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Abstract. Previous empirical research has demonstrated an internal inconsistency that may occur in response strategies between the first and second valuations made to closed-ended contingent valuation questions. One possible explanation for this bound effect is the surprise of being asked the second valuation question, which may be enhanced where there is a lack of trust. This paper considers the use of closed-ended contingent valuation to estimate non-market benefits for an improved street lighting scheme where there is a lack of trust in the agency responsible for provision. The results provide confirmation that surprise is an important determinant of bound effects, however, efforts to reduce such bias using a prior statement of the bid range were found to be ineffective in increasing trust and reducing surprise. Given the importance of this area of research, directions for future research are considered.

Introduction

To conform with the National Oceanic and Atmospheric Administration (NOAA) blue ribbon recommendations (Arrow *et al.* 1993), most contingent valuation (CV) practitioners in recent years have adopted a closed-ended format for the measurement of willingness to pay (WTP) for non-market goods. Using the closed-ended (CE) format, typically the respondent can choose between the 'with' policy situation at a given price or bid level (BL) and the 'without' at zero price. The yes/no responses to the BLs are modelled within a discrete choice framework from which welfare measures can be estimated (see Hanemann and Kanninen, 1999).

Despite the advantages of the closed-ended approach over the open-ended[1,2], the format is limited in terms of the information it provides, where the analyst only knows whether a respondent is willing to pay above or below the BL specified. As a consequence, practitioners have tended to favour a double-bounded (DB) approach[3], where a positive response to the initial BL determines a second, higher, BL which is presented to the respondent (ascending sequence). Similarly, a negative response to the initial BL determines a second lower BL (descending sequence). This practice has been shown to significantly boost the statistical efficiency of the closed-ended

[1] The open-ended approach is more straightforward than the closed-ended approach as it merely asks the respondent for the maximum amount they would pay or minimum compensation they would accept in respect to the change in provision described. Although the open-ended alternative has advantages in terms of the ease of analysis, information provided and the absence of distributional assumptions, it has been much criticised, for example, in terms of incentives for strategic behaviour, sensitivity to the 'fair-share heuristic' and difficulty of the respondent task (Hoehn and Randall, 1987; Bohara *et al.*, 1998)

[2] The open-ended approach can also be supplemented with a payment card, which may lead to more valid WTP responses (Donaldson *et al.* 1997)

[3] The double bounded approach can also be extended to further bounds, however, Cooper and Hanemann (1995) and Scarpa and Bateman (2000) suggest further bounds provide little efficiency gain beyond that achieved by the first follow-up.

approach (Hanemann *et al.*, 1991, Calia and Strazzera, 2000[4]). However, these efficiency gains are made at the expense of an increased propensity for bound effects and previous empirical research has suggested an internal inconsistency in the response strategies between the first and second bounds. This has led to the common observation of a lower WTP associated with the second bound responses (McFadden and Leonard, 1993; Carson *et al.*, 1994; Alberini *et al.*, 1997; Clarke, 2000; Bateman *et al.*, 2001) and parameter inconsistency in the determinants of valuation responses (Cameron and Quiggin, 1994; Alberini *et al.*, 1997; DeShazo, 2002).

One possible explanation for this bound effect is the surprise of being asked the second valuation question, which may be enhanced where there is a lack of trust. Although this proposition has not been empirically tested, it may be possible to reduce the "surprise" generated by the introduction of a second bound by using a statement of the bid range in advance of the discrete choice questions (Cooper *et al.*, 2002). If the use of such a statement is unsuccessful, it may be necessary to restrict the double bound to only descending question sequences (DeShazo, 2002) or not even ask the second question.

This paper considers the use of closed-ended contingent valuation to estimate non-market benefits for an improved street lighting scheme where there is a lack of trust in the agency responsible for provision. Reflecting the characteristics of the case study considered and recent research to help minimise bound effects, this paper considers the affect of surprise at being asked the second valuation question and a lack of trust in the agency responsible for provision on bound effects observed and whether the

[4] Calia and Strazzera (2000) considered the comparative efficiency of single and double bounded methods for different survey sizes and found the efficiency gains for small samples surveys to be particularly large.

introduction of a bid statement in advance of the valuation questions reduces these effects.

