Prior knowledge, familiarity and consequentiality in contingent valuation

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Stated preference surveys are more likely to be demand revealing if the respondent views their responses as consequential i.e. the respondent cares about the policy in question, believes their response will affect the provision of the good and that they will be required to pay the stated amount. In this paper, we contribute to the growing literature on the subject by examining the influence of a respondent's prior knowledge about the good being valued on stated *policy* consequentiality. We find that consistent with previous research, willingness to pay varies according to stated consequentiality; and that stated consequentiality itself varies according to a number of observables. Consequentiality and willingness to pay appear to be related on a continuum but this estimate is revised downwards for respondents with a high a priori knowledge of the good. Additionally, we enquire which observed variables influence respondents stated policy consequentiality and share our concerns that a single Likert scale question does not adequately capture a respondent's belief over consequentiality.

Keywords: stated preferences; contingent valuation; consequentiality; willingness to pay; benefit-cost analysis

Subject classification codes: Q51: D83; H41

1 Introduction

Stated Preference (SP) surveys are often used for the valuation of non-market environmental goods and services, for example, water quality improvements. The values generated using SP are useful in cost-benefit analyses of environmental projects and policies (Atkinson et al. 2018). Throughout the history of the application of SP surveys, there has been a debate regarding hypothetical bias, where it is argued that respondents answer differently in surveys compared to how they would in a real market situation (Hausman 2012). To address this, SP literature has focussed on creating incentive compatible survey mechanisms which incentivize the respondent to truthfully reveal their maximum willingness to pay (Carson, Groves, and List 2014). Conditions for incentive compatibility include i) the use of a binary choice format of the valuation question and (ii) consequentiality (Zawojska and Czajkowski 2017). A survey is deemed to be consequential when i) the respondent views their responses as influencing the future supply of the public good, ii) they care about what the outcomes of the survey and iii) they believe they will be required to pay for the outcome if the policy is implemented (Carson and Groves 2007, Herriges et al. 2010).

The concept of policy consequentiality was first introduced by Bulte et al., (2005), in the context of seal conservation in the Netherlands. The authors showed that including text stating the results of the survey would be "considered" by policymakers resulted in significantly lower willingness to pay (WTP) estimates compared to those respondents who did not receive the text. The majority of field-based research has focussed on respondents perceived policy consequentiality. These perceptions are typically measured by responses to a Likert scale follow up question asking whether respondents believe the results of the survey will be shared and/or used by policymakers. These responses have been used to examine the influence of stated consequentiality on the willingness to pay distribution (Herriges, et al., 2010, Nepal, et

al., 2009); the construct validity of the survey (whether the WTP estimate conforms to a variety of theoretical considerations such as the respondent's willingness to pay being related to their characteristics and to characteristics of the good) (Hwang, et al., 2014, Interis and Petrolia, 2014, Vossler and Watson, 2013); and the criterion validity of the survey (comparing the prediction from a survey to a suitable proxy which involves real payments) (Johnston, 2006, Vossler, et al., 2012, Vossler and Evans, 2009). A common finding with these studies is that where respondents perceive the survey as more consequential, willingness to pay increases. Where WTP distributions are statistically different between consequential and inconsequential respondents, this is known as the Carson and Groves "knife edge result".

When considering consequentiality in the context of criterion and construct validity, research has shown that values stated by those who perceive the survey to be consequential are more likely to conform to theoretical expectations regarding the relationships between WTP and its possible determinants. Vossler and Evans, (2009) consider consequentiality in the context of criterion validity. Five treatments were used which varied signals of how the results would be used to inform environmental policy in experimental referenda. Results showed that when respondents viewed their responses as consequential, there was no elicitation bias in the results. In their choice experiment on WTP for wetland ecosystem service restoration, Petrolia, et al., (2014) found that inconsequential respondents were more likely to ignore some of the choice attributes. Morgan, et al., (2018) question how consequentiality changes across subpopulations and how this affects the welfare implications for the policy process. Using a contingent valuation survey to estimate willingness to pay for an artificial reef development in Florida Coastal Waters they compare willingness to pay, consequentiality and construct validity for residents and non-residents. Construct

validity improved with higher consequentiality for residents, although for residents and non-residents stated consequentiality levels were similar.

Despite the widening use of Likert scale follow up questions to judge perceived consequentiality, there has been little empirical research on what aspects of the survey or characteristic of the respondent themselves determine the degree of perceived consequentiality. Vossler and Watson (2013) used an ordered probit model to examine what influences stated consequentiality as part of an advisory referendum on conservation and preservation efforts in Massachusetts, USA. They found respondents who had a college education and those who were more uncertain about their vote were less likely to view the survey as consequential. Other characteristics considered included income, age, gender, environmental membership and charitable donations, all of which were insignificant predictors. Similar modelling was undertaken by Groothuis et al. (2017) who used a bivariate probit model to explore the determinants of consequentiality and referendum votes for a survey on water vole conservation in North Carolina. Results showed that consequentiality was endogenous to hypothetical referendum responses: as the randomly assigned tax amount increased, respondents were less likely to find the survey consequential. In addition, being female and having a college education increased the likelihood of a respondent believing the survey to be consequential.

There have been two main concerns with the measurement of consequentiality in recent literature. Firstly, the relationship between payment consequentiality and WTP and secondly the measurement of both perceived policy and payment consequentiality. Laboratory-based studies which compare stated preference surveys with real payment scenarios have shown that when consequentiality is guaranteed, i.e. the respondents have to pay their stated amount, actual willingness to pay decreases (Murphy and

Stevens, 2004). This finding has been demonstrated in the field by Zawojska, Bartczak, Czajkowski (2019) who use two separate Likert scale questions to measure perceived policy and perceived payment consequentiality: policy consequentiality increases WTP and payment consequentiality reduces WTP. Furthermore, there is a growing concern as to whether the Likert scale follow up questions are indeed measuring respondent's beliefs over consequentiality. There are concerns that current measures of incentive compatibility use latent (unobserved) respondent beliefs and that imprecise measurement of these beliefs gives rise to measurement error; whilst stated beliefs may be correlated with other unobserved factors (Czajkowski et al. 2017).

Our paper contributes to the growing literature on stated consequentiality by exploring which observable factors influence respondents stated policy consequentiality in a contingent valuation survey for a new flood defence scheme. In line with previous studies, respondents were asked to state how confident they were that the results of the survey would be used by policymakers using a Likert scale ranging from "very unconfident" through to "very confident". There was an option of "neither confident nor unconfident." We provide evidence for the effects of perceived policy consequentiality on WTP using a series of regression models. Second, we test for the detriments of this perceived outcome consequentiality using an ordered probit (similar to Groothuis et al. 2017, Vossler and Watson 2013). A new contribution to the literature is the exploration of the influence of respondent's prior knowledge about the good to be valued on stated policy consequentiality: at the start of the survey, respondents complete a nine-question quiz about the good being valued (wetlands restoration). This allows us to test whether prior knowledge influences perceived policy consequentiality. We can also test whether personal motivations regarding the goods delivery affect stated policy consequentiality. In particular, we are interested in whether the relationship between increased WTP and

consequentiality is motivated by a respondent's desire for the good to be delivered in the context of an endogeneity concern that responses to the value elicitation question and to follow up questions on stated policy consequentiality may be motivated by similar, unobserved factors (Johnston et al. 2017, Czajkowski et al. 2017).

