue influences of sample size on our results, we use 1) non-parametric Mann-Whitney tests, which are not affected by unequal sample sizes, 2) interaction variables controlling for the different samples in the pooled regressions, 3) where possible, robust regressions, which control for heteroskedasticity (i.e. when variance of error terms differ for different observations), which may well be present given the different sub-samples that make up our pooled models.

Results

4.1 Description of sample

Table 2 presents definitions and summary statistics for key variables that will be used in the analysis throughout the rest of this paper. Non-parametric Mann Whitney tests indicate that the samples are statistically homogenous in terms of gender, income, donations to charity, self-reported knowledge about climate change and actual knowledge about carbon dioxide causing climate change. They differ however with regards to age (mean age of CV-Def

respondents is significantly lower than mean age of CV-Act (p=0.0136) and P-Def (p=0.0081) respondents). At this stage, we consider these differences in the samples modest enough to warrant leaving the data as is.

Table 2: Socio-economic Characteristics

Variable name	Description	CV-Act (n=491)	P-Def (n=575)	P-Act (n=101)	CV-Def (n=103)
Y^{c}	Gross annual household income (mean £) [b]	35,825	36,235	38,762	32,791
MALE	Gender of respondent (1=male, 0=female)	0.50	0.51	0.50	0.49
AGE	Age (mean years) [a]	47.7	48.3	46.5	43.5
EDUC	Respondent has university degree or professional qualification (1=yes, 0=no)	0.49	0.46	0.51	0.58
DONATE	Respondent donates regularly to charity (1=yes, 0=no)	0.57	0.54	0.62	0.52
KNOW	Self-reported measure of knowledge about climate change (scale 1-5, where 1=very low knowledge and 5=very knowledgeable)	3.20	3.19	3.23	3.28
KNOWCO2	Awareness that CO2 is the main cause of climate change (1=yes, 0=no)	0.35	0.33	0.47	0.35

[a] The highest level in the survey ("over 75 years old") was given a value of 80 years of age.

[b] The highest level in the survey ("over £150,000 per year") was given a value of £175,000 per year.

[c] We report summary statistics for income in this table, although we use the natural logarithm of income in the regressions. We find the income statistic to be more meaningful at this stage than the log(y) statistic.

4.2 Effort

Information acquisition (from henceforth, 'effort'), was proxied by a simple measure of number of optional information pages accessed by respondents. Table 3 presents summary statistics describing effort across treatments[7].

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[7] There was also the option of using time spent on the survey as a proxy for effort. However, time spent can be influenced by many irrelevant factors (such as leaving the computer to make a cup of tea) and as reported in Berrens et al, (2004), time spent completing the survey was a less robust indicator of effort than number of pages accessed.

Table 3: Demand for added information by subject

Effort statistics	CV-Act (n=491)	P-Def (n=573)	P-Act (n=101)	CV-Def (n=103)
Share of sample that read a <u>minimum of one</u> piece of added information	0.62	0.04	0.55	0.31
Mean effort (scale 0-2, where 0=respondent has not read any added info, 2=resp. has read all added info) (s.d.)	0.99 (0.87)	0.06 (0.28)	0.86 (0.87)	0.48 (0.76)

Summary statistics indicate a sizeable variation between effort levels across survey types. As expected, effort levels are highest when respondents are faced with an 'Active' decision about reading more information (i.e. "Would you like to read more information?") Chi-squared tests of equal proportions unanimously confirm that the share of respondents accessing added information significantly differs between 'active' and 'default' surveys (all p=0.000), and Mann-Whitney non-parametric tests confirm that the difference between overall effort levels between 'active' and 'default' surveys is also significant (all p=0.0000). This satisfies our third hypothesis (*H03: fewer respondents will read added information if it is offered using a default opt-in question frame*).

However, we remark on the large difference in effort between the two default surveys: only 4% of respondents chose to access at least one piece of added information in P-Def, compared to 30% in the CV-Def survey. Testing (parametric t-tests and non-parametric Mann-Whitney tests) indicate that this difference is significant (p=0.000). The question is: which of these results is the more remarkable? The 4% opt-in rate in the persuasive survey or the 30% opt-in rate for the CV survey? An overview of the default literature suggests that opt-in rates range from around 15% for organ donation (Johnson and Godstein, 2003), through 21-62% for carbon offsets for flights to environmental economics conferences (Lofgren et al, 2012; Araña and Leon, 2012).

