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Gender-specific starting point bias in choice experiments: Evidence from an empirical study

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ABSTRACT

In this paper, we test whether preferences and willingness-to-pay estimates obtained in a Choice Experiment study are susceptible to starting point bias as is often the case in Dichotomous Choice Contingent Valuation studies. On the basis of a multinomial probit model, we find that preferences are indeed susceptible to starting point bias. In a split-sample design our results suggest that varying the price levels displayed in a so-called Instructional Choice Set presented prior to the actual preference eliciting choice sets, significantly impacts respondents' preferences and willingness-to-pay for protecting Danish nature areas from new motorway development. In particular, our results show that the bias is gender-specific. Only female respondents are significantly affected. Results further reveal that the impact of the starting point bias decays as respondents evaluate more and more choice sets. This supports the Discovered Preference Hypothesis, and on the basis of this we suggest a number of ways to potentially mitigate the starting point bias.

1. Introduction

In studies applying the Dichotomous Choice Contingent Valuation Method (DC-CVM), respondents are asked whether or not they would be willing to pay a specific price to obtain a specified change in the provision of the good in question. However, DC-CVM surveys are known to be susceptible to *starting point bias*[1] (SPB). This bias emerges when respondents are uncertain about their true preferences for the good. As a consequence, they then regard the presented price as conveying an approximate value of the good's "true" or "correct" value and therefore they anchor their willingness-to-pay (WTP) in this value [34,42,61]. Several surveys have studied the influence and importance of SPB in DC-CVM, see e.g. [4,17,19,25,36,75]. In general, the results show that SPB has a significant influence on the derived WTP. Stated WTP thus becomes a function of the "response path" and not only a function of the respondent's true preferences as standard welfare-economic assumptions prescribe.

The construct underlying the choice experiment (CE) is closely related to the DC-CVM in that they share the same random utility framework [30]. In effect, DC-CVM can be seen as a special case of CE with only one choice set. With this

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[1] In the literature, the term 'anchoring' is often used instead of SPB to describe more or less the same effect. For simplicity, only the term SPB will be used in the remainder of this paper.

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Table 1
Attributes and attribute levels used in the CE survey

Attribute (type of nature)	Level (km new motorway through area)
Forest	0, 5, 10 km
Wetland	0, 2.5, 5 km
Heath/pastoral area	0, 2.5, 5 km
Arable land[a]	80, 82.5, 85, 87.5, 90, 92.5, 95, 97.5, 100 km
Annual extra tax payment per household[b]	(0 DKK), 100, 200, 400, 700, 1100, 1600 DKK

[a] As each alternative had to sum to 100 km of new motorway, a fourth supplementary attribute, "arable land", was introduced. This attribute functioned as an accumulation attribute, the level being dependent on the level of the other attributes.
[b] 100 DKK ≈ 13.4 EUR.

close relation between CE and DC-CVM in mind, the *a priori* expectation would be that CE is equally prone to SPB. However, to date, very few studies have investigated the possible existence of SPB in CE.

In this paper we make a novel contribution to the examination of SPB in CE. We find that SPB is indeed present in CE. Surprisingly however, this finding is gender specific. Further, we relate our findings to an adjusted version of Levitt and List's model of utility [47] and to the Discovered Preference Hypothesis [65].

2. Starting point bias in choice experiments

Before testing for SPB, it is necessary to explicitly define the SPB in relation to CE, as an exact definition is less obvious than in DC-CVM. The prices attached to the alternatives in CE are displayed simultaneously within each choice set[2] and not just as a single alternative with a single price as in DC-CVM. If SPB is present in a CE, it is not clear whether it is the highest price, the lowest price, the average of the displayed prices, or maybe some other type of vector of the prices, that sets the anchor.

2.1. Price vector effects

So far, the majority of studies that have been carried out concerning SPB in CE define SPB as the effect of using different bid ranges for the price attribute. More specifically, this type of SPB is related to the price vector used. However, studies are few and results are ambiguous. Hanley et al. [32] and Ohler et al. [64] find no effect of changing the price vector used whereas Carlsson and Martinsson [21] and Ryan and Wordsworth [68] find the opposite.

2.2. Starting point effects

In the frame of a double-bounded DC-CVM SPB effect, the prices used in the *first* choice set might influence the perception of the prices in the following choice sets. Cognitive psychologists argue that people, when faced with an unfamiliar situation make estimates by starting from an initial value and then adjusting the value to yield the final answer. This initial value may be suggested by the formulation of the problem [42]. To the authors' knowledge, the potential presence of this particular type of SPB in CE has until now only been treated in one study. Carlsson and Martinsson [21] hypothesize that adding a choice set with low prices and large attribute improvements as the first choice set in a sequence would make respondents state lower marginal WTP in the following choice sets. However, in a split-sample survey focusing on a market good (reduction of power outages) they find no significant effects, thus rejecting the presence of SPB.

3. Study design

During the past 10 years, almost 200 km of new motorways have been built in Denmark. In order to assess the impacts on recreational benefits when placing new motorways through nature areas, the conducted survey examines the recreational benefits associated with reducing the impact of new motorways on different types of nature. In a questionnaire, respondents were faced with a scenario description based on the current plans regarding future motorway development. The scenario assumed that 100 km of new motorways will be built over the next 10 years. In accordance with Lancaster's [45] *attribute theory of value*, three different types of nature were chosen as attributes in the study. A zero-priced status quo alternative was defined on the basis of the present area distribution of these nature types in Denmark. The attributes as well as the applied attribute levels are displayed in Table 1.

[2] Typically, a choice set consists of two policy-generated alternatives with different prices and a zero-priced status quo alternative.

As a full factorial design comprised 162 alternatives, a D-optimal fractional factorial design consisting of 18 choice sets was identified[3] [54]. Splitting the respondent sample into three groups, each respondent answered six choice sets. A choice set consisted of three alternatives: the zero-priced status quo alternative and two policy-generated improvement alternatives with an associated price.

Collection of data was carried out through an online internet survey. Respondents were sampled from a nationwide internet panel consisting of approximately 17,000 people. To minimize potential self-selection bias, randomized quota-sampling was performed on the basis of quotas regarding gender and age, relating to the amount of people with internet access in the given target group.

4. Procedure

Formally, the test of SPB was carried out by using a two-split sample design. In both samples respondents were introduced to an "Instructional Choice Set" (ICS), which was simply an example of the subsequent actual choice sets used in the survey for preference elicitation. The ICS was introduced as a part of the scenario, describing the hypothetical market put forward. Respondents were asked to look at the example and consider what they would choose. It was emphasized that respondents should consider all the attributes and especially that they should take the trade-off in prices between the alternatives into consideration.