Our results show that consistent with previous field studies, consequential respondents have a statistically higher WTP than unsure and inconsequential respondents. Furthermore, we find that consequential is a significant predictor of whether a respondent is willing to pay or not. A correlation was found between increased WTP, increased likelihood of stating the survey to be consequential and stronger belief in being at risk from flooding. In line with previous studies, we are concerned that the relationship between increased WTP and perceived consequentiality may be endogenous. There is potential that stated policy consequentiality, in this case, may not be measuring an aspect of incentive compatibility but instead is being used by some respondents as another way to express their positive preferences for the delivery of the flood defence good.

The remainder of the paper is structured as followed: Section 2 provides information about the study background and area; an overview of the study design and data are provided in Section 3; econometric analysis is provided in Section 4 and the discussion and conclusions in Section 5.

2 Study background and area

We consider the determinants of stated consequentiality and its impact on WTP in the context of flood defence investments in Scotland. Due to the impacts of climate change and population growth in coastal regions, governments worldwide need to reconsider the range of flood defence options available to them along the coastline. In the United Kingdom, there has been a gradual move towards "Natural Flood

Management" as part of the UK government's Flood Risk Management Strategy (SEPA 2012, Ledoux et al. 2005). Managed realignment - one aspect of natural flood management - involves breaching existing coastal defences, allowing previously reclaimed land to be subjected to tidal flooding, and permitting the natural processes of inundation, erosion and accretion to take place (French 2006). Managed realignment makes use of the storm buffering capacity of intertidal habitats such as mudflats and saltmarshes (King and Lester 1995). However, residents can be opposed to such schemes which appear to "give land back to the sea" (Coates, Brampton, and Powell 2001, French 2002). Consequently, there is an increasing need to engage with local residents throughout the planning process and study public perceptions of managed realignment schemes (Ledoux et al. 2005).

Our case study considers the proposal for a managed realignment scheme at Newburgh, on the Tay Estuary, Scotland. As part of the Fife Shoreline Management Plan, SEPA (the Scottish Environment Protection Agency who are responsible for delivering flood risk management plans) have proposed "Natural Flood Management" as the preferred policy option. Whilst SEPA have responsibility for producing the flood management plan, it is local authorities who are responsible for funding flood defence through council tax (local taxes) collected from residents within the local authority area. As such, local authorities need to ensure that its allocation of funds to flood defence matches the preferences of its taxpayers. This provides a suitable scenario in which to test the effects of a priori knowledge and personal motivations on stated consequentiality and WTP. The contingent valuation survey is detailed in the following section.

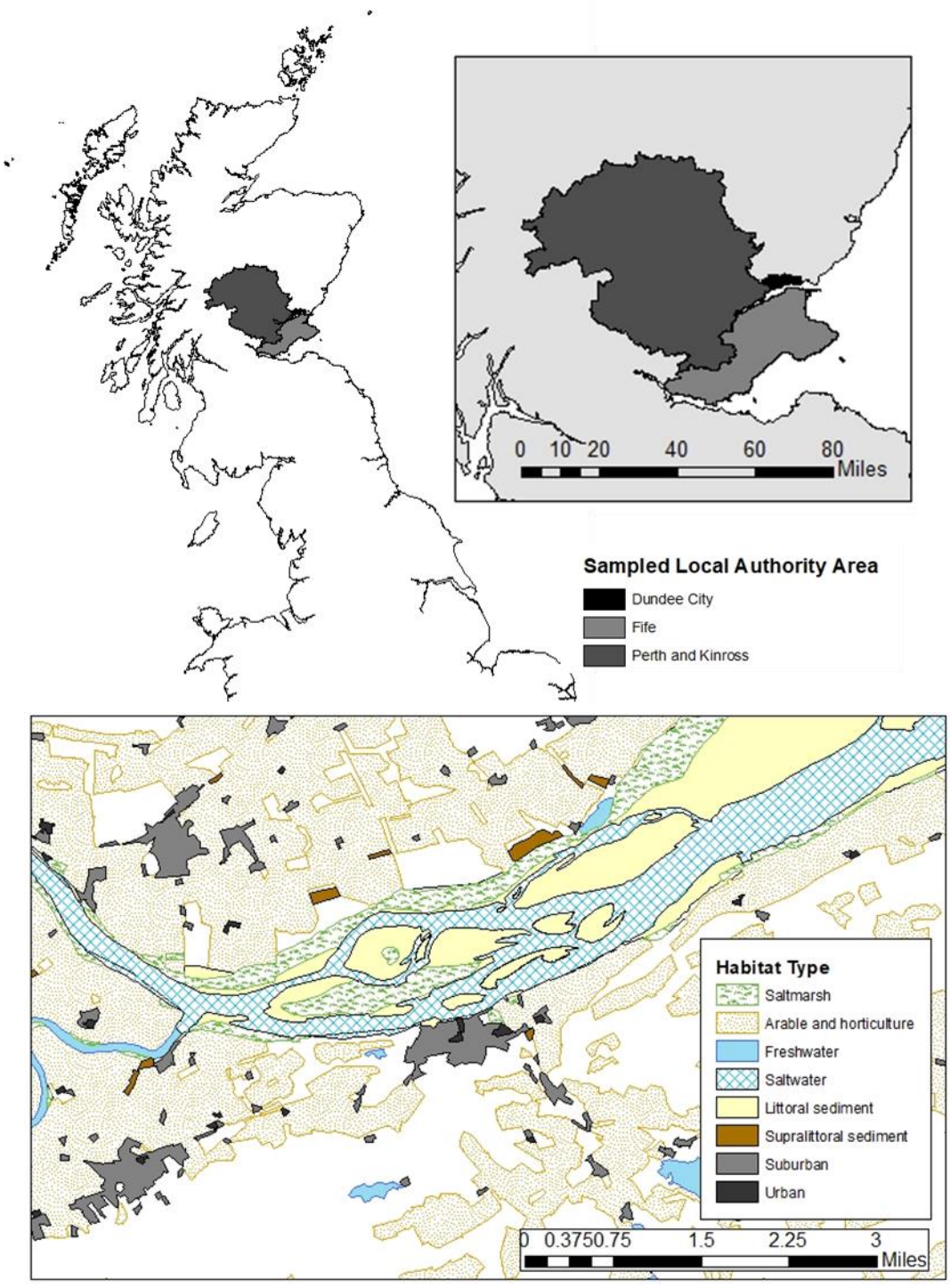

Figure 1: Location of proposed managed realignment scheme, Newburgh, Tay Estuary. The top panel shows case study regions. The bottom panel shows selected estuarine habitats using Rowland, C.S.; Morton, R.D.; Carrasco, L.; McShane, G.; O'Neil, A.W.; Wood, C.M. (2017). Land Cover Map 2015 (25m raster, GB). NERC Environmental Information Data Centre. https://doi.org/10.5285/bb15e200-9349-403c-bda9-b430093807c7, Contains OS data © Crown copyright and database right 2018.

3 Study design and data

3.1 Survey instrument

The survey was designed to explore local resident's attitudes towards a proposed new flood defence scheme on the Tay Estuary, Scotland. The survey was implemented online using the website www.surveygizmo.com. This was a two-stage process with a random sample of residents in the affected local authorities first contacted by postal mail inviting them to take part in the online survey. This invite was sent out on University letter headed paper and introduced the aims of the survey, why it was important that they respond and stated that the results would be shared with Scottish Government departments (the first reference to policy consequentiality within the survey instrument). A link to the online survey was provided.