Explaining bound effects

In the absence of bound effects $WTP(A)_1$ (first valuation at BL A) = $WTP(A)_2$ (second valuation at BL A) and the parameters are consistent across both treatments, i.e. $ß_{A1} = ß_{A2}$, where A is the BL offered. As noted above, some studies have shown $WTP(A)_1 > WTP(A)_2$ and $ß_{A1} \neq ß_{A2}$. A plethora of explanations have been considered to explain bound effects, including framing effects, anchoring, cost uncertainty, inconsistent heuristics, strategic behaviour and "yea" saying[5]. This study focuses on the surprise caused by the second valuation question and the affect of a lack of trust in the agency responsible for provision.

Respondents may be surprised when asked the second valuation because they thought the price conveys information about the actual cost of the scheme. This may appear to be violated by the second valuation question, whether lower or higher. In situations where there is a background of tax increases, of projects not keeping to budget and possibly a lack of trust, respondents may wish to use the valuation exercise to send a message that the cost of a given scheme should be kept low. In the ascending sequence, respondents would be concerned that agreeing to the second bound would encourage profligate use of funds. If they wished to send a message that projects should keep to budget, respondents should be less inclined to agree to the upper BL. The surprise that the price does not convey the actual cost of the project may also increase the general level of uncertainty and respondents may employ heuristics to

[5] For a summary see Bateman *et al.* (2001) and DeShazo (2002).

help them make sense of the task they have been set. In some cases these heuristics may be inconsistent with the objectives of the question. For example, respondents may consider that the true BL is "somewhere in the middle" of the BLs A and B, where A >B, and the "true" price might be perceived to be the mean of A and B. The overall result from this is unclear.

Respondents that felt they could have the good at the initial price stated may be surprised to be offered it at a different price. In the ascending sequence, this surprise may be accompanied by feelings of loss[6] and this may be perceived as breaking some implicit contract that they could have the good at the initial price. Breaking the perceived implicit contract may give rise to feelings of being conned and indigation, with respondents unlikely to agree to the higher BL. In the case of the descending sequence, respondents may perceive the cost decrease to imply a reduction in the quality or quantity of the good being provided (Alberini *et al.*, 1997). Although this would also have a negative bound effect, a reduction in price may also be interpreted as a bargain, possibly having the opposite effect.

Empirical evidence

The last section has described possible explanations for inconsistencies between responses to the first and follow-up bid amounts. The evidence suggests that, if different, the WTP measure associated with the second bound responses is higher than for the first (McFadden and Leonard, 1993; Carson *et al.*, 1994; Alberini *et al.*, 1997; Bateman *et al.*, 2001). This is consistent with some, but not all of the explanations. Using two very different CV studies, DeShazo (2002) found evidence to suggest the

[6] Based on the work of Kahneman and Tversky (1979), DeShazo (2002) uses prospect theory to explain bound effects through loss aversion and framing effects.

bound effect was only present within the ascending sequence, which was consistent with feelings of loss and being conned. Burton *et al.* (2003) found evidence that within controlled experiments, if the averaging of cost explanation is true, it will significantly affect the responses given.

Based on focus group and verbatim responses to debriefing questions, Carson *et al.* (1992) found that some respondents substituted the quality or quantity of the programme being valued to a different level when moving from the first to second responses. This evidence supported the quality/quantity explanation. However, Carson *et al.* (1999) suggested that there is no collaborative quantitative evidence to suggest these qualitative findings are common.