To test for SPB in the present study, we fixed the prices used in the ICS at different levels in the two split samples. In all other respects the questionnaires were kept identical in the two samples. In sample A the ICS displayed prices of 400 and 1100 DKK for alternatives 1 and 2, respectively. Sample B, on the other hand, employed a lower set of prices at 100 and 200 DKK for alternatives 1 and 2, respectively.

Ideally, and in accordance with standard assumptions, the respondents' preferences and thus WTP should not be influenced by the set of prices in the ICS. This ought to result in similar distributions of choices in the choice sets in the two samples, *ceteris paribus*.

A suitable frame for testing for SPB is an attuned version of the model applied by Levitt and List [47] in a laboratory experiment setting. In the model, a utility maximizing individual i is faced with a choice a related to a single action, $a \in (0,1)$. The choice of action influences the individual's utility through two separable components; a wealth component W_i and a moral component M_i[4]:

$$U_i(a, v(p,c), n) = M_i(a, v(p,c), n) + W_i(a, v(p,c)). \tag{1}$$

Here v represents the stake of the game,[5] which in the CE set-up is a joint function of the attributes (protection of nature p and cost c) of the alternative related to action a. The cost of social norms[6] is denoted n. The wealth[7] component W_i refers to the utility associated with the specific level of protection of nature and the cost represented by the alternative chosen in action a. W_i increases as the level of protection increases, i.e. $\partial W_i/\partial p > 0$, and cost decreases, i.e. $\partial W_i/\partial c < 0$. It should be stressed that the direct effects on the individual related to the choice of action differ between the work of Levitt and List [47] and the present application. In [47] it is assumed that the choice of action has a direct effect on the wealth component, i.e. a pay-off or a loss. However, in the present CE set-up a direct effect on the wealth component cannot be established.

The utility associated with the moral component M_i entails a, v and n.[8] In [47] v is the financial externality an action can impose on other individuals. Applied in the present setting, choosing a high cost protection alternative could potentially impose a proportional financial externality on others. This would require that the individual presumes that other households are obliged to pay c or at least a fraction of c if he or she chooses action a. However, the scenario description and payment vehicle presentation does *not* motivate the respondent to establish such a link between own actions and the financial burden on others.[9] Hence, for simplicity it seems reasonable to assume that the respondents do not hold altruistic preferences. Thus, we can assume that $\partial M_i/\partial c = 0$. However, the financial externality might be present in relation to

[3] To minimize the number of dominating and non-causal alternatives, the initially identified efficient design was subjected to the manual swapping procedure suggested by Huber and Zwerina [38].

[4] A number of papers argue that individual utility and choice go beyond wealth [3,6,12,63].

[5] Compared to [47], the stake of the game in the present application is not quite as transparent, as the stake is a function of the level of attributes representing the protecting of nature (a positive stake) and the price (a negative stake).

[6] Here, the term "cost of social norms" covers other similar expressions from the literature such as "social costs", "moral costs" or "prescription costs".

[7] Adhering to the terminology in [47] we use the term "wealth" even though, as one reviewer notes, in the case of a non-market good this component obviously covers more than the pure monetary value of the choice.

[8] In [47] an additional term s is included in M, denoting the impact on moral behavior from feeling scrutinized when being observed by a researcher. List et al. [52] find that stated preferences are significantly affected by the level of observability when interviewing respondents. Particularly, a low degree of social isolation, i.e. a high degree of scrutiny, had a marked impact on stated preferences as compared to a case with a high degree of social isolation. Similarly, Alpizar et al. [5] find contributions made in public to be 25% higher than when made in private. The present survey being a well-controlled internet panel survey not involving any direct social interaction, we assume the impact of scrutiny to be negligible. Hence, for simplicity s is left out of Eq. (1).

[9] In the scenario, respondents are only told that the lump-sum tax level associated with each alternative applies to their *own* household. Thus, respondents are not explicitly told whether other households should pay the same amount or not.

protecting nature as it seems more straightforward and logical that individual *i*'s choice of an alternative with no protection of nature can impose a loss for others, and consequently $\partial M_i/\partial p > 0$.

The cost of social norms is denoted by n. In the choice of alternative motorway layout (action a), the individuals might feel obliged to choose a level of increased protection even though they find the two policy-generated alternatives too expensive. Conversely, individuals might derive utility specifically by accepting high cost of protection, because they see themselves as socially responsible individuals [2,9,67]. Independently of motivation for the cost of social norms (negatively motivated by not doing or positively motivated by doing), the cost has positive influence on M_i so that $\partial M_i/\partial n > 0$.

Given this model, SPB might affect the moral utility component. As mentioned, the prices applied in the ICS might be perceived as cues of the true social value. Thus, the prices may motivate the individual to make "socially correct" choices [19] and thereby influence choices through the cost of social norms factor. If the price levels in the ICS are in fact perceived as a cue of the true social value, then one would expect the distribution of choices between the two alternatives and the status quo to differ between the two samples. More specifically, compared to the distribution in sample A, it would be expected that the lower-priced ICS in sample B, causing a lower moral utility component, would displace the distribution of choices towards the zero-priced status quo alternative and/or the cheaper of the policy-generated alternatives. As a logical consequence, sample B would then yield lower aggregate WTP estimates than sample A.

Consequently, the following main hypothesis is put forward:

H1. Preferences are independent of treatment and hence identical in samples A and B.

If tests reject the hypothesis, the presence of SPB in the data set is established. However, anomalies in terms of for example SPB in the present study might be expected to adhere to the Discovered Preference Hypothesis (DPH) [18,65]. The DPH states that when respondents are faced with new decisions in unfamiliar environments, initial decisions will exhibit large randomness and little conformity with standard preference theory, e.g. rationality. However, as choices are repeated and respondents gain familiarity with the decision environment, decisions will progressively exhibit less randomness and greater rationality, i.e. anomalies will decay. In other words, behaviour initially deviates from, but with experience converges to, the predictions of standard theory. It is thus argued that by "training" respondents their preferences become more stable and rational.

Following this reasoning, we would expect SPB, if present, to disappear as the respondents become more experienced with the valuation set-up and the good in question [10,20]. Further, appointing greater weight to the later responses in the DPH frame may achieve robust and theoretically consistent measures of preferences in the estimation process [11,14]. Accordingly, an established overall SPB in the data set might conceal the fact that the choices in the first choice sets are heavily anchored in the ICS whereas the bias decreases in the following choices.