The first page of the online survey repeated similar information to that contained in the information letter. Page 2 provided more background information on climate change and the associated flood risk throughout Scotland, and why the survey was focussing on the town of Newburgh. This page also provided an outline of what to expect for the remainder of the survey, including information on why the respondent would be asked to complete a series of multiple-choice questions about flood risk.

Box 1: Introductory text to the online survey

Page 1:

Researchers from the Economics Department at the University of Stirling are investigating the costs and benefits of a new type of flood defence which could be used to protect homes on the banks of the Tay Estuary from coastal flooding. As part of this project we are interested in the opinions of local residents regarding the new proposals. You may be aware that new flood defences involve a cost to households. It is therefore vital that future flood defence options are accepted by the general public. This survey gives you a chance to make your opinions heard. We would like to know what you personally would like to happen in your local area. Your thoughts will be shared with various Scottish Government departments and will be used to help inform the future plans for your local authority. You may feel that you do not live close enough to the Tay Estuary to warrant taking part, however we need responses from a wide-ranging area and your thoughts are still valid.

Excerpt from Page 2:

The survey will start by asking you some questions about flooding and the Tay Estuary. These questions will help us understand what you already know and help improve how the Scottish Government and local authorities share their information with you in future. These questions will help us understand what you already know and help improve how the Scottish Government and local authorities share their information with you in future. We will then ask you to complete the survey itself.

Excerpt from Page 3:

Please answer the following nine questions about flood defence and the Tay Estuary to the best of your knowledge. We would really like to find out how much people know about the Tay Estuary. This will make it easier for the Scottish Government and local authorities to let you know what is taking place in your area now and in the future.

Respondents were then asked to answer a nine-question multiple choice quiz regarding flooding, flood defences and the costs and benefits of managed realignment. The quiz was developed with academics specializing in flood risk management to ensure the questions and answers were appropriate to the good in question. Responses from this quiz allow us to test how much respondents knew about a good being valued prior to the survey and allowed us to test for the influence of a priori knowledge on stated consequentiality.

Respondents were then made familiar with the good being valued. Respondents received information regarding future flood risks in the Tay Estuary and the principles

of managed realignment as a form of flood defence. The Newburgh managed realignment scheme was then detailed including a map of how many homes would be protected, how long until the benefits would be realised and information about the payment vehicle (an annual increase in council tax). Prior to WTP elicitation, respondents were reminded to consider their household budget and were told the average council tax bill in their local area. The status quo option was also detailed indicating what would happen if no managed realignment took place (Box 2).

WTP was then elicited using a payment card format. The respondent was asked to select either yes or no for all the values listed ranging from £0 to £150. The values shown on the payment card were chosen based on feedback from initial focus groups. The payment card format was chosen to increase the statistical efficiency gains relative to the dichotomous choice format and lower the cognitive burden placed on respondents which are associated with the open-ended format (Boyle and Bishop, 1988; Mitchell and Carson, 1989). However, we recognise that payment cards are not widely viewed as incentive compatible (Carson and Groves 2007). There are concerns that payment cards can lead to participants under-revealing demand for the good and that in many cases payment cards do not follow an implementation rule. As discussed by Vossler and Holladay (2018) there are certain valuation scenarios where payment cards are considered incentive compatible. They can be used for goods where the cost to the respondent, if the project takes place, is not known with certainty but would be determined based on actual project costs if it takes place. This cost uncertainty needs to plausible to respondents. In addition, Vossler and Holladay recommend including a coercive payment vehicle and frame the elicitation as an advisory referendum. Our payment card meets the requirement regarding cost uncertainty: we highlighted that the overall cost of managed realignment scheme was uncertain, and this was why a range of

values were offered. We also used a coercive payment vehicle. However, we do not include an advisory referendum in our scenario.

Box 2: Elicitation scenario

We would now like you to think about the value to you personally of developing this managed realignment scheme for Newburgh on the Tay Estuary:

- On the next page you will be shown a table of prices that would be added to your council tax annually to cover the costs and maintenance of the scheme.
- You are asked to choose amongst a variety of price options as the precise costs of going ahead with the managed realignment scheme at present are unknown.
- The price you choose will be used to inform the local authorities and the Scottish Government when deciding future flood defence options in the Tay Estuary.
- Before you answer carefully consider the cost to you. Think about your household budget and what you would have to trade off to pay for the increase in council tax e.g. what you like to buy or a reduction in your planned savings. The average household council tax bill in Scotland is £984 per year.

What happens if there is no Managed Realignment Scheme?

- If the managed realignment scheme does not take place the existing flood defences (sea walls) will continue to be maintained by the local authorities at no additional cost on your council tax bill.
- However there will be no additional flood protection and additional benefits of managed realignment will not be realised.

Remember that your preferences will be used in conjunction with costs of the scheme, when they are known, by local authorities and the Scottish Government to inform which flood defence policy is chosen.

A series of debriefing questions included questions regarding perceived flood risk and worry about the state of current flood defences, whether respondents understood the information presented to them, as well as a series of socio-demographic questions. On the final page, respondents were asked "How confident are you that the results of this survey will be used by policymakers in deciding future flood risk management in the Tay Estuary?" with responses measured on a Likert scale ranging

from “very unconfident” through to “very confident”. This was used to assess perceived policy outcome consequentiality.

Table 1: Survey summary

1.	Subject begins survey (background information)
2.	Nine question multiple choice quiz
3.	Managed realignment policy outlined, including costs, timescale and status quo scenario
4.	Elicit WTP for managed realignment scheme
5.	Series of follow up questions regarding flood risk attitudes
6.	Socio-demographic questions

3.2 Sampling

The questionnaire and survey design were developed in collaboration with flood risk management specialists at the University of Stirling. A draft questionnaire was designed, and a focus group held with staff and students from the University of Stirling. This allowed checks to be made on the questionnaire's content validity (clear, reasonable and unbiased questions) to ensure that respondents were motivated to answer seriously, thoughtfully, and truthfully. There was an emphasis on respondents understanding of the payment card format.

A pilot survey was completed in January 2013 with respondents from the proposed sample population. This aimed to ensure the correct spread of bid intervals on the payment card. 50 responses were received. The final survey was conducted throughout 2013 using a two-step process. 4000 households throughout the local authorities affected by the proposed flood-defence scheme were randomly selected from the Scottish Phone Directory. These were contacted via a mail and invited to take part in the online survey.

4 Results

We first describe our data, and this is followed by a formal econometric analysis of willingness to pay and an econometric analysis of the drivers of perceived

consequentiality. Of the 4000 households contacted a total of 749 people partially completed the online survey with 593 responses completed in enough detail to be used in the analysis. Of these 89 respondents were in the control group and did not take the first quiz. As a result, there are 504 useable responses for the analysis. This was a response rate of 15% and is comparable with a similar UK wide stated preference survey for flood defence (12%) (Joseph et al. 2015), as well as other UK postal stated preference surveys that had response rates ranging from 11 % to 22% (Burton et al. 2001; Hanley et al., 2010). It is recognised that representation errors may occur since people can choose whether to participate in the survey or not and this element may be correlated with their preferences for the good, leading to non-response bias. In addition, our survey requires access to the Internet and this is not available to all people within the population (Lindhjem and Navrud, 2011).