Bateman *et al.* (2001) also used qualitative analysis to explore how respondents react to the follow-up question. Within two focus groups, in which reactions to the follow-up questions were explored, responses suggested that the second question engendered uncertainty within the approach. For example, one participant suggested that "it was confusing on the day" and another that they started "thinking you don't know what you are talking about, if you don't know what you are talking about you can't ask me for that money". Other participants' suggested feelings of indignation at being asked to pay a higher amount. Two participants suggested that they felt they were being cheated by being asked for a higher amount.

Reducing bound effects

In the case of the data considered by DeShazo (2002), it was possible to avoid bound effects by restricting the follow-up questions to a descending sequence. However,

this will lead to a reduction in the efficiency gains associated with the second bound. Furthermore, it is not clear to what extent the bound effects in the descending sequence would also be absent in other studies. Instead, it may be possible to change the wording of the CV questions to reduce bounding effects.

It is standard practice when using the DB approach not to give prior warning to respondents that they will be asked a follow-up question. Indeed, giving such a warning may affect the extent to which the instrument is incentive compatible. Instead of a warning, Cooper *et al.* (2002) have suggested that a prior statement of the bid range may reduce bound effects. As well as reducing any surprise arising from the second bound, the prior statement of a bid range may reduce any potential feelings of loss, make cost uncertainty more consistent across both valuations and reduce any sense of indignation resulting from a cost increase. Although there is a danger that the increased uncertainty resulting from the use of a prior statement of the bid range may increase the standard error of the estimates, the results of Cooper *et al.* (2002) suggested that this practice may reduce bound effects.

Data and analytical methods

The analysis reported here is based on a case study that investigated the benefits associated with a scheme that would significantly improve the quality of street lighting in built up areas. These benefits would arise from improvements to road safety, reductions in crime levels and lower levels of light pollution in the night sky. The response-policy link that Carson *et al.* (1999) suggest is necessary in CV applications, was clear in this case. The scheme would be introduced and paid for at a local authority level, with the local authority collecting payments directly from

constituent households in the form of local taxes. The link between service improvements and tax rises was, perhaps, all too clear to the respondents, as an unpopular increase in local taxation had occurred in the year of the survey. It was envisaged that, although the street lighting scheme might be viewed favourably, there would be resistance from a number of respondents to a further increase in local taxes. It was hypothesised that respondents would have little trust in their local authorities to deliver services and that the use of the follow-up question would exaggerate such feelings. In consequence, bound effects were expected to be significant. The prior statement of the bid range was employed to reduce such effects.

Given the likely controversial nature of the payment vehicle, special care was taken with the questionnaire design process. This led to the pilot questionnaire being tested across four focus groups. Participants were recruited for the groups using a market research firm, with a £25 incentive being offered to reduce sample selection bias. The meetings lasted between 1.5 and 2 hours and were led by an experienced facilitator. A total of 30 participants were involved in the focus groups, reflecting a mix of gender, age and income. A discussion protocol was designed to ensure consistency. This process was useful in increasing the clarity and relevance of the information provided to respondents as well as providing general support for the design of the questionnaire.

The revised questionnaire opened with a series of questions on street lighting and respondent attitudes towards it. Following a question on the current levels of local taxation, the street lighting improvement scheme and the payment vehicle were

introduced. A split-sample approach was used to consider the effect of a prior statement of the bid range. The bid range was introduced as follows:

> "It is estimated that the street lighting improvement scheme would lead to a rise in your council tax of between £ __ __ and £ __ __."

The bid range contained the upper and lower bounds. This was used as an alternative to the one-and-a-half-bound approach adopted by Cooper *et al.* (2002), in which the amounts stated within the bid range represented the initial BL and, only if applicable, the BL for the follow-up question. Using the approach adopted here, enabled the conventional double-bounded approach to be used, with the difference in the split sample only due to the prior-bid-range statement. As such the initial bound was introduced by stating 'taking the middle value of the cost range stated'[7]. The lower BL was introduced by stating 'taking the lower value of the cost range stated' and the higher BL by stating 'taking the higher value of the cost range stated'. Following a similar strategy to Blamey *et al.* (1999), respondents were also given the option of stating that they are not willing to pay anything towards the scheme. This option was included to further improve the information on respondent WTP. Based on issues raised within the pre-survey focus groups, at the end of the questionnaire all respondents were asked a variety of attitudinal questions relating the payment vehicle, trust in the authority responsible for implementing the scheme, and the perceived benefits of street lighting improvement. Motivational, demographic and socio-economic characteristics of the respondent's household were also elicited.