Following the DPH, we now elaborate on [47] by adding a subscript t, denoting the number of the choice set associated with action a:

$$U_{it}(a, v, n) = M_{it}(a, v, n) + W_{it}(a, v) \tag{2}$$

If a learning effect gradually reduces the severity of SPB, then choice of action and utility should converge to the same level in samples A and B, effectively removing the inequality:

$$U_{it\_\text{Sample A}}(a, v, n) \to U_{it\_\text{Sample B}}(a, v, n) \quad \text{as} \quad t \to \infty. \tag{3}$$

Consequently, a second hypothesis is put forward, conditional on rejection of H1:

H2. Rejection of H1 is independent of the choice set number.

Rejection of H2 will indicate that preferences do not converge and that the SPB from the ICS carries over to all remaining choice sets. In that case the SPB might not be interpretable in terms of the DPH but it is rather an initially coherent type of anomaly which would severely invalidate the validity of estimates [8,10].

5. Results

Samples A and B had response rates of 53% and 48%, respectively, yielding a total of 294 and 285 useable responses. Table 2 displays an analysis of a range of demographic background characteristics. The two samples differ significantly only with respect to gender ($\chi^2 = 10.8$, $p = 0.001$). In sample A, women account for 52% of the total whereas this share is only 43% in sample B.

Due to the different distributions of gender in the two samples, the following tests for SPB are carried out on an overall level as well as on a gender-specific level. This approach is taken in order to ascertain whether potential differences with regard to preferences in the two samples are caused merely by an overall impact of the differing ICSs, or if there is a gender-specific effect.

Table 2
Respondent demographics

	No. of respondents		Significance in χ^2-test		No. of respondents		Significance in χ^2-test
	Sample A	Sample B			Sample A	Sample B	
Gender				Personal gross income/year (DKK)			
Male	141	163	***	< 150,000	13	19	NS
Female	153	122		150,000–299,999	40	49	
				300,000–499,999	83	83	
				>500,000	123	120	
Age				Education			
18–24	29	28		Primary school	15	11	
25–34	53	56		Vocational	73	66	
35–44	80	75	NS	High school	15	14	NS
45–54	67	67		Short academic (<3 years)	38	29	
55–64	58	46		Middle academic (3–4 years)	75	88	
65–70	7	12		Long academic (>4 years)	51	57	

NS indicates no significant difference at 95% level, *** indicates a significant difference at 99.9% level.

Table 3
Test for identical distribution of choices in the two samples

Sample	Alternative chosen	Number of choices (percentage of total)		χ^2-test
		Sample A	Sample B	p-Value[a]
Full	Status Quo	507 (29%)	536 (31%)	<0.001
	Cheap	776 (44%)	787 (46%)	
	Expensive	481 (27%)	387 (23%)	
Male	Status Quo	268 (32%)	313 (32%)	0.220
	Cheap	359 (42%)	419 (43%)	
	Expensive	219 (26%)	246 (25%)	
Female	Status Quo	239 (26%)	223 (31%)	<0.001
	Cheap	417 (45%)	368 (50%)	
	Expensive	263 (29%)	141 (19%)	

[a] The χ^2-test compares the actual numbers from sample A with the numbers from sample B adjusted to reflect the total number of choices in sample A

5.1. Comparison of choices

The first hypothesis (H1) is initially tested simply by comparing the distribution of choices in the two split samples. Table 3 reports these distributions as well as Pearson χ^2-tests for identical distributions.

Looking at the full sample, the hypothesis of equal distributions in the two samples is strongly rejected. Specifically, respondents in sample A tend to choose the expensive alternative more often than respondents in sample B. This tendency is in keeping with the suspicion of SPB resulting in generally lower WTP estimates in sample B, as compared to sample A. However, it turns out that only females are significantly affected whereas male respondents are not. Female respondents in sample B choose the expensive alternative less often than in sample A. This is counterbalanced by choosing the status quo or the cheap alternative more often. Thus, female respondents in sample B have generally expressed higher sensitivity towards changes in the price than in sample A. Consequently, female respondents' marginal utility of income would seem to be higher in sample B than in sample A. This implies that female respondents' preferences, and thus WTP, are affected by the price levels employed in the ICSs and, hence, susceptible to SPB.

This comparison of choices only provides a test in one dimension—the price attribute. As the observed disparity in propensity of choice could potentially be explained by the influence of the other attributes, we continue with a test based on a parametric approach that comprises preferences in all attribute dimensions.

5.2. The parametric analysis

Multinomial Probit Models describing the elicited preferences for samples A and B are presented in Table 4. This type of model was chosen to avoid the restrictive IIA assumption, which in the early stages of analysis was found to be violated.

Table 4
Comparison of estimates obtained from multinomial probit model

Parameter	Sample A		Sample B		ΔWTP (CI_A vs CI_B)[b]
	Estimates	WTP [95% CI][a]	Estimates	WTP [95% CI]	
Forest_max (0 km)					
All	1.0347***	895 [644–1146]	0.8147***	640 [425–855]	$255^{(-)}$
Male	1.0617***	844 [653–1035]	1.4189***	798 [607–990]	$46^{(-)}$
Female	0.9972***	938 [722–1154]	1.1993***	530 [389–670]	$408^{(+)}$
Forest_med (5 km)					
All	0.4975***	430 [275–585]	0.3990***	313 [172–454]	$117^{(-)}$
Male	0.4534***	360 [186–535]	0.6756***	380 [212–548]	$-20^{(-)}$
Female	0.5306***	499 [312–686]	0.6204***	274 [134–414]	$225^{(-)}$
Wetland_max (0 km)					
All	0.8839***	765 [538–992]	0.5365***	421 [237–605]	$344^{(+)}$
Male	0.8592***	683 [491–875]	0.9697***	546 [350–742]	$137^{(-)}$
Female	0.8853***	833 [615–1050]	0.7953***	351 [206–497]	$482^{(++)}$
Wetland_med (2.5 km)					
All	0.5073***	439 [258–620]	0.3354***	263 [108–418]	$176^{(-)}$
Male	0.5551***	441 [270–613]	0.5341**	301 [126–475]	$140^{(-)}$
Female	0.4444***	418 [225–611]	0.5968**	264 [123–404]	$154^{(-)}$
Heath_max (0 km)					
All	0.3606***	312 [181–443]	0.1509*	119 [9–229]	$193^{(+)}$
Male	0.4619***	367 [221–514]	0.3144*	177 [31–323]	$190^{(-)}$
Female	0.2550**	240 [76–404]	0.1794^{NS}	79 [−46–254]	$161^{(-)}$
Status quo					
All	0.0996^{NS}	86 [−10–182]	0.1649**	130 [42–218]	$-44^{(-)}$
Male	-0.0069^{NS}	−5 [−144–133]	0.2465*	138 [−10–287]	$-143^{(-)}$
Female	0.1962*	184 [18–351]	0.2772^{NS}	122 [−9–254]	$62^{(-)}$
Price					
All	−0.0012***		−0.0013***		
Male	−0.0013***		−0.0018***		
Female	−0.0011***		−0.0023***		
Std_1					
All	1.6619***		1.1082***		
Male	1.7345***		1.5391***		
Female	1.5307***		0.8483***		
N	1764, 846, 918		1710, 978, 732		
Simulations	250		250		
LL(0)	−1938.2, −929.5, −1008.6		−1879.0, 1074.5, 804.3		
LL(b)	−1650.5, −796.5, −847.7		−1581.8, −929.4, −644.2		
Pseudo-R^2	0.148, 0.143, 0.160		0.158, 0.135, 0.199		