Given the relatively low cost of choosing an opt-in for more information in a survey context, and given the opt-in rates (ranging 15-62%) for what are arguably, more weighty or costly options such as organ donation, it seems that 4% opt-in rate in the present study is remarkably low. This finding hints at the possibility of a synergistic relationship between the persuasive information frame and the opt-in information default. We tentatively suggest that the tendency of respondents to the P-Def survey to go along with the default hints at some

element of what Herbert Simon termed 'docility', defined as a '*tendency to accept knowledge and advice that are transmitted through social channels*', social channels being defined as '*information received from "qualified" sources*' (p.244, Simon, 1982). In this light, it appears that the default is interpreted by the respondent as the recommended course of action by the "qualified" source – which would be the researcher. However, we cannot verify these suggestions with our current data, and so refrain from pursuing this very interesting line of thought.

4.3 Willingness to Pay for Climate Change Adaptation

Table 4 summarises mean WTP according to effort levels (simplifying to effort=0 (respondent has not read any of the optional information), and effort>0 (respondent has read at least one piece of optional information)).

Table 4: Summary Statistics WTP for Adaptation to Climate Change

	Sample size	Sample WTP>0	Sample non-valid £0 [b]	Conditional mean WTP (WTP>0) [a]	Total mean WTP [a]
CV-Act (effort=0)	189	0.35	0.20	25.92 (40.52)	11.48 (29.79) *[149]*
CV-Act (effort>0)	302	0.70	0.11	35.46 (51.13)	27.92 (47.62) *[268]*
CV-Def (effort=0)	71	0.52	0.21	32.73 (48.75)	24.28 (41.35) *[57]*
CV-Def (effort>0)	32	0.52	0.24	29.77 (26.66)	24.68 (26.54) *[29]*
P-Act (effort=0)	46	0.37	0.18	31.99 (45.37)	14.31 (33.91) *[38]*
P-Act (effort>0)	55	0.64	0.20	32.25 (32.51)	25.50 (31.73) *[43]*
P-Def (effort=0)	550	0.62	0.20	31.45 (44.68)	21.59 (42.51) *[432]*
P-Def (effort>0)	25	0.81	0.10	27.53 (26.61)	20.36 (26.00) *[19]*

Figures in parentheses ( ) are standard deviations; figures in square brackets [ ] are subsample sizes

[a] Non-valid zero WTP and outliers of £500 and over have been removed from mean WTP calculations.

[b] Calculated as percentage of all WTP values; these £0 values are dropped from the analysis.

A first inspection of the data reveals that the overall WTP distributions are positively skewed, with standard deviations that are at least double the mean WTP value. This is quite typical for CV data, and is mostly due to the large number of zero values for climate change adaptation. Non-valid reasons for the zero WTP values (such as "I don't trust the WAF would spend the money appropriately" and "Governments should pay for this by reallocating money in their current budgets") were dropped from the analysis. Outliers are often removed from the analysis of CV data in order to bring the distribution closer to normality. We follow convention and truncate the top 0.4% of values of £500 and over so as to avoid over-inflated mean values. However, we acknowledge that by truncating these values, we obscure the fact that the persuasive information results in a few very high values.

In terms of the influence of our treatments on mean WTP, results are rather mixed. Univariate tests of differences in mean WTP are presented in Table 5. Given our rather different sample sizes and skewed distributions, we opt to present results of non-parametric Mann Whitney tests which are more robust to sample size and distributional assumptions than standard parametric t-tests.