Self-reported socio-demographic characteristics were compared with Scottish Neighbourhood Statistics for the Fife, Dundee and Perth & Kinross local authorities. 60% of responses were from the Fife local authority, with 26% from Dundee and 13% from Perth & Kinross. Analysis revealed that the sample was not fully representative of the local population. The oldest age groups (50 - 64 years and 65 and over) were well represented in the survey whilst the youngest age group (18 - 29) was underrepresented (9% of the sample compared to 22% in population). Males were also over-represented in the survey (58% compared to 47% in the overall population). The modal income group was £20,000 - £39,000 which was similar to the median income of the local authorities (£26,000). Over 80% of the sample owned their own homes compared to the Fife average of 64%. A full description of the data and summary statistics can be found in Table 2.

Table 2: Summary statistics and data descriptions

CATEGORICAL VARIABLES	Data Description	Percentage of Sample
Income (measured in bands)	*Under £15,000*	13.57
	£15,000 - £19,999	12.32
	£20,000 - £39,999	32.99
	£40,000 - £69,999	25.68
	£70,000 - £99,999	9.60
	Over £100,000	5.85
Gender	*Male = 1*	58.25
	Female = 0	41.75
Highest level of education	*Higher education =1*	55.21
	School or college =0	44.79
Member of environmental group	*Yes*	33.40
Local Authority	*Fife*	60.13
	Perth & Kinross	13.44
	Dundee	26.43
Age: measured in bands	*18 – 29*	9.39
	30 – 49	33.86
	50 – 64	34.05
	65 and over	22.7
Whether the respondent owned the property	*Yes*	82.32
Home insurance	*Respondent has home insurance*	69.12
My property is at risk from flooding	*Strongly disagree, disagree, neutral= 0; agree, strongly agree = 1*	17.96
The flood risk is increasing	*Strongly disagree, disagree, neutral= 0; agree, strongly agree = 1*	28.73
I am worried the current defences are not adequate enough to protect my home	*Strongly disagree, disagree, neutral= 0; agree, strongly agree = 1*	21.70
It is the councils responsibility to fund flood defence not mine	*Strongly disagree, disagree, neutral= 0; agree, strongly agree = 1*	67.11
My home has been flooded	*Respondent's home has been flooded =1, 0 otherwise*	12.08
Resident in flood plain	*Respondent lives on the flood plain =1, 0 otherwise*	26.03
The information provided confirmed what I already knew	*Strongly disagree, disagree, neutral= 0; agree, strongly agree = 1*	29.60
The information provided affected my WTP	*Strongly disagree, disagree, neutral= 0; agree, strongly agree = 1*	40.60
The information provided was too complicated for me to think about	*Strongly disagree, disagree, neutral= 0; agree, strongly agree = 1*	16.00
CONTINUOUS VARIABLES		**Mean (Standard Deviation)**
Distance	*Average distance respondent lives from site (miles)*	17.62 (10.18)
Score Quiz 1 – a priori knowledge	*Score from the opening quiz to test respondents knowledge of flood risk and flood defence*	3.05 (1.78)
Time spent on survey	*Minutes spent on the survey*	24.15 (92.81)

4.1 Econometric analysis of willingness to pay

Figure 2 presents the number of respondents indicating a yes vote across the possible cost amounts shown on the payment card. WTP was elicited using a payment card and thus the precise level of the maximum WTP is not directly observable. Monetary values were censored within the amount intervals presented in the payment card. Let WTP_i denote respondent i's willingness to pay for the proposal. WTP_i is not directly observed. We obtain the signal $c_{i,l} \leq WTP_i < c_{i,u}$ where $c_{i,l}$ is the highest cost for which the participant votes yes and $c_{i,u}$ is the next highest amount. The lowest amount on the payment card is zero, $c_{i,l} = 0$ and $c_{i,u} = \infty$ if the respondent votes yes to the highest amount.

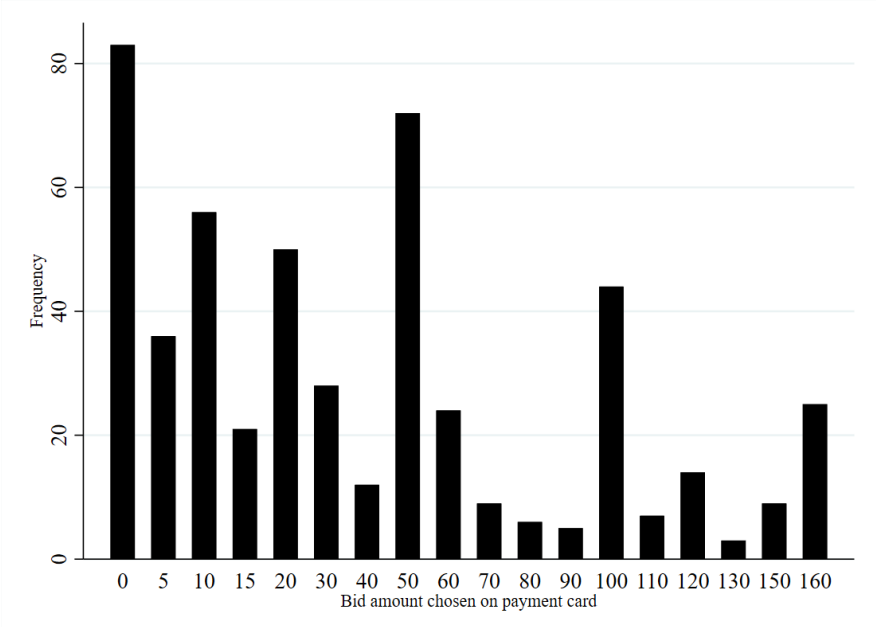

Figure 2: Bar chart of highest chosen bid amounts from the payment card

Initially sample mean willingness to pay was calculated using the highest value that the respondent selected on their payment card: $\sum_{ci,l=1}^{T} WTPc_{i,l}/T$. The sample

mean WTP was calculated at £44.77 per household per annum (SD = 46.21) and 83% of the sample were willing to pay towards the management realignment scheme.

Mean WTP also compared across different levels of perceived policy consequentiality (Table 3). Overall 34% of the sample were "confident" that the results of the survey would be shared with policy makers and 6% were very confident. 23% of the sample were either confident or very unconfident that the results of the survey would be shared with policy makers. Willingness to pay appears to be on a continuum with willingness to pay increasing as perceived consequentiality increases: unconfident respondents were prepared to pay on average £37.14 towards the managed realignment compared to confident respondents who were prepared to pay £48.78 per household per annum.

Considering zero bids, for the inconsequential respondents (unconfident or very unconfident) the main reason for not being willing to pay was believing it was the Scottish Government's responsibility to fund flood defence. This was also the case for the "neither confident, not unconfident" respondents. By answering negatively to the consequentiality question, respondents may be reaffirming to the researcher that they do not want to fund the scheme, believing a negative response will reduce the likelihood of the scheme taking place in the same way a zero WTP would reduce the likelihood. In contrast, the main reason for both the confident and very confident respondents not being willing to pay was that "they would like to but could not afford to". This implies that whilst these respondents agreed with the scheme in principle they rightfully considered their budget constraints, believing that the tax amount would indeed be collected if the project went ahead.

Table 3: Mean sample willingness to by stated policy consequentiality

Stated perceived consequentiality	Percentage of sample	Percentage of sample willing to pay	Mean WTP	Standard deviation
Very unconfident	5.09	54.55	25.00	32.07
Unconfident	17.82	76.62	37.14	44.24
Neither confident nor unconfident	36.57	82.28	41.36	42.99
Confident	34.26	91.89	48.78	47.40
Very confident	6.25	92.59	66.48	54.65

To relate the WTP to stated consequentiality and other explanatory variables we compare two maximum likelihood approaches: the interval model and hurdle model.