*Indicates significance at 95% level, **at 99% level and ***at 99.9% level. NS indicates no significance.

[a] 95% confidence intervals are estimated using the Delta Method in accordance with Greene [29] and Hanemann and Kanninen [31].

[b] CI_A vs CI_B denotes a *t*-test of overlap between the two confidence intervals. (−) indicates no significant difference in WTP. (+) indicates no overlap at the 95% level, (++) at the 99% level.

Referring to the non-parametric comparison of choices in the previous section, the following parametric models are based on the full sample (hereafter referred to as the main model) as well as on gender-specific samples.

Parameter estimates denote the marginal utility associated with a change from the status quo attribute levels [1]. The parameter estimates for protecting forest (Forest_), wetland (Wetland_) and heath[10] (Heath_) are significant and positive in both samples, in the main models as well as in the gender-specific models. Dividing with the negative price parameter estimates results in positive estimates of WTP to avoid the level-specified amount of kilometres of motorway through the specific nature types. Given potentially different scale parameters in the two models, the parameter estimates cannot be directly compared across models [54,71]. But a direct comparison *can* be made with regard to the WTP estimates, as the scale parameter cancels out in this calculation [73].

5.2.1. *Differences in WTP*

The numerical differences in WTP estimates are reported in the far right column of Table 4. In the main models, WTP estimates in sample B are generally lower than in sample A. The same tendency is apparent in the gender-specific models.

[10] The medium level of protection for the heath attribute (Heath_med) is not included in the model as this parameter estimate was found not to be significantly different from zero.

However, for male respondents the differences in WTPs are smaller than is the case for female respondents. This supports the observed difference in SPB between genders in the non-parametric comparison of choices. Taken at face value these numerical differences suggest that SPB does indeed cause female respondents to express lower WTP in sample B than in sample A. To ascertain whether the differences are significant a *t*-test is carried out for each of the WTP differences, testing the null of equal WTP in the two samples.[11]

In the main model the results of the tests for identical WTPs between the two samples support the first notion of WTP estimates in sample B being lower than in sample A. More specifically, with regard to the WTP for the maximum protection of wetland and heath, the *t*-tests reject the null hypothesis. These findings indicate that WTP in sample B is indeed lower than in sample A.[12] Similar results are evident in the gender-specific model for females, though here significant differences are established for Forest_max and not Heath_max. For male respondents none of the *t*-tests reject the null.

5.2.2. Differences in preferences

An alternative way to examine the effects of the ICS is to consider effects on overall preferences. To formally test the hypothesis of identical *preferences* in the two samples, a likelihood ratio test for nested models is conducted. The test statistic is asymptotically χ^2-distributed with $K+d_\mu$ degrees of freedom, where K is the number of variables in the models and d_μ is a dummy taking value one if the ratio μ between scale parameters is found to be significantly different from one, zero otherwise [71]. Pooling the two data sets yields a test statistic of 21.73 for the main model. With 8 degrees of freedom,[13] this is significant at the 1% level. The hypothesis of identical preferences in samples A and B is therefore rejected. The test statistic for female respondents in the two samples is 31.41, which is highly significant. It is thus affirmed that female respondents in sample A have expressed preferences different from those expressed by female respondents in sample B. For male respondents, the test statistic is only 5.95 which is not significant at the 5% level. Thus, it cannot be rejected that male respondents in the two samples have stated identical preferences. In other words, the presence of SPB is established, but it can only be ascribed to female respondents.

5.2.3. Choice set number sensitivity

Rejection of hypothesis H1 makes the hypothesis H2 relevant. Rejection of identical preferences across samples A and B might be choice set sequence sensitive due to a potential learning effect as prescribed by the DPH. Due to the character of the experimental design, the information on preferences obtainable from a single choice set does not allow for a fully specified model as presented in Table 4. Hence, the test is based on subgroups of three choice sets, as this was identified as the lowest number allowing for full model specification. The likelihood ratio tests for identical preferences are carried out on gender-specific levels in Table 5.

The results suggest that the SPB observed for female respondents might be choice set number sensitive and thus subject to a learning effect. The tests reject identical preferences of female respondents in samples A and B when based on choice sets 1–3, 2–4 and 3–5, respectively. However, applying the test to choice sets 4–6 yields a test statistic with a *p*-value of .055, leading to a failure to reject the null hypothesis at the 5% level. Extrapolating this tendency implies that the SPB is reduced by the learning effect and ultimately the preferences will converge at a stable level, which is in accordance with the DPH. However, this conclusion is subject to reservations as it rests on a rather strict adherence to the chosen 5% significance level boundary. If instead the 10% level had been chosen, the null hypothesis would indeed be rejected implying a persistent SPB.

When looking at male respondents, the probabilities of identical preferences increase as more choice sets are evaluated, even though the hypothesis of equal preferences cannot be rejected in any of the four cases. This implies that the preferences converge to a more stable level which suggests that even though men are not subject to SPB when given an ICS, they still go through a learning process.

The suggested choice set number sensitivity for females is supported by the test results in the far right column of Table 5. For female respondents, two attributes have non-overlapping confidence intervals in the first three cases. However, moving to choice sets 4–6 this number decreases to zero which could be interpreted as further evidence of a learning effect. For male respondents, the number of attributes for which the WTP 95% confidence intervals do not overlap is zero in all cases.

