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Gender anomalies in Stated Preference surveys – Are biases really gender dependent?

By Jacob Ladenburg[1] and Søren Bøye Olsen[2]

Abstract

The potential for a number of common but severe biases in stated preference method surveys being gender dependent has been largely overlooked in the literature. In this paper we summarize results from three Choice Experiment studies that find evidence in favor of gender differences in vulnerability to biases. Specifically, the results indicate that women are more susceptible to starting point bias than men, while men are more susceptible to hypothetical bias than women. This seems to be interrelated with women inherently being more uncertain than men when choosing from a choice set. Furthermore, we set up