Table 5: Hypothesis tests on WTP for Adaptation

Hypotheses	Non-parametric test results
Test effect of persuasive information (H01)	
1. WTP CV-Act= WTP P-Act	0.9097
2. WTP CV-Def= WTP P-Def	0.0332*
Test effect of persuasive information controlling for effort (H01)	
3. WTP(effort=0) CV-Act= WTP(effort=0) P-Act	0.9779
4. WTP(effort=0) CV-Def= WTP(effort=0) P-Def	0.2558
5. WTP(effort>0) CV-Act= WTP(effort>0) P-Act	0.4875
6. WTP(effort>0) CV-Def= WTP(effort>0) P-Def	0.4570
Test effect of effort (H02)	
7. WTP(effort=0) CV-Act= WTP(effort>0) CV-Act	0.0000***
8. WTP(effort=0) CV-Def= WTP(effort>0) CV-Def	0.1897
9. WTP(effort=0) P-Act= WTP(effort>0) P-Act	0.0010***
10. WTP(effort=0) P-Def= WTP(effort>0) P-Def	0.5547

The main finding in Tables 4 and 5 is that the persuasive information treatment has very little effect on WTP (only observed when comparing the 'Default' surveys), and what little effect is observed is *in the opposite direction of what was hypothesized*. Thus, based on the above data, we must reject our first hypothesis (*H01: the persuasive survey will produce higher WTP estimates*).

With regards to the influence of effort on WTP, we observe (Tables 4 and 5) that respondents who read additional information in the 'active' surveys have significantly higher WTP than those who do not choose to read more information. However, when information is offered via an opt-in default, mean WTP does not vary between effort levels. In sum, it appears that WTP is only related to effort when information is offered using an 'active' question; when it is offered through an opt-in default, WTP remains unchanged. Based on the mixed evidence for the 'active' versus 'default' surveys, we cannot confirm our second hypothesis (*H02: respondents who choose to read added information will have higher WTP*).

These latter results hint at the possibility that effort is motivated by pre-existing higher WTP values rather than the other way round (WTP being determined by effort). This question was raised in Section 2.2, with regards to Hypothesis 2, where we asked which came first: effort or preferences. We propose that, given an 'active' offer of additional information, respondents with high expected WTP will self-select to added information, and that respondents with lower expected WTP will choose not to read added information. This confirms somewhat to the information search literature, according to which, search is motivated by expected expenditure amongst other factors (Simon, DATE).

Before continuing to speculate on the reasons for these interesting results, we carry out regression analyses in order to verify whether the information and question frame treatments influence WTP when controlling for socio-economic, attitudinal and knowledge variables.

4.4 Regressions on mean WTP

Table 6 presents the results of various regressions[8]. In the first column, we present results of a Tobit Type I model, which is typically used on data with a non-negligible fraction of zero values. Use of this model on valuation data with many zero values assumes that the data is censored at zero (i.e. that negative values are unobserved). Given that we wouldn't really expect negative WTP values for adaptation to climate change, this assumption is probably rather inaccurate. For this reason we also model the participation decision (a Probit model on a dummy variable where 0=WTP=0 and 1=WTP>0) separately from the contribution decision (a truncated regression on all WTP>0)[9]. Finally, recognising that EFFORT is endogenous (i.e. it is determined by some of the same independent variables that determine WTP – regression results supporting this claim are available upon request), we present results of an Instrumental Variable regression, in which "DEFAULT" is used as the exogenous instrument). Given that DEFAULT was such a significant influence on effort as identified in Table 2, it was considered a strong instrument. The high F-statistic (63.79) of the first-stage regression confirms this to be the case (a rule of thumb is that if the F-statistic is less than 10, then the instrument is weak).

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[8] The modeling process involved a series of regressions with interaction variables of the form "survey*independent variable" in order to uncover significant influences that might have been obscured by the different sample sizes. Only one of these interaction variables was significant ("survey*DONATE"), however we opted not to include it in the final regression as DONATE was significant in the pooled model anyway. The significance of this interaction simply indicates that donate is particularly significant for the smaller (default) survey sample.

[9] We also estimated a Heckman two-stage model, which controls for sample selection bias, but could find no evidence for sample selection as given by the Mills Lambda ratio (in all regressions, the Milla Lambda was never significant).