The interval model is commonly applied in contingent valuation studies when the dependent variable is not fully observed through the payment card elicitation method (Cameron and Huppert 1989; Vossler and Holladay 2018). Interval regression uses both the lower and upper bounds of the value chosen on the payment card for the regression and reflects the fact that a respondent's true value may lie between the highest bid they chose and next highest amount. Theoretically, there are K payments, $c_1 \ldots., c_k$ arranged in ascending order so that $c_k > c_{k-1}$. When a respondent picks payment c_k, the probability that WTP lies between c_k and c_{k+1}: $\Pr(choose\ c_k) = \Pr(c_k \leq wtp < c_{k+1}$. Responses to the payment card can be treated by specifying WTP as $\Pr(choose\ c_k) = \phi\left(\frac{(c_{k+1}-\mu)}{\sigma}\right) - \phi\left(\frac{(c_k-\mu)}{\sigma}\right)$ where $\phi\left(\frac{(c_{k+1}-\mu)}{\sigma}\right)$ is the standard normal CDF evaluated at $\phi\left(\frac{(c_{k+1}-\mu)}{\sigma}\right)$. The log likelihood function on for the responses can then be formed: $\ln L = \sum_{i=1}^{T} \ln(\phi\left(\frac{(c_{k+1}(i)-\mu)}{\sigma}\right) - \phi\left(\frac{(c_k(i)-\mu)}{\sigma}\right)$

Where individual i picks payment $c_k(i)$. This is a form of an interval model in which every individual picks some payment (Haab and McConnell 2002). The empirical model is specified as:

$$WTP = \beta_0 + \beta_1 consequentiality + \beta_2 quizscore + \beta_3 floodrisk + \beta_4 worrydefences + \beta_5 envgroup + \beta_6 age + \beta_7 income + \beta_8 gender + \beta_9 education + \beta_9 distance + \varepsilon_i$$

WTP is the probability that an i_{th} respondent chooses to tick an amount on the payment card. β_i is the coefficients of the explanatory variables. ε_i is the error term.

Due to the high number of zero bids in our sample (27%) we also chose to estimate a hurdle model. The hurdle model is a two-part model which allows for different mechanisms in participation and amount decisions, the hurdle or first tier is whether or not to choose positive *y*. In our research, that is a respondent willing to pay towards the managed realignment scheme and if yes, how much are they willing to pay? We apply the Cragg model which integrates the probit model to determine the probability of $y > 0$ and the truncated normal model for given positive values of *y*,

$$f(w, y \mid x_{1,} x_{2,}) = \{1 - \Phi(x_{1,}\gamma)\}^{1(w=0)} \left[\Phi(x_{1,}\gamma)(2\pi)^{-\frac{1}{2}\sigma^{-1}} \exp\{-(y - x_2\beta)^2/2\sigma^2\}/\right.$$

$$\left.\Phi(x_2\beta/\sigma)\right]^{1(w=1)}$$

Where *w* is a binary indicator equal to 1 if *y* is positive and 0 otherwise. The probability of $y > 0$ and the value of y, given $y > 0$ are determined by two different mechanisms (the vectors γ and β) and there are no restrictions on the elements of $x_{1,} x_{2,}$ implying that each decision may be determined by different explanatory variables.

The first equation in the hurdle model uses a probit model to examine what determines whether respondents are willing to pay or not:

$$WTP = 1 \; if \; WTP > 0 \; and \; WTP = 0 \; if \; WTP \leq 0$$

$$WTP = \beta_0 + \beta_1 consequentiality + \beta_2 quizscore + \beta_3 floodrisk + \beta_4 worrydefences + \beta_5 envgroup + \beta_6 age + \beta_7 income + \beta_8 gender + \beta_9 education + \beta_9 distance + \varepsilon_i$$

WTP is the probability that an i_{th} respondent chooses is willing to pay towards the managed realignment scheme. β_i is the coefficients of the explanatory variables. ε_i is the error term.

The second hurdle model estimates the amount that respondents are willing to pay towards the managed realignment scheme estimated using a tobit model truncated at 0:

$$WTP_i = WTP_i \; if \; WTP_i^* > 0 \; and \; WTP_i^* = 0 \; otherwise$$

$$WTP_i = \beta_0 + \beta_1 consequentiality + \beta_2 quizscore + \beta_3 floodrisk + \beta_4 worrydefences + \beta_5 envgroup + \beta_6 age + \beta_7 income + \beta_8 gender + \beta_9 education + \beta_9 distance + \varepsilon_i$$

Where WTP_i^* is the observed response on how much respondents are willing to pay for the managed realignment scheme. WTP_i^* is the value that the respondent ticked on the payment card. Alternatively, we could have taken the next highest value on the payment card, calculated the midpoint WTP or used the linear WTP as compared in Hanley, Kristrom and Shogren (2009).

Table 4 presents the estimation results for the interval regression model and Table 5 presents the results for the Cragg Hurdle model. For the first stage probit model, marginal effects at means (MEM) were calculated to make the results more intuitive (Table 6). For the categorical variables, this was calculated as a discrete change comparing one level to another. The MEM for categorical variables, therefore, shows how P (y=1) changes as the categorical variable changes from 0 to 1, holding all other variables at their means. For a categorical variable x_k : Marginal Effect x_k = Pr (y = 1 | x, x_k = 1) – Pr (y=1| x, x_k = 0). For the continuous variable (distance driven) this is calculated as the instantaneous rate of change: Marginal Effect of x_k = limit [Pr (y = 1 | x, x_k +Δ) – Pr (y=1| x, x_k)] / Δ] as Δ gets closer and closer to 0.