[7] For example, if the bid range is £5 to £15, the middle value will be £10.

The survey was undertaken in August 2003 with 1080 useable questionnaires being completed (815 with the bid range statement and 265 without). Given the controversial nature of the payment vehicle and, for policy reasons, the need to provide robust valuations of the street lighting scheme, it was decided that the most robust option was to state the bid range for the largest proportion of the sample.

Trust, surprise and reaction to the double bounded approach

Focus group findings

The reaction to the follow-up question and the effect of the bid-range statement was initially explored using the results of the focus groups and responses to attitudinal and motivational questions. The focus groups confirmed the expectation that many individuals have little trust in their local government. Indeed, 17 out of 30 participants agreed with the statement 'You can't trust the local government to use council tax revenue to finance the street lighting improvement scheme'. The issue of trust was given further consideration within the focus groups, with the key issues being: residents don't really see what they get from the council tax they currently pay; whether the council will actually spend the money on the lighting scheme; and the likelihood that the costs of the scheme will escalate beyond those stated. The authors were concerned that the use of the second bound would not help to relieve such feelings.

The topic of the follow-up question was raised in all groups, and all participants were asked to complete a version of the questionnaire including the bid-range statement. Despite these safeguards, most respondents stated that they were surprised to be asked the follow-up question (26 out of 30) and agreed with the statement 'if the council are

unsure about the amount that we will have to pay for the lighting improvement scheme, it makes me worry how much this is actually going to cost' (26 out of 30). Within the discussion one participant described the asking of the second question as 'a bit sly', another 'a bit dodgy'.

Such sentiments suggest that the second question may have created the feeling that respondents were being deceived over the true cost of the scheme. Two participants suggested that the follow-up made them question how realistic the costs presented were and another was annoyed by being asked the second valuation question. Another participant suggested that the higher BL in the follow-up question was designed to gain support for a further tax increase if the costs were larger than expected. Importantly, however, when asked if the prior statement of the cost range had helped reduce the level of surprise engendered by the follow-up question, there was a general consensus that it had made little difference. This perhaps suggests that respondents already lacked trust in their local authorities prior to the valuation questions and, consequently, the follow-up question only provided confirmation of their existing attitudes.

Survey results

The lack of trust in local government was confirmed by the survey, with 47.5% (without the bid-range) and 48.8% (with the bid-range) of the respondents of respondents agreeing or agreeing strongly that they could not trust the local authority to use tax revenue to finance the street lighting scheme. Regarding certainty about the cost, the majority (62.2% without and 58.0% with) of respondents agreed that if the council were unsure about the cost of the lighting improvement scheme, they would

worry about how much they would actually have to pay. When relating to the actual valuation questions, however, a less significant proportion of the respondents thought the costs of the scheme were unrealistic (33.0% without and 34.8% with). In terms of their surprise at being asked the follow-up question, a sizeable proportion of respondents stated that they were surprised (34.5% without and 37.2% with). Regarding the effect of the prior bid-range statement, this was found to have no statistically significant effect ($p > 0.1$) on the attitudes of the respondents.

Modelling WTP responses

A spike modelling approach was adopted to integrate both the payment principle and DC valuation question responses (Kriström 1997). Here the likelihood function consists of two separate components: WTP = 0 and WTP > 0. This approach has recently been extended to the DB (Yoo and Kwak 2002)[8]. As the two model components (payment principle and valuation) are separate, there is no requirement for any correspondence between the variables included (Reiser and Schechter 1999; Yoo *et al.*, 2001). Models using a log-logistic functional form were found to provide a marginally better fit to the data than a number of alternative specifications.