Table 6: Regressions on LnWTP

	Tobit regression on all WTP			Probit regression on decision to pay			Truncated regression on WTP>0			Interval regression on all WTP (DEFAULT=instrument)		
	Coefficient		t-ratio	coefficient		t-ratio	coefficient		t-ratio	coefficient		t-ratio
Socio-economic variables												
LNY	0.330	***	3.36	0.023		1.06	0.344	***	4.00	0.228	***	3.05
MALE	-0.170		-1.20	-0.048		-1.52	0.042		0.36	-0.019		-0.18
AGE	-0.109	**	-2.48	-0.004	***	-4.25	0.007	*	1.77	-0.007	**	-2.13
EDUCATION	0.406	***	2.93	0.080	***	2.60	0.142		1.22	0.344	***	3.24
DONATE	1.354	***	9.43	0.274	***	8.91	0.400	***	3.24	0.974	***	8.79
KNOW	0.411	***	4.99	0.071	***	3.98	0.231	***	3.21	0.336	***	5.56
KNOWCO2	0.493	***	3.41	0.127	***	4.11	-0.026		-0.23	0.476	***	3.99
Treatment variables												
EFFORT	0.786	***	6.74	0.175	***	6.79	0.240	**	2.34	-0.470	**	-2.23
DEFAULT (1=default; 0=active)	1.192	***	5.23	0.235	***	4.98	0.335		1.63	-		-
PERSUASION (1=pers-uasive; 0=standard info)	-0.228		-1.19	-0.075	*	-1.92	0.060		0.41	-0.387	**	-2.04
EFFORT*DEFAULT	-0.454	*	-1.87	-0.073		-1.19	-0.114		-0.64	-		-
Intercept	-4.746	***	-4.50	-			-2.584	***	-2.69	-1.628	**	-2.00
Log-likelihood	-1768.0588			-531.341			-1102.347			-		
LR /Wald Chi2	287.32 (11 dof)***			219.27 (11 dof)***			65.36 (11 dof)***			-		
1st stage F-statistic	-			-			-			63.79 (9 dof)***		
2nd stage F-statistic	-			-			-			28.81 (9 dof)***		
N	1040			1040			696			1035		

* Significant at 10% level; ** at 5% level, *** at 1% level

Results show that the coefficients on PERSUASION are negative in all models, partly confirming findings in Tables 4 and 5 that persuasion actually decreases WTP. However, this influence is only significant in the contribution (Probit) model, and in the IVreg model. Thus, we conclude that it is a weak influence, but the direction of influence is consistently negative.

The interaction variable "EFFORT*DEFAULT", which was intended to correct for the endogeneity problems associated with 'EFFORT' in the Tobit and two-stage decision model is negative as expected given results in Tables 4 and 5. However, it is only significant in the Tobit model (and only at the 10% level), and does not emerge as significant in either of the two-stage model components.

Finally, results confirm that EFFORT has a strong influence on both the WTP participation and contribution decisions in all models. However, it has a positive sign in all models except for the IV model - where it is negative. This seems to contradict the summary statistics reported in Tables 4 and 5 and so we tread cautiously whilst interpreting the results of this model. If we take a look at the first stage regression (which models the influences on EFFORT), we find that EFFORT is strongly determined many of the covariates that drive WTP. It has a positive and significant relationship with EDUCATION, DONATE and both knowledge variables (all significant at the 5% level and below), and negatively influenced by PERSUASION (p=0.000)[10]. Thus, the implication is that, when we control for these various influences which *also* happen to influence WTP mostly in a *positive* direction (with the exception of PERSUASION which has a weak negative influence), then EFFORT is actually negatively related to WTP.

In order to probe this issue further, we carried out a series of Probit regressions on a dummy version of the dependent variable EFFORT (where 0=has not read any added info; 1= has read at least one piece of added info), and restricted the data into DEFAULT and ACTIVE subsamples. Interestingly, we find that the endogeneity issue associated with EFFORT is only relevant for the ACTIVE subsample. In other words, EFFORT in the ACTIVE subsample is determined by the aforementioned variables (education, knowledge, donation, persuasion) which also determine WTP, but EFFORT in the DEFAULT subsample is influenced only by REALKNOWCO2. A

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[10] It is also, as expected, very strongly determined by DEFAULT (p=0.0000).

number of regressions including a range of interaction variables were carried out on the restricted DEFAULT subsample in order to identify more determinants of the EFFORT(dummy), but we could identify none. This suggests that we are missing explanatory variables to explain the drivers for EFFORT in the DEFAULT survey. All we know is that, when the more costly option of reading more is chosen in defiance of the DEFAULT, it is not driven by the same variables that influence EFFORT in the ACTIVE subsample and which also happen to influence WTP (with the exception of REALKNOWCO2, which remains the only identifiable influence). It is also not associated with higher WTP. This leaves us with an intriguing question: what exactly is driving the demand for more information in the DEFAULT surveys?