Table 4: Willingness to pay regression results: interval model

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Policy consequentiality: unconfident		17.09*					
		(10.17)					
Policy consequentiality: neither confident nor unconfident		18.97**					
		(9.50)					
Policy consequentiality: confident		26.80***					
		(9.62)					
Policy consequentiality: very confident		34.32***					
		(12.13)					
Quiz One Score	-0.89	-1.23	5.98***	0.42	2.95	-5.46***	-0.56
	(1.18)	(1.17)	(0.54)	(3.01)	(2.13)	(1.86)	(3.94)
My property is at risk from flooding	21.11***	17.39**		-3.44	8.32	22.90*	-12.00
	(7.72)	(7.74)		(20.63)	(14.62)	(12.01)	(18.87)
I am worried the flood defences are not adequate enough to protect my home	21.44***	23.51***	37.00	59.30***	18.95	24.40**	76.53***
	(7.13)	(7.06)	(29.89)	(16.54)	(12.70)	(11.16)	(22.00)
Member of environmental group	12.27***	11.47**	69.39***	-5.48	9.12	17.12**	-7.61
	(4.64)	(4.58)	(3.04)	(11.39)	(7.77)	(7.29)	(15.52)
Male	9.44**	10.19**	-41.42***	29.40***	3.16	7.77	0.10
	(4.14)	(4.11)	(1.20)	(9.06)	(7.40)	(6.49)	(14.63)
Age 30 - 39	-0.01	3.47		-15.16	11.82	3.68	-19.80
	(8.69)	(8.62)		(24.82)	(15.51)	(12.41)	(28.63)
Age 40 - 49	-10.26	-8.25	24.21***	15.13	-7.92	1.49	-86.87***
	(8.09)	(7.99)	(3.45)	(27.30)	(14.02)	(11.64)	(17.54)
Age 50 - 59	-1.21	1.17	-75.19***	-6.46	-1.16	23.82**	-35.94**
	(7.78)	(7.70)	(3.69)	(24.02)	(13.10)	(11.19)	(15.73)
Age 60 - 64	-4.91	-2.66	41.45***	10.87	3.21	12.87	-51.68**
	(9.19)	(9.08)	(3.12)	(29.79)	(15.98)	(13.78)	(21.78)
Age 65 and over	-1.98	1.64	-3.16	21.73	-6.08	17.11	-30.52*
	(7.94)	(7.90)	(2.02)	(26.98)	(13.31)	(12.09)	(16.24)
Income £15,000 - £19,999	6.99	6.77	52.38***	15.21	-3.80	22.50*	25.06
	(7.54)	(7.46)	(2.02)	(18.65)	(12.14)	(12.73)	(18.84)
Income £20,000 - £39,999	15.62**	15.97**	106.63***	22.56*	10.82	24.88**	-22.93
	(6.42)	(6.35)	(4.60)	(12.06)	(10.71)	(11.32)	(16.03)
Income £40,000 - £69,999	13.29*	12.29*	85.17***	-0.31	2.21	28.54***	2.11
	(7.03)	(6.97)	(5.94)	(15.51)	(12.30)	(11.00)	(16.92)
Income £70,000 - £99,999	30.71***	30.32***	97.32***	-14.13	24.06	50.53***	45.91
	(9.25)	(9.12)	(5.24)	(20.49)	(15.19)	(14.45)	(31.41)
Income Over £100,000	35.14***	35.30***	-13.25	17.06	37.06*	52.27***	92.55***
	(10.91)	(10.76)	(42.32)	(21.34)	(19.52)	(17.03)	(30.68)
Higher education	-0.83	-1.10	-12.39***	28.92**	-11.99	0.34	25.55**
	(4.36)	(4.30)	(2.56)	(13.03)	(7.49)	(6.71)	(10.84)
Distance from site (miles)	-0.63***	-0.61***	0.64***	-0.52	-0.32	-0.77**	-0.76
	(0.21)	(0.21)	(0.10)	(0.45)	(0.36)	(0.34)	(0.63)
Constant	31.90***	8.88	-67.96***	-7.16	30.76*	25.66	88.02***
	(10.41)	(13.87)	(4.78)	(31.62)	(17.66)	(16.68)	(26.34)
lnsigma	3.64***	3.62***	0.26	3.48***	3.64***	3.53***	2.79***
	(0.04)	(0.04)	(0.26)	(0.09)	(0.06)	(0.06)	(0.15)
Observations	375	375	18	61	142	131	23
AIC	2595.99	2592.39	73.55	464.70	999.21	859.08	155.97
BIC	2670.60	2682.71	88.68	504.81	1055.37	913.71	177.55
Log likelihood	-1278.99	-1273.19	-19.77	-213.35	-480.60	-410.54	-58.99
Chi2	112.43	124.03	89.25	34.81	27.90	75.45	52.66

Table 5: Willingness to pay regression results: Cragg Hurdle Model

VARIABLES	Model 8 - Probit	Model 8- Tobit
Policy consequentiality: unconfident	0.75**	50.68
	(0.37)	(39.54)
Policy consequentiality: neither confident nor unconfident	1.08***	41.75
	(0.35)	(37.82)
Policy consequentiality: confident	1.46***	50.53
	(0.37)	(38.09)
Policy consequentiality: very confident	1.58***	64.81
	(0.51)	(40.43)
Quiz one score	0.11**	-6.38*
	(0.05)	(3.48)
My Property is at risk from flooding	-0.25	43.36**
	(0.43)	(20.28)
I am worried the flood defences are not adequate enough to protect my home	0.81*	36.72*
	(0.42)	(21.02)
Member of environmental group	0.39*	18.25
	(0.20)	(11.83)
Male	0.09	29.92**
	(0.18)	(13.11)
Age 30 – 39	0.55	-7.18
	(0.39)	(22.94)
Age 40 – 49	0.34	-35.65
	(0.33)	(23.54)
Age 50 – 59	0.23	-1.08
	(0.32)	(22.61)
Age 60 – 64	1.25**	-25.79
	(0.49)	(29.69)
Age 65 and over	0.29	-1.77
	(0.32)	(23.64)
Income £15,000 - £19,999	0.43	18.79
	(0.30)	(25.31)
Income £20,000 - £39,999	0.25	58.94**
	(0.25)	(23.89)
Income £40,000 - £69,999	0.47	38.07*
	(0.29)	(23.05)
Income £70,000 - £99,999	0.27	85.14***
	(0.38)	(26.73)
Income Over £100,000	0.57	95.60***
	(0.42)	(30.13)
Higher education	0.39**	-12.34
	(0.18)	(12.39)
Distance from site (miles)	-0.01	-1.47**
	(0.01)	(0.58)
Constant	-1.33**	-73.98
	(0.53)	(52.16)
Lnsigma	4.08***	
	(0.08)	
Observations	375	375
AIC	3335.14	
BIC	3511.85	
Log likelihood	-1622.57	
Chi2	21.00	

Model 1: Full sample, no control for consequentiality
Model 2: Full sample, control for consequentiality
Model 3: Restricted to very unconfident respondents
Model 4: Restricted to unconfident respondents
Model 5: Restricted to neither confident nor unconfident respondents
Model 6: Restricted to confident respondents
Model 7: Restricted to very confident respondents
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Analysis of marginal effects: hurdle model (Stage 1 Probit)

VARIABLE		Change
Comparison of policy consequentiality		
Unconfident vs very unconfident		0.24 **
Neither confident nor unconfident		0.32***
Confident vs very unconfident		0.39***
Very confident vs very unconfident		0.41***
Neither confident nor unconfident		0.08
Confident vs unconfident		0.15***
Very confident vs unconfident		0.17**
Confident vs neither confident		0.07*
Very confident vs neither confident		0.09
Very confident vs confident		0.02
Quiz one score		
	+1	0.02**
	+SD	0.04**
	Marginal	0.02**
My Property is at risk from flooding: Yes vs No		-0.05
I am worried the flood defences are not adequate enough to protect my home: Yes vs No		0.13***
*** p<0.01, ** p<0.05, * p<0.1		

Several results emerge from this analysis. First, in line with the findings of Groothuis et al. (2017), Hwang, Petrolia, and Interis (2014), Interis and Petrolia (2014), and Vossler and Watson (2013), results from the interval regression model show that respondents who perceive the survey to be consequential have a statistically higher WTP than respondents who do not perceive the survey to be consequential. Unlike previous papers, we do not find a knife edge result (where WTP distributions are equal among those believing the survey to be at least minimally consequential, and different for those believing that the survey is irrelevant for policy purposes, Herriges, 2010). Instead, we find that WTP increases on a continuum based on respondent's perceived consequentiality: highly inconsequential respondents are willing to pay the least amount with inconsequential respondents prepared to pay £17.09 more per household per annum and highly consequential respondents prepared to pay £34.32 more per annum compared to highlight inconsequential respondents (Model 2). Estimating separate models for each subset of respondents showed predicted WTP was lowest for highly inconsequential respondents at £20.30 per annum (*CI* = 13.37 - £27.33) followed by inconsequential respondents £41.85 per annum (*CI* = 38.35 - £45.36) followed by those

who were neither confident not unconfident (£43.82 per annum, *CI*= 41.91 – 45.74), next consequential (£50.38 per annum, *CI*= 47.31 – 53.45) and finally highly consequential respondents were willing to pay the most at £61.31 per annum (*CI*= 56.10 – 66.53). Caution should be noted on the relatively small sample sizes for highly inconsequential and highly consequential respondents (18 and 23 observations respectively).