In terms of additional explanatory variables, the questionnaire survey produced approximately 50 variables based on attitude, experiences, behaviours and socio-economic characteristics, a number of which were significantly related to the valuation responses. In order to achieve parsimony, factor analysis was used to reduce the set of interrelated variables into a smaller number of uncorrelated factors through the calculation of factor scores. The initial factor loading or interrelatedness

[8] More recently, an approach has been developed to model zero values separately from those identified as protest responses (Strazzera *et al.*, 2003).

was calculated using varimax orthogonal rotation, which maximises the extent to which the variables are loaded onto a given factor, aiding factor identification (Hair *et al.*, 1995; Field, 2000). Factor scores were calculated using the Anderson-Rubin regression method which ensures the factor scores are uncorrelated (Field, 2000). Using both the scree plot and the conventional eigenvalue cut off point of 1.0 as a guide, 12 factors were extracted for consideration. Those that were found to be statistically significant within the valuation model, are reported in Table 1. The eigenvalues for these factors are reported and the variables with factor loadings over 0.35 (Field, 2000). Perhaps of most interest within this paper is the factor labelled 'trust/realism' which is calculated from, amongst others, the attitudinal responses reported in Section V.

TABLE 1 ABOUT HERE

Confirmation of the meaning of the factors was provided by entering the original variables independently into the model. Although a variable for the natural log of income was statistically significant ($p<0.05$) when entered into the model individually, a factor for the socio-economic/income characteristics of the respondent was not significant and hence was excluded from the model. Similarly, respondents of 65 years of age and above were willing to pay more for the scheme, but this did not come out within the factor analysis.

Table 2 reports models of the payment principle and DC valuations by bound and with or without bid range. These models show that responses are affected by a number of issues beyond the BL, with a subjective label given to each of the factors

used. Considering initially the WTP = 0 component of the model, the decision whether to be willing to pay anything for the scheme was found to be significantly ($p<0.05$) determined by factors that have been interpreted to reflect the following considerations:

(1) the perceived improvement in the safety arising from improved by street lighting;
(2) the realism and trustworthiness of the scheme and the payment vehicle;
(3) the perceived disamenity from street lighting;
(4) a preference not to have to pay so much for the scheme;
(5) an interest in astronomy (with bid range only); and
(6) an absence of personally benefits.

Of these responses, only in the case of improved safety (from crime and on the roads) does the model suggest that a higher value of the factor would lead to a higher probability of the respondent being willing to pay for the scheme. As respondents' willingness to pay a non-zero amount are modelled separately, this part of the model does not change between initial and second bound.

TABLE 2 ABOUT HERE

The only factors that were significant determinants of the amount respondents were WTP across all models were: 'trust/realism'; and 'not personally benefit'. The factor 'safety' was significant for all by the second bound without bid range models (Model 3). With the exception of the "whole sample" model, 'Prefer not to pay' and 'car

crime' were statistically significant determinants only in the with-bid-range models (Models 4 and 5).

Split-sample tests

The consistency of bound effects was explored in terms of the welfare estimates from the regression models. Estimates of mean values were calculated by applying the Simpson's Method (Duffield and Patterson, 1991), with the distribution censored at the highest BL offered. This approximation implies that the estimates represent a lower bound of the mean (LBM). Alternatives to censoring at the maximum BL are available, however they all depend on an arbitrary choice of the upper truncation point and their adoption generally increases the standard error of the estimates (Ready and Hu, 1995; Haab and McConnell, 1998). A non-parametric bootstrapping approach (Efron and Tibshirani, 1993) using 1000 iterations was adopted to estimate confidence intervals for the mean and median values. This approach avoids further parametric assumptions, it can be used to generate estimated distributions for any welfare measure required and it provides the basis for investigating differences between measures.