6. Discussion

6.1. The gender-specific discrepancy

To assess the convergent validity of the results, the identified gender-specific SPB could be compared to CVM studies focusing on SPB. To the authors' knowledge, gender specificity has not previously been tested in studies dealing with SPB

[11] As the two samples are independent a standard *t*-test is applied. However, the complete combinatorial approach would give the exact measure of difference between two independent samples [66]. Accordingly, the *t*-tests presented might underestimate the level of significance of difference in WTP. Thus, the hypothesis of equal WTP could potentially be rejected at better than a 5% significance level.

[12] Even though differences in WTPs are established across samples, the internal preference ordering is similar in the two samples. This suggests that the ICS only influences the overall level of WTPs, whereas the relative preferences remain unaffected.

[13] Based on a grid search procedure, the ratio between scale parameters, μ, in samples A and B is estimated to be insignificant in all three models. Accordingly, the number of degrees of freedom in the test is 8.

Table 5
Gender specific LR test for equality of model parameters based on subsets of choice sets

	Choice sets	$LL_{Sample\ A}+LL_{Sample\ B}$	$LL_{pooled\ model}$	LR-test, DF = 8	*p*-Value	CI_A vs CI_B[a]
Male	1, 2, 3	−287.96–324.67 = −612.63	$-618.05\ (\mu = 1.18^{NS})$	10.84	0.2109	0
	2, 3, 4	−283.54–313.22 = −596.75	$-599.42\ (\mu = 1.27^{NS})$	5.34	0.7207	0
	3, 4, 5	−273.86–323.63 = −597.49	$-598.57\ (\mu = 0.92^{NS})$	2.16	0.9757	0
	4, 5, 6	−356.07–427.56 = −783.64	$-784.55\ (\mu = 1.01^{NS})$	1.82	0.9860	0
Female	1, 2, 3	−441.33–340.15 = −781.48	$-790.76\ (\mu = 1.15^{NS})$	18.56	0.0174	2
	2, 3, 4	−433.11–336.31 = −769.42	$-783.53\ (\mu = 1.05^{NS})$	28.22	0.0004	2
	3, 4, 5	−427.19–327.59 = −754.78	$-766.26\ (\mu = 1.13^{NS})$	22.96	0.0034	2
	4, 5, 6	−399.06–295.73 = −694.79	$-702.41\ (\mu = 1.04^{NS})$	15.24	0.0546	0

[a] CI_A vs CI_B denote the number of attributes, for which the WTP 95% confidence intervals do not overlap significantly between samples A and B.

in CVM. This might reflect a lack of gender-specific SPB in existing studies, or it might reflect an oversight in the extant literature. Given the close resemblance between CE and CVM, it seems reasonable to suspect that the identified gender difference would be similarly present in CVM surveys. This opens for a range of additional gender analysis which would be interesting to perform on existing CVM data sets and which are certainly relevant to include in future CVM studies.

The ICS used in the questionnaire can be characterized as information to respondents about the following valuation exercise. In the field of environmental economics, there is a vast literature dealing with the effect of different types of information on stated WTP. The effect of information concerning budget/substitution reminders [13,43,53,62,76], quality of the environmental resource [16,37,72], and cheap talk [22,27,44,46,48] are amongst the subjects that have been examined. Only Ladenburg et al. [44] asks whether male and female respondents are influenced differently by the information.

Consequently, an explanation of the observed gender-specific SPB has to be sought elsewhere.

The difference in SPB could be explained by gender-specific differences in utility from moral cost. For example, authors of [7,28,40,50,77] find that women are generally more environmentally and socially concerned than men. Referring to Eq. (1), we would then expect that $M_{female} > M_{male}$. This does however not explain the observed gender differences with regard to the SPB. Perhaps women are more sensitive to social cues in determining appropriate behaviour [26]. In relation to the present case this provides a potential explanation for women being more sensitive to the ICS.

The marketing literature provides a second reason for the observed differences in the sensitivity to the prices in the ICS. Meyers-Levy [57] establishes the "selective hypothesis" to explain observed gender differences in cognitive human expressions. In this hypothesis, male respondents are categorized as *selective information processors*, whereas female respondents are *comprehensive information processors*. Males thus seem to base their judgement on a subset, schema or an overall message theme of the available information. Females, on the other hand, make an effort to assimilate all of the available information before making a judgement [60]. Research in the field also indicates that females have a lower threshold for elaborating on enclosed information compared to males. Consequently, differences in information processing can be expected if the information exceeds the threshold for females but not for males [59]. In line with this and Ref. [58], it could be argued that male respondents have not found the information in the ICS equally motivating as have the female respondents. Consequently, male respondents may not have put any particular emphasis on the price levels displayed in the ICS. On the other hand, female respondents may have read the ICS carefully and thereby become influenced by the price levels used in the ICS.

6.2. Starting point bias and the discovered preference hypothesis

Taken at face value, the identified SPB has fairly important implications for the validity and interpretation of CE studies as it does not conform to the standard economic theories of preference underpinning the CE method. Such inconsistencies between an individual's responses and the theory that is being used to organize the survey data are referred to as *anomalies* [70]. But does this ultimately imply that the observed anomalies make CE studies useless as means of measuring and monetarizing respondent preferences, as have been argued from a *constructed preference* view [69] or a *prospect theory* view [41,74]? While this is not necessarily the case [10,70], we should at least recognize the existence and importance of anomalies and preferably investigate strategies for dealing with them.[14] Examples of such strategies are the use of cheap talk scripts[15] and so-called consequential designs which have been shown to increase incentive compatibility and accordingly improve the reliability of value estimates obtained in CE [20,23,27,46,51].

[14] As one reviewer notes, anomalies exist in all stated preference and revealed preference surveys plus lab and field experiments. Even real behaviour can be anomalous [52].

[15] The success of cheap talk scripts is however somewhat ambiguous as several studies have found discouraging results in terms of no or only limited effect of the script [22,48,55]. Harrison [35] concludes that rather than merely assuming that cheap talk will ensure incentive compatibility, it should be tested in each specific context.

In this paper we find that preferences of especially women, even though subject to anomalies in terms of SPB, may converge towards the same level in the two samples. In effect, the results suggest that the SPB decays as more choice sets are evaluated. This further supports the usefulness and reliability of CE. The decay of anomalies is clearly in accordance with the DPH. Previous studies concerning the DPH interpretation of decaying anomalies have found similar results, though none of these look at potential gender differences. In a literature review, Braga and Starmer [18] find some, but not unequivocal, support for the DPH. Cherry et al. [24] and List [49] find that people generally become more rational through refining values, not by changing preferences, and that their stated values become more consistent with their true preferences as market experience increases through a process of repetition and learning. Bateman et al. [11] and Hutchinson et al. [39] find strong evidence of learning effects in a CE study as well as a CVM study, respectively.