A second finding is that allowing WTP to differ between consequential and inconsequential respondents in Model 2 does not alter the construct validity compared to Model 1. Construct validity is assessed by the power of the explanatory variables in the regression equation (Carson, Flores, and Meade 2001). Following economic theory, it is expected that income should influence WTP, with those earning the most prepared to pay the most, whilst users of the good should be willing to pay more than non-users. Other variables specific to the good such as respondent's attitudes should also be considered, in this case, attitudes towards flood risk and current flood defences. Perceived flood risk, worry about existing flood defences, gender, environmental group membership, income and distance from the site were significant in both Models 1 and 2. We can also compare coefficient estimates across the five subsamples models to offer further insights into construct validity. In our case, we only compare across Models 4, 5 and 6 (inconsequential, neither confident nor unconfident and consequential) due to the limited number of observations in Models 3 and 6.

Distance from the managed realignment site is only a significant predictor of WTP for consequential respondents with WTP decreasing the further a respondent lives from the site. Additionally, income is only a significant indicator of WTP for consequential respondents with those on the highest income bands willing to pay significantly more than respondents on the lower income bands.

Regarding flood risk attitudes results are mixed: respondents worry about current flood defences not being able to protect their home are significant predictors of WTP for inconsequential and consequential respondents although agreement about the respondent's own property being at risk from flooding weakly affects WTP for consequential respondents only. Overall, construct validity appears to be slightly improved for respondents who perceived the survey to be consequential.

Thirdly, the respondent's a priori knowledge of the good in question only has a significant effect on WTP for consequential respondents. With each one-point increase in a prior knowledge WTP decreases by £5.46 per household per annum.

Considering the results of the Cragg Hurdle Model we find that increasing perceived policy consequentiality consistently increases the likelihood of a respondent choosing to pay towards the managed realignment scheme (probit model) but that consequentiality has no effect on the respondents selected maximum WTP (Tobit Model). Furthermore, perceived policy consequentiality appears to be the main explanatory variable as to whether a respondent chooses to pay or not, alongside with respondents' prior knowledge, worry about existing flood defences and level of education. Results of the Tobit Model conform to our expectations of construct validity with income, distance from the site and perceived flood risk all having a significant effect on the WTP estimate in expected ways. For example, respondents who perceive their property to be at risk from flooding are willing to pay £43.36 more per household per annum and WTP decreases by £1.47 per additional mile the respondent lives from the site. We also find that higher prior knowledge, despite increasing the likelihood a respondent is willing to pay or not, decreases the amount the respondent is willing to pay.

4.2 Understanding perceived consequentiality

The above analysis indicates there are significant differences in WTP between respondents who perceive the survey to be consequential and those who do not. As a result, an attempt has been made to analyse identifiable factors which may be correlated with perceived consequentiality.

We used an ordered probit model to examine the factors which we hypothesise influence beliefs regarding stated consequentiality. Stated policy consequentiality is the dependent variable categorised as 0 for highly inconsequential respondents through to 5 for highly consequential respondents. Ordered probit models are appropriate for analysing Likert Scale data as these models preserve the order of the responses whilst making no assumptions of the interval distance between the options. The independent variables in the models include which factors we hypothesise to influence beliefs regarding consequently. The five-group ordered probit model takes the following linear form:

$$y^* = \beta x + \varepsilon_i$$

While y^* is not observed, we do observe y, where

$$y = 0 \qquad if\ z \leq \mu_0$$

$$y = 1\ if \mu_0 < z \leq \mu_1$$

$$y = 2\ if \mu_1 < z \leq \mu_2$$

$$y = 3\ if \mu_3 < z \leq \mu_4$$

$$y = 4\ if \qquad z \leq \mu_4$$

The values of μ_i are generated from the estimated model: where: y^* is the value of the index for stated consequentiality; z is the predicted value; x is a matrix of the exogenous variables; β is a vector of estimated coefficients and ε_i is the error term.

$$Stated\ consequentiality = \beta_0 + \beta_1 quizscore + \beta_2 floodrisk + \beta_3 fworrydefences + \beta_4 informationconfirmed +$$

$\beta_5 informationcomplicated + \beta_6 councilsresponsbility + \beta_7 gender + \beta_8 age + \beta_9 income + \beta_9 education + \beta_{10} distance + \varepsilon_i$

In line with Vossler and Watson (2013), we include socio-demographic variables (income, age, education and gender). Secondly, we test for the effect of personal motivations for the goods provision on consequentiality. This is measured by how close they live to the proposed flood-defence scheme; whether they believe they are at risk from flooding and if they are worried about the current flood defences. We also include a variable explaining of how much they knew about the good being valued before the survey as measured by their response to the quiz. We also include a variable which measured who the respondents think should fund flood defence "*it is the council's responsibility to fund flood defence, not my own"* measured as 0 for disagree and 1 for agree. Additionally, we also test whether respondent's view of the information presented to them in the survey affects their stated consequentiality: "*the information confirmed what I already knew"* and *"the information was too complicated for me to think about"* measured as 0 for disagree and 1 for agree.

We hypothesise that people with a higher degree of familiarity with the good will perceive the survey to be more consequential as they may already be aware of the proposed flood-defence scheme and as such believe that the results will be shared with policymakers as part of the planning process. This is also measured by the respondent's a priori knowledge of the good as determined by the first quiz score.

From the results of the ordered probit model, we see that increased prior knowledge, the perceived risk from flooding, worried about existing flood defences and age have a significant effect on respondents stating the survey to be consequential (Table 7). We find that increased prior knowledge has a weak effect on stated consequentiality: an increase in prior knowledge of 1 point increased the likelihood that

a respondent finds the survey consequential by 2 percentage points and highlight consequential by 1 percentage point. This suggests that respondents who had a better understanding of flood risk management issues may also be more aware of the ongoing policy process and thus see the survey as consequential within this process. Further to this, we find that whilst prior knowledge increases the likelihood of a respondent perceiving the survey to be consequential, it also revises the WTP estimate downwards.

Respondent's perceived risk of flooding increased the likelihood they find the survey to consequential by 14 percentage points and highly consequential by 10 percentage points. In the WTP analysis, we also found that consequential respondents whose home was at risk from flooding were willing to pay £20.20 more per annum than those not at risk from flooding. In contrast, worry about existing flood defences appears to decrease respondents perceived policy consequentiality despite having a positive impact on their WTP.

There is a partial correlation between perceived flood risk, consequentiality and WTP, which raises a potential endogeneity concern. One notion is that respondents who will benefit most from the policy: i.e. those who perceive themselves to be most at risk from flooding, will be willing to pay the most towards the good and are also more likely to state they believe the results of the survey will be shared with policymakers (in the hope that the good is delivered). It is logical that respondents who are most worried about flooding are going to be prepared to pay the most to protect their home and that these are also the respondents keenest on the policy taking place. There is a concern that stated consequentiality, in this case, may be another expression of people's preferences for the policy action, in the same way stating a high WTP is, rather than evidence that the survey is consequential. Along the same lines, we would have also expected that distance from the site would have affected perceived consequentiality, with those living

close to the site stating the perceived the survey to be consequential. However, we only find no evidence of distance on stated consequentiality.