The results presented in Table 3 explore bound consistency[9]. For the whole sample, although the second bound median and LBM were lower than for the initial bound, this was only significant for the median values. Using likelihood ratio tests

[9] Medians for the bootstrapped distributions were compared directly to see if they overlapped significantly. Difference of two means Z-test was performed to compare LBM estimates, however, the assumption were in some cases violated and, where necessary, a comparison of distribution test was also performed for confirmation of the Z-test findings.

parameters were found to be consistent across both treatments (P<0.10). In order to generate a *ceteris paribus* test of the causes of bound effects, only those respondents trusting or not surprised respectively were included in the sample. For those trusting the agency responsible for provision their WTP was much larger, illustrating the importance of this issue as a determinant, but the range of the median values was much greater than observed for the sample as a whole, suggesting the BL range was perhaps not sufficient for this subgroup. Indeed, the distribution of LBM was also highly skewed. On this basis it is difficult to make judgements as to whether this was a cause of bound effects. However, the models for those not surprised by the second bound were much more robust and for these respondents no bound effects were observed. Although it could be argued that this was due to the smaller sample size, in comparison, significant bound effects were observed for both median and LBM estimates for those stating there were surprised to be asked the second question. Furthermore, using a likelihood ratio tests parameters were found to be consistent across both treatments (P<0.10). Hence, these results strong suggest that surprise is a determinant of bound effects.

TABLE 3 ABOUT HERE

The upper half of Table 4 provides the results of the models used to explore the effect of a prior statement of the bid range on bound consistency. The welfare estimates from models without the prior bid range statement are prone to bound effects for both median and LBM responses. The use of the prior bid range statement does reduce the difference between the median and LBM for the two bounds, but, does not remove the problem, as there is still a significant difference between the median estimates.

TABLE 4 ABOUT HERE

In the lower half of Table 4 the effect of the bid-range statement was explored. Separating the effect of bid range stated by initial and second bounds, the main effect was observed for the first valuation response. Indeed, a significant reduction in the lower bound mean was observed, reducing the mean from £15.24 to £12.60. This finding is consistent with the expectation that the prior statement reduces the perceived difference between the two questions. Using double-bound models there is no overall effect on the welfare estimates of the bid range statement. Using likelihood ratio tests the consistency of the parameters was explored between bounds (i.e. Model 2 versus Model 4 and Model 3 versus Model 5) and between those models with and without the bid range statement (i.e. Model 2 versus Model 3 and Model 4 versus Model 5). No statistically significance differences between these models were observed ($P<0.10$).

Conclusion

This paper has explored the empirical effects of using the follow-up question in closed ended contingent valuation, the causes of such bound inconsistency and the potential to reduce such effects using a prior statement of the bid range being used. The case study is interesting as the payment vehicle for the scheme was viewed as realistic but there was a lack of trust in the provider. Although parameter consistency was observed, the results did suggest negative bias in responses to the follow-up question. Adjusting to allow comparisons across respondents who were not surprised by the follow-up question revealed bound consistency, suggesting surprise to be a key

determinant of this problem. The use of a prior bid range statement as an endeavour to reduce surprise and increase trust was unsuccessful, with expressed attitudes unchanged. The use of the prior bid range statement did, however, reduce the problem of bound inconsistency to be present only in the median responses. This finding is consistent with the expectation that the prior statement reduces the perceived difference between the two questions.

The question of how to reduce the problem of bound effects remains. Central to achieving this will be an improved understanding of why these effects occur and in what circumstances. This paper has added to this understanding. In the case study presented here, surprise was found to be a key determinant of the bound effects observed. Given the clear efficiency gains of the second bound, rather than dismiss its use, the findings within this paper encourages further research to explore how to alleviate this form of bound effects.