Some form of "warm-up" choices or market-like training of respondents might circumvent initial instability of preferences and reduce irrational behaviour in the preference elicitation questions [15,20,33]. In the words of Hutchinson et al. [39, p. 12] "*an ideal elicitation format should use repetition and exposure to allow respondents the opportunity to gain experience of the valuation mechanism (institutional learning) and experience of the good under investigations (value learning) prior to the use of an incentive compatible valuation question*". Such a "learning" approach is supported by Bateman et al. [10] who further advocate the DPH interpretation over other potential conceptions of individual's preferences. However, the DPH does not hold any *a priori* expectations with regard to the observed gender differences. Our results, as well as those of Mason et al. [56], suggest that an expansion of the DPH with the gender difference aspect is in order. Further, our findings suggest that the learning approach mentioned above should allow for differentiating between men and women in the learning process, for instance by giving women more warm-up choices than men.

6.3. Use of an information choice set

In our study we used an ICS with a dual purpose. The rationale for this was, firstly, to experimentally control for the SPB by varying the prices in the ICS in the two samples and secondly to provide respondents with the opportunity to engage in institutional, as well as value learning [20,33].

It might be argued that by introducing respondents to the ICS, we effectively induce an anchor. Hence, the ICS could actually be the cause of the observed SPB. However, this argument misses the point that respondents are initially uncertain and maybe even unaware of their own preferences. According to the DPH, searching for an initial starting point is just a natural part of the process of learning about own values. Had the ICS not been included in the study, it is more than likely that respondents would have looked to the first of the choice sets for a starting point reference instead. In that case, the initial level of the SPB would be set by the price levels in the first of the actual choice sets, thus affecting choices in the subsequent choice sets. Starting with a relatively low-priced choice set would then lead to low estimates of WTP, whereas starting with prices in the upper end of the bid range would lead to higher WTP estimates. While Carlsson and Martinsson [21] find no significant impact of the starting point choice set on the estimated marginal WTP, they use 12–13 choice sets per respondent. If a SPB does occur in the first two, three or maybe four choice sets in the overall analysis it may be outweighed by the remaining larger number of choice sets where stated preferences have become stable and rational as prescribed by the DPH. A further explanation of the differences between our findings and those in [21] might be that they focus on a market good. It seems viable that less learning is required and stated preferences will converge faster to the true preferences when evaluating market goods as compared to non-market goods, *ceteris paribus*.

The ICS employed in the present study is likely to have made the decision environment more familiar and increased respondents' awareness of own preferences in order to remove SPB from the data set. Even so, the resulting anomaly decay in the data generating process for female respondents rests on a very strict interpretation of confidence limits. It is quite possible that female respondents still experience uncertainty in the following choice sets despite being presented with the initial ICS. Thus, the choice will still reflect deviations between the stated and the true preferences. Relaxing the confidence limits, one might argue that SPB has persisted throughout female's choices. Elaborating on this, one might find results speaking in favour of other conceptions of individual's preferences than the DPH, such as for instance coherent arbitrariness or prospect theory views [8,41,69,74]. This is clearly an area warranting further research.

It might follow that instead of just one, a series of two or maybe even three ICSs or practicing choice sets ought to have been introduced prior to the actual choice sets in order to further facilitate the learning process and make behaviour converge more towards the true preferences. A discussion of the appropriate number of ICSs to use is similar to the issue of how many choice sets should be evaluated before the respondent gains sufficient experience for stated preferences to converge to true preferences [10,11,20,33]. However, no general guidelines have been put forward as to exactly how many choice sets are needed. This is worthy of further consideration and investigation in future research.

Alternatively, SPB caused by the ICS might simply be mitigated by reminding respondents that the prices displayed in the ICS should in no way be interpreted as the expected level of WTP. This also calls for further research.

7. Conclusion

We find that preferences elicited in a Choice Experiment are subject to Starting Point Bias (SPB). More specifically, female respondents' preferences are affected by this bias, whereas male respondents' are not. Thus, employing different

sets of price levels in an Instruction Choice Set (ICS) presented prior to the actual choice sets resulted in significantly different distributions of choices as well as significantly different preferences and estimates of WTP in two otherwise identical choice set designs. Overall, this implies that female respondents, when shown a low-priced ICS, tend to express lower WTP than when shown a high-priced ICS. Further, results indicate that the impact of the SPB decays, as the number of choice sets evaluated by the respondent increases. Interpreting these results in the framework of the Discovered Preference Hypothesis this suggests that the ICS provides respondents with institutional as well as value learning. Assuming that the SPB is inherently caused by lack of experience, it might be expected that if respondents were given sufficient experience then the observed anomaly would diminish. Thus, inclusion of one or more ICSs prior to the actual choice sets may offer a promising way of reducing the impact of SPB in the actual preference eliciting choice sets, and hence the results.

Our findings suggest that SPB might be a general problem in Choice Experiments, in particular with regard to female respondents. In future applications of the method, analysts should be aware of this potential bias and take precautions in order to keep *homo oeconomicus*, or maybe rather *femina oeconomica*, intact. These precautions might include gender-specific use of one or more ICSs. Given the limited number of studies concerning SPB and gender differences in Choice Experiments and CVM, there is still a range of issues left for further research. Hopefully, our contribution has shed some light on parts of these as well as highlighted those worthy of further investigations in future research.