Table 7: Exploring consequentiality: order probit regression results

VARIABLES	Model 1	Analysis of marginal effects				
		Very Unconfident	Unconfident	Neither confident nor unconfident	Confident	Very confident
Quiz One Score±	0.06*	-0.01*	-0.01*	-0.01	0.02*	0.01*
	(0.03)					
My property is at risk from flooding	0.64***	-0.04***	-0.10***	-0.10**	0.14***	0.10**
	(0.22)					
I am worried the flood defences are not adequate enough to protect my home	-0.38*	0.04	0.07**	0.02***	-0.10**	-0.04**
	(0.20)					
The information confirmed what I already knew	-0.03	0.00	0.01	0.00	-0.01	0.00
	(0.13)					
The information was too complicated for me to think about	0.22	-0.02	-0.04	-0.03	0.05	0.03
	(0.21)					
It is the councils responsibility to fund flood defence not mine	0.08	-0.01	-0.01	-0.01	0.02	0.01
	(0.12)					
Male	-0.04	0.00	0.01	0.00	-0.01	-0.01
	(0.12)					
Age 30 - 39	-0.55**	0.04**	0.10**	0.07*	-0.13**	-0.08*
	(0.24)					
Age 40 - 49	-0.35	0.02	0.06	0.06	-0.08	-0.05
	(0.23)					
Age 50 - 59	-0.42*	0.03**	0.07**	0.06*	-0.10**	-0.06*
	(0.22)					
Age 60 - 64	-0.31	0.02	0.05	0.05	-0.07	-0.05
	(0.26)					
Age 65 and over	-0.54**	0.04**	0.09***	0.07*	-0.13***	-0.08**
	(0.22)					
Income £15,000 - £19,999	0.13	-0.01	-0.03	-0.01	0.04	0.02
	(0.21)					
Income £20,000 - £39,999	-0.01	0.00	0.00	0.00	0.00	0.00
	(0.18)					
Income £40,000 - £69,999	0.26	-0.02	-0.05	-0.03	0.07	0.03
	(0.20)					
Income £70,000 - £99,999	0.13	-0.01	-0.02	-0.01	0.04	0.02
	(0.26)					
Income Over £100,000	0.07	-0.01	-0.01	-0.01	0.02	0.01
	(0.30)					
Higher education	0.06	-0.01	-0.01	-0.01	0.02	0.01
	(0.12)					
Distance from site (miles) ±	-0.01	0.00	0.00	0.00	0.00	0.00
	(0.01)					
/cut1	-1.86***					
	(0.32)					
/cut2	-0.96***					
	(0.31)					
/cut3	0.12					
	(0.30)					
/cut4	1.50***					

	(0.31)	
Observations	375	
AIC	1026.886	
BIC	1117.205	
Pseudo R-squared	0.0294	
Log-likelihood	-490.4	
Chi2	29.740	

Notes:
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
± Marginal effects calculated for continuous variable and reported as a discrete change of +1

5. Discussion and conclusion

Carson and Groves (2007) argue that for a stated preference survey to produce meaningful information about economic value, the respondent must view their responses as potentially influencing the supply of the public good and the cost of this change in supply to them. Additionally, the respondent needs to care about what the outcomes of those actions might be, in which case the survey is "consequential". Respondents who perceive their survey responses to be at least minimally consequential face the same incentives and thus respond to the WTP to question in a similar manner as those who believe it to be strongly consequential, all else being equal.

There is a range of field studies which suggest that perceived consequentiality matters in stated preferences and that observables can help explain how this perceived consequentiality varies across people. Extending the work of Vossler and Watson (2013) and Groothuis et al. (2017) we indeed find that WTP varies according to stated policy consequentiality, and that stated policy consequentiality itself varies according to a number of observables. These include a priori knowledge of the good.

A novel finding from our study is the exploration of the impact of consequentiality on zero bids. Our Cragg Hurdle Model shows the respondent's perceived consequentiality was the main reason whether they were willing to pay or not, however, stated consequentiality did not affect how much the respondents were willing

to pay. Turning to the interval model, we show that as perceived consequentiality increases so does WTP, suggesting consequentiality occurs on a continuum. This contrasts with previous studies which show a knife edge result for WTP and consequentiality (Herriges et al. 2010). In addition, we find that consequential respondents with a higher a priori knowledge of the good are willing to pay significantly less than consequential respondents with a minimal a priori knowledge of the good. This finding draws parallels with laboratory-based studies on consequentiality and WTP which show that when payment consequentiality is ensured, WTP decreases (Murphy and Stevens 2004). One can conjecture that respondents with a greater prior knowledge of managed realignment schemes may already be aware of the ongoing flood risk management discussions within the study area. Hence, they believe the survey is part of this process, and furthermore, they may then perceive that if the proposal is implemented the payment will be collected, and as such revise their WTP downwards. An improvement of our study would have been to also question respondents directly about payment consequentiality, in addition to the question on policy consequentiality. Carson and Groves (2007) state that strong consequentiality includes both payment and policy consequentiality. To date, only one study has examined policy and payment consequentiality using two separate Likert Scale questions Zawojska Bartczak and Czajkowski (2019) and this is a key area for future research into consequentiality.

In line with previous studies, we are concerned that the relationship between increased WTP and perceived consequentiality may be endogenous. Respondents who perceive their home to be at risk from flooding can state a higher WTP and be more likely to perceive the survey as consequential. We raised the concern that stated consequentiality, in this case, may not be measuring an aspect of incentive compatibility

but instead is being used by some respondents as another way to express their positive preferences for the delivery of the flood defence good. Indeed, respondents who wish the policy to go ahead may be more likely to describe the survey as consequential and state a high WTP, in the hope these responses contribute to the policy maker's decision. This concern is shared with Czajkowski et al (2017), Vossler et al. (2012), Vossler and Watson (2013) and Groothuis et al. (2017). We attempted to investigate the relationship between WTP and consequentiality using an Instrumental Variable approach, but we could not find a suitable instrument from our survey which correlated with stated consequentiality but not WTP. For future research considering the impact of consequentiality, we urge the use of multiple questions which could capture respondents' beliefs over consequentiality (both policy and payment).

In line with Vossler and Evans (2013), we find some evidence that controlling for consequentiality increases construct validity, with income, distance from the site and being a member of an environmental group only being significant drivers of WTP for consequential respondents. It is worthwhile noting that in a recent review on incentive compatibility in stated preference methods (Zawojska and Czajkowski, 2017) express concern on the measurement of construct validity and whether the current state of economic theory allows this to be properly assessed.

We also acknowledge the limitations of our study. Firstly, our valuation format does not provide an incentive compatible elicitation mechanism as we do not use a referendum style binary question. However, in the UK the use of referendum in public decision making is limited and designing the elicitation mechanism as a binding referendum would have been unusual for survey respondents. Whilst we are not able to test whether the elicited preferences are true, we believe that our study is still useful regarding policy consequentiality in contingent valuation studies

As research continues to test the relationship between consequentiality and WTP, further work is needed to ensure that follow-up questions are indeed capturing a measure of consequentiality and are not being used by respondents as a further way of expressing positive preferences. This is vitally important where results will be used for policy analysis, especially if respondents who are judged as inconsequential are removed from the final analysis used to estimate welfare implications (Morgan, Huth, and Hindsley 2018). Overall it is clear that more research needs to be undertaken into how respondents answer the policy consequentiality question and what drives these responses if Likert scale self-assessed consequentiality going to become common in stated preference surveys, especially if the answers are going to dictate the aggregation in WTP estimates.

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