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Table 1. Factors and factor loadings

Factors	*Factor loading*
Safety	
Eigenvalue	5.38
Improved street lighting will lead to less accidents on the roads	0.74
Improved street lighting would reduce crime	0.73
Improved street lighting would make private property more secure	0.72
Street lighting makes me feel safer from crime after dark	0.71
Better street lighting would improve road safety for children	0.68
The street light scheme would improve ease of access for pedestrians	0.68
The street light improvement scheme would enhance drivers field of vision	0.64
The threat of crime makes it unsafe to walk the streets after dark	0.46
With existing street lighting it is difficult for drivers to see pedestrians or cyclists	0.47
Trust / realism	
Eigenvalue	2.41
If the council are unsure about the amount that we will have to pay for the lighting improvement scheme, it makes me worry how much this is actually going to cost	0.65
The cost of the scheme to me is unrealistic	0.64
The street lighting improvement scheme should be funded by reducing the quality of other services rather than increasing council tax	0.51
Having stated my opinion regarding the first increase in council tax I was surprised to be asked to state my opinion again for another amount	0.47
You can't trust local government to use council tax revenue to finance the street lighting improvement scheme	0.47
The street lighting improvement won't be as good as shown in the pictures	0.40
Car crime	
Eigenvalue	1.75
Do you park your car in the street?	0.45
Have you ever had you car broken into?	0.72

Disamenity	
Eigenvalue	1.44
Street lighting can be annoying	0.45
Street lights look unattractive during the day	0.64
Prefer not pay	
Eigenvalue	1.26
I would prefer a more modest improvement scheme that cost less	0.49
The street lighting improvement scheme should be funded by reducing the quality of other services rather than increasing council tax	0.45
Star gazing	
Eigenvalue	1.11
Improving the visibility of the stars at night is important to me	0.54
Do you take an active interest in astronomy?	0.54
Not personally benefit	
Eigenvalue	1.08
I will not benefit personally from improving the existing street lighting	0.42
Improved street lighting is a relatively low priority compared to other council services	0.38
I'm happy with the lights we have now	0.35

Table 2. Log-logistic spike models of valuation responses

	Model 1: Whole Sample[a] Double bounded	Model 2: Initial bound (with)[b]	Model 3: Second bound (without)	Model 4: Initial bound (with)	Model 5: Second bound (with)
WTP=0					
Constant	-0.76 (10.06)**	-0.72 (-4.75)**	-0.72 (-4.75)**	-0.77 (-8.83)**	-0.77 (-8.83)**
Safety	-0.70(-9.04)**	-0.78 (-4.76)**	-0.78 (-4.76)**	-0.69 (-7.76)**	-0.69 (-7.76)**
Trust/ realism	0.72(9.18)**	0.69 (4.15)**	0.69 (4.15)**	0.73 (8.18)**	0.73 (8.18)**
Disamenity	0.24(3.26)**	0.35 (2.30)*	0.35 (2.30)*	0.21 (2.45)*	0.21 (2.45)*
Prefer not to pay	0.30(4.14)**	0.50 (3.24)**	0.50 (3.24)**	0.25 (2.98)**	0.25 (2.98)**
Star gazing	0.24(3.12)**	0.19 (1.19)	0.19 (1.19)	0.26 (2.93)**	0.26 (2.93)**
Not personally benefit	0.53(6.98)**	0.45 (2.76)**	0.45 (2.76)**	0.56 (6.36)**	0.56 (6.36)**
WTP>0					
Constant	-2.41(-13.93)**	-2.15 (-4.47)**	-1.33 (-3.47)**	-1.76 (-7.03)**	-2.59 (-8.53)**
Ln (BL)	0.86(12.91)**	0.59 (2.99)**	0.41 (2.52)**	0.61 (5.50)**	0.83 (6.53)**
Safety	-0.74(-6.46)**	-0.84 (-3.16)**	-0.45 (-1.89)	-0.70 (-5.18)**	-0.88 (-5.92)**
Trust / realism	1.11(9.58)**	0.96 (3.65)**	1.05 (4.93)**	1.14 (7.93)**	1.16 (7.35)**
Car crime	0.40(3.92)**	0.44 (1.88)	0.30 (1.51)	0.39 (3.08)**	0.27 (2.00*
Prefer not pay	0.50(4.96)**	0.35 (1.51)	0.39 (1.88)	0.51 (4.06)**	0.67(4.79)**
Not personally benefit	0.49(4.75)**	0.61 (2.54)*	0.48 (2.30)*	0.49 (3.78)**	0.53 (3.80)**
Log-likelihood ratio[c]	0.17	0.19	0.18	0.20	0.20
Sample size	1080	265	265	815	815