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References

[1] W. Adamowicz, J. Louviere, M. Williams, Combining revealed and stated preference methods for valuing environmental amenities, J. Environ. Econom. Manage. 26 (3) (1994) 271–292.
[2] G.A. Akerlof, W.T. Dickens, The economic consequences of cognitive dissonance, Amer. Econ. Rev. 72 (3) (1982) 307–319.
[3] G.A. Akerlof, R. Kranton, Economics and identity, Quart. J. Econ. 115 (3) (2000) 715–753.
[4] A. Alberini, M. Veronesi, J. C. Cooper, Detecting starting point bias in dichotomous-choice contingent valuation surveys, FEEM Working Paper no. 119.05, September 2005.
[5] F. Alpizar, F. Carlsson, O. Johansson-Stenman, Anonymity, reciprocity, and conformity: evidence from voluntary contributions to a national park in Costa Rica, Working Papers in Economics no. 245, Göteborg University, Sweden, February 2007.
[6] J. Andreoni, Giving with impure altruism: applications to charity and Ricardian equivalence, J. Pol. Econ. 97 (6) (1989) 1447–1458.
[7] J. Andreoni, L. Vesterlund, Which is the fair sex? Gender differences in altruism, Quart. J. Econ. 116 (1) (2001) 293–312.
[8] D. Ariely, G. Loewenstein, D. Prelec, Coherent arbitrariness: stable demand curves without stable preferences, Quart. J. Econ. 118 (1) (2003) 73–105.
[9] E. Aronson, The return of the repressed: dissonance theory makes a comeback, Psychol. Inquiry 3 (4) (1992) 303–311.
[10] I. Bateman, D. Burgess, W.G. Hutchinson, D.I. Matthews, Preference learning versus coherent arbitrariness: NOAA guidelines or a learning design contingent valuation (LDCV), CSERGE Working Paper no. 18, 2006.
[11] I. Bateman, B. Day, D. Dupont, S. Georgiou, J. Louviere, S. Morimoto, P. Wang, Preference formation in choice experiments (CE): task awareness and learning in the cognitive process, in: Thirteenth Annual Conference of the European Association of Environmental and Resource Economists (EAERE), June 2004.
[12] G.S. Becker, A theory of social interactions, J. Pol. Econ. 82 (6) (1974) 1063–1093.
[13] J.C. Bergstrom, J.R. Stoll, A. Randall, Information effects in contingent markets, Amer. J. Agr. Econ. 71 (1989) 685–691.
[14] K. Binmore, Why experiment in economics?, Econ. J. 109 (1999) F16–F24.
[15] D. Bjornstad, C. Ronald, O. Laura, A learning design for reducing hypothetical bias in the contingent valuation method, Environ. Resource Econ. 10 (3) (1997) 207–221.
[16] G.C. Blomquist, J.C. Whitehead, Resource quality information and validity of willingness to pay in contingent valuation, Resource Energy Econ. 20 (1998) 179–196.
[17] K.J. Boyle, R.C. Bishop, M. Welsh, Starting point bias in contingent valuation surveys, Land Econ. 61 (1985) 188–194.
[18] J. Braga, C. Starmer, Preference anomalies, preference elicitation and the discovered preference hypothesis, Environ. Resource Econ. 32 (1) (2005) 55–89.
[19] T.A. Cameron, J. Quiggin, Estimation using contingent valuation data from a "dichotomous choice with follow-up" questionnaire, J. Environ. Econ. Manage. 27 (1994) 218–234.
[20] F. Carlsson, P. Martinsson, Do hypothetical and actual marginal willingness to pay differ in choice experiments, J. Environ. Econ. Manage. 41 (2001) 179–192.
[21] F. Carlsson, P. Martinsson, How much is too much?—An investigation of the effect of the number of choice sets, starting point and the choice bid vectors in choice experiments, Environ. Resource Econ. 40 (2) (2007) 165–176.
[22] F. Carlsson, P. Martinsson, Do experience and cheap talk influence willingness to pay in an open-ended contingent valuation survey, Working Papers in Economics no. 190, Göteborg University, Sweden, January 2006.
[23] R.T. Carson, T. Groves, M.J. Machina, Incentive and informational properties of preference questions, in: The Kobe Conference on Theory and Application of Environmental Valuation, Kobe, 2000.
[24] T.L. Cherry, T.D. Crocker, J.F. Shogren, Rationality spillovers, J. Environ. Econ. Manage. 45 (1) (2003) 63–84.
[25] Y.L. Chien, C.J. Huang, D. Shaw, A general model of starting point bias in double-bounded dichotomous contingent valuation surveys, J. Environ. Econ. Manage. 50 (2) (2005) 362–377.
[26] R. Croson, U. Gneezy, Gender differences in preferences, Working paper: Wharton School, University of Pennsylvania, 2004.
[27] R.G. Cummings, L.O. Taylor, Unbiased value estimates for environmental goods: a cheap talk design for the contingent valuation method, Amer. Econ. Rev. 89 (1999) 649–665.