Discussion and conclusions

The aim of this research was to explore the influence of persuasion and optional information acquisition on WTP for non-use goods in a CV survey context. The rationale for this study was grounded in our awareness that CV attempts to elicit hypothetical market values by presenting respondents with set amounts of information that have very little resemblance to the information that is used in the real world to generate real market values. Despite applying a range of controls and procedures to produce well-behaved and stable values, CV still struggles to produce values that are reflections of what *people would really pay*. We hoped that by turning the problem on its head, and making CV surveys emulate the market (if only a tad), we might help to identify why CV struggles so to produce values that are deemed 'realistic'.

Based on the results of our experimental study, we find - contrary to expectations - that persuasion drives WTP *downwards*. There are various reasons this could be the case. On the one hand, survey respondents may react defensively - even negatively - to persuasive-type information in a survey context. Perhaps the survey context itself is seen as largely free from persuasive communications which bombard us in most other areas of our daily life. This perception of the survey as a 'sanctuary' from persuasion might be especially enhanced when the introductory page reads: *"This is a study by a*

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university and/or NGO". One might expect a respondent to drop their 'consumer-guard' and go onto the next page expecting neutral and dry information.

Another more pedestrian reason may be that *our* persuasion treatment wasn't very persuasive. However, our treatment design was based on a review of over twenty charitable websites aimed at raising funds for non-use goods (e.g. pandas, whales). We are of the opinion that if these organisations use these approaches, it is because they work.

The upshot of this discussion is that persuasion *in a CV-survey context* does not produce over-inflated WTP values as we had anticipated. In fact, persuasion produces marginally lower values compared to the neutral, analytic-type information combined with reminders of substitutes and budget constraints that is usually recommended. We tentatively suggest that they key to interpreting these results is the survey context: it is very likely that in a survey context, individuals wear their 'citizen' hat, whereas in the market, they wear their 'consumer' hat. The citizen is idealistic and public-spirited; the consumer always looking for a bargain. These are interesting issues that merit further investigation.

With regards to optional information acquisition, we found that respondents did access added information, thus dispelling any possible concerns that no-one would read more than they have to in a survey setting. As expected, we found that the decision to read more information was largely influenced by *how the information was offered* to the survey respondent. Offering information using an open-ended "yes/no" question generated significantly higher effort levels than offering information using an opt-in default ("If you want information, click here"). However, we found that despite the default opt-in question a significant one-third of respondents to the standard CV survey actually chose to read more. On the other hand we also found that persuasive information appeared to dissuade respondents from accessing added information when this was offered as an opt-in default (only 4% chose to read more). We suggest that this remarkably low level of effort might be indicative of 'docility' - a tendency to simply accept information provided by an authority. However, we cannot validate this hypothesis with our current data.

Finally, we found that the relationship between effort and WTP depends on *how the information was offered*. To be specific, the relationship between effort and WTP

was found be positive or negative depending on how the information was offered! When information was offered using an 'active' yes/no question, effort and WTP were positively related. However, this was not the case for the default opt-in surveys: those respondents who did not go along with the default and chose the more costly option of reading added information had marginally *lower* WTP than those who did not read the information. We expected that the more costly option of reading information would be motivated by involvement with the good (which motivated search) and perception of good as high-value (hence, greater effort). We cannot discard the first reason: perhaps they do have high involvement. This may mean that they are reading the information more critically (known 'high elaboration likelihood' in social psychology. Or maybe they simply are explanation "fiends" - they want more information, but this doesn't alter their WTP.

All in all, the findings reported here have perhaps raised more questions than they have answered. We also acknowledge a number of limitations with our study, such as varying sample sizes, small subsample sizes and perhaps an excessively complex design. Nonetheless, we consider that as a 'thought experiment' this study has succeeded in forcing us to consider exactly what it is that CV practitioners are asking of respondents when they complete a CV survey. By addressing these important questions, we may start to understand how CV values relate to normative and revealed market values.

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