Note: [a] ** $p < 0.01$; * $p < 0.05$ and the confidence intervals for the welfare estimates are shown within in parentheses. [b] with - with the bid-level statement [c] The log-likelihood ratio figures are for model improvement from the basic double bounded spike model with only the bid level as an explanatory variable

Table 3. Welfare measure estimates using the log-logistic model[a,b]

Tests conducted	Type of model	Sample size	Medians			Low Bound Means (LBMs)		
			Median value (£)	Bootstrap 95% CI	Distribution test (p-value)	LBM value (£)	Bootstrap 95% CI	Difference test (p-value)
Whole sample	Initial bound	1080	3.81	2.74-9.07	0.01	13.24	11.89-15.74	0.27
	Second bound	1080	1.42	0.79-5.37		11.98	10.82-14.68	
Trusting	Initial bound	269	32.19	26.95-246.98	0.64	19.69	19.62-23.11	0.13 (0.01)[c]
	Second bound	269	20.34	17.31-501.53	(not trusting <0.00)	17.90	17.78-21.86	(not trusting 0.18(0.05))
Not surprised	Initial bound	310	23.70	17.91-44.31	0.30	19.67	18.33-22.22	0.27 (0.36)
	Second bound	310	21.80	17.95-74.37	(surprised <0.01)	18.63	18.01-21.62	(surprised <0.01(<0.01))

Notes: [a] 'yes' responses coded as 1 and 'no' as 0. [b] The results are presented for full models, with the factors presented in Table 4 providing the additional explanatory variables. [c] The p-values in parentheses are estimated using non-parametric distribution tests and are provided where the assumptions of the Z-test are violated.

Table 4. Welfare measure estimates using the log-logistic model[a,b]

Tests conducted	Type of model	Sample size	Medians			Low Bound Means (LBMs)		
			Median value (£)	Bootstrap 95% CI	Distribution test (p-value)	LBM value (£)	Bootstrap 95% CI	Difference test (p-value)
Bound consistency	Initial bound (without bid range)	265	6.07	2.96-13.53	< 0.01	15.24	13.78-17.10	0.06
	Second bound (without bid range)	265	1.58	0.24-4.71		13.28	11.74-15.14	
	Initial bound (with bid range)	815	3.53	1.96-6.64	< 0.01	12.60	10.82-14.60	0.34
	Second bound (with bid range)	815	1.47	0.48-3.37		11.52	9.85-13.44	
Bid range	Without bid range (initial bound)	265	6.07	2.96-13.53	0.16	15.24	13.78-17.10	0.02[c]
	With bid range (initial bound)	815	3.53	1.96-6.64		12.60	10.82-14.60	(0.04)
	Without bid range (second bound)	265	1.58	0.24-4.71	0.46	13.28	11.74-15.14	0.10
	With bid range (second bound)	815	1.47	0.48-3.37		11.52	9.85-13.44	(0.11)
	Without bid range (double bound)	265	4.32	2.52-8.67	0.18	13.04	11.17-15.34	0.16
	With bid range (double bound)	815	2.89	1.62-5.03		11.51	9.96-13.16	(0.15)

Notes: [a] 'yes' responses coded as 1 and 'no' as 0. [b] The results are presented for full models, with the factors presented in Table 4 providing the additional explanatory variables. [c] The p-values in parentheses are estimated using non-parametric distribution tests and are provided where the assumptions of the Z-test are violated.