[28] C.C. Eckel, P.J. Grossman, Differences in the economic decisions of men and women: experimental evidence, in: C. Plott, V. Smith (Eds.), Handbook of Results in Experimental Economics, Elsevier, New York, forthcoming.
[29] W.H. Greene, Econometric Analysis, Prentice-Hall International Inc., New York, 2003.
[30] M.W. Hanemann, Welfare evaluations in contingent valuation experiments with discrete responses, Amer. J. Agr. Econ. 66 (3) (1984) 332–341.
[31] M.W. Hanemann, B. Kanninen, The statistical analysis of discrete-response CV data, in: I.J. Bateman, K.G. Willis (Eds.), Valuing Environmental Preferences—Theory and Practice of the Contingent Valuation Method in the US, EU, and Developing Countries, Oxford University Press, Oxford, 1999.
[32] N. Hanley, W. Adamowicz, R.E. Wright, Price vector effects in choice experiments: an empirical test, Resource Energy Econ. 27 (3) (2005) 227–234.
[33] N. Hanley, J.F. Shogren, Is cost benefit analysis anomaly-proof?, Environ. Resource Econ. 32 (1) (2005) 13–24.
[34] C.C. Harris, B.L. Driver, W.J. McLaughlin, Improving the contingent valuation method: a psychological perspective, J. Environ. Econ. Manage. 17 (3) (1989) 213–229.
[35] G.W. Harrison, Making choice studies incentive compatible, in: B. Kanninen (Ed.), Valuing Environmental Amenities Using Stated Choice Studies: A Common Sense Guide to Theory and Practice, Kluwer, Boston, 2006.
[36] J.A. Herriges, J.F. Shogren, Starting point bias in dichotomous choice valuation with follow-up questioning, J. Environ. Econ. Manage. 30 (1) (1996) 112–131.
[37] J.P. Hoehn, A. Randall, The effect of resource quality information on resource injury perceptions and contingent values, Resource Energy Econ. 24 (2002) 13–31.
[38] J. Huber, K. Zwerina, The importance of utility balance in efficient choice designs, J. Marketing Res. 33 (1996) 307–317.
[39] W.G. Hutchinson, I. Bateman, D. Burgess, D.I. Matthews, Learning effects in repeated dichotomous choice contingent valuation questions, The Royal Economic Society Annual Conference, Paper no. 59, April 2004.
[40] O. Johansson-Stenman, P. Martinsson, Honestly, why are you driving a BMW?, J. Econ. Behav. Org. 60 (2) (2006) 129–146.
[41] D. Kahneman, A. Tversky, Prospect theory: an analysis of decision under risk, Econometrica 47 (2) (1979) 263–291.
[42] D. Kahneman, P. Slovic, A. Tversky, Judgement under Uncertainty: Heuristics and Biases, Cambridge University Press, New York, 1982.
[43] M.J. Kotchen, S.D. Reiling, Do reminders of substitutes and budget constraints influence contingent valuation estimates? Another comment, Land Econ. 75 (1999) 478–482.
[44] J. Ladenburg, S.B. Olsen, R.C.F. Nielsen, Reducing hypothetical bias in Choice Experiments—Testing an Opt-Out reminder, in: European Association of Environmental and Resource Economists 15th Annual Conference, Thessaloniki, Greece, 2007.
[45] K.J. Lancaster, A new approach to consumer theory, J. Polit. Economy 74 (2) (1966) 132–157.
[46] C.E. Landry, J.A. List, Using ex ante approaches to obtain credible signals for value in contingent markets: evidence from the field, Amer. J. Agr. Econ. 89 (2) (2007) 420–429.
[47] S.D. Levitt, J. A List, What do laboratory experiments measuring social preferences reveal about the real world?, J. Econ. Perspect. 21 (2) (2007) 153–174.
[48] J.A. List, Do explicit warnings eliminate the hypothetical bias in elicitation procedures? Evidence from field auctions for sportscards, Amer. Econ. Rev. 91 (2001) 1498–1507.
[49] J.A. List, Does market experience eliminate market anomalies?, Quart. J. Econ. 118 (1) (2003) 41–71.
[50] J.A. List, Young, selfish and male: field evidence of social preferences, Econ. J. 114 (492) (2004) 121–149.
[51] J.A. List, P. Sinha, M.H. Taylor, Using choice experiments to value non-market goods and services: evidence from field experiments, Adv. Econ. Anal. Pol. 6 (2) (2006) 1–37.
[52] J.A. List, R.P. Berrens, A.K. Bohara, J. Kerkvliet, Examining the role of social isolation on stated preferences, Amer. Econ. Rev. 94 (3) (2004) 741–752.
[53] J.B. Loomis, A. Gonzalez-Caban, R. Gregory, Do reminders of substitutes and budget constraints influence contingent valuation estimates?, Land Econ. 70 (1994) 499–506.
[54] J. Louviere, D.A. Hensher, J. Swait, Stated Choice Methods. Analysis and Applications, Cambridge University Press, Cambridge, UK, 2000.
[55] J.L. Lusk, Willingness-to-pay for Golden Rice, Amer. J. Agr. Econ. 85 (4) (2003) 840–856.
[56] C.F. Mason, O.R. Phillips, D.B. Redington, The role of gender in a non-cooperative game, J. Econ. Behav. Org. 15 (2) (1991) 215–235.
[57] J. Meyers-Levy, Gender differences in information processing: a selective interpretation, in: P. Cafferata, A.M. Tybout (Eds.), Cognitive and Affective Responses to Advertising, Lexington, MA, 1989.
[58] J. Meyers-Levy, D. Maheswaran, Exploring differences in males' and females' processing strategies, J. Cons. Res. 18 (1991) 63–70.
[59] J. Meyers-Levy, B. Sternthal, Gender differences in the use of message cues and judgements, J. Marketing Res. 28 (1991) 84–96.
[60] J. Meyers-Levy, A.M. Tybout, Schema congruity as a basis for product evaluation, J. Cons. Res. 16 (1989) 39–54.
[61] R.C. Mitchell, R.T. Carson, Using Surveys to Value Public Goods: The Contingent Valuation Method, RFF, Washington, DC, USA, 1989.
[62] H.R. Neill, The context for substitutes in CVM studies: some empirical observations, J. Environ. Econ. Manage. 29 (1995) 393–397.
[63] K. Nyborg, Homo economicus and Homo Politicus: interpretation and aggregation of environmental values, J. Econ. Behav. Org. 42 (2000) 305–322.
[64] T. Ohler, A. Le, J. Louviere, J. Swait, Attribute range effects in binary response task, Marketing Lett. 11 (3) (2000) 249–260.
[65] C.R. Plott, Rational individual behaviour in markets and social choice processes: the discovered preference hypothesis, in: K. Arrow, E. Colombatto, M. Perlman, C. Schmidt (Eds.), Rational Foundations of Economic Behaviour, Macmillan Press Ltd., London, 1996.
[66] G.L. Poe, K.L. Giraud, J.B. Loomis, Computational methods for measuring the difference of empirical distributions, Amer. J. Agr. Econ. 87 (2) (2005) 353–365.
[67] M. Rabin, Cognitive dissonance and social change, J. Econ. Behav. Org. 23 (2) (1994) 177–194.
[68] M. Ryan, S. Wordsworth, Sensitivity of willingness to pay estimates to level of attributes in discrete choice experiments, Scot. J. Polit. Economy 47 (5) (2000) 504–524.
[69] P. Slovic, The construction of preferences, Amer. Psych. 50 (1995) 364–371.
[70] R. Sugden, Anomalies and stated preference techniques: a framework for a discussion of coping strategies, Environ. Res. Econ. 32 (1) (2005) 1–12.
[71] J. Swait, J. Louviere, The role of the scale parameter in the estimation and comparison of multinomial logit models, J. Marketing Res. 30 (3) (1993) 305–314.
[72] J. Tkac, The effect of information on willingness-to-pay values of endangered species, Amer. J. Agr. Econ. 80 (1998) 1214–1220.
[73] K. Train, Discrete Choice Methods with Simulation, Cambridge University Press, Cambridge, 2003.
[74] A. Tversky, D. Kahneman, Rational choice and the framing of decisions, J. Bus. 59 (4, pt. 2) (1986) S251–S278.
[75] J. Whitehead, Incentive incompatibility and starting point bias in iterative valuation questions, Land Econ. 78 (2) (2002) 285–297.
[76] J. Whitehead, G.C. Blomquist, Do reminders of substitutes and budget constraints influence contingent valuation estimates? Comment, Land Econ. 71 (1995) 541–543.
[77] L.C. Zelezny, P. Chua, C. Aldrich, Elaborating on gender differences in environmentalism, J. Soc. Issues 56 (3) (2000) 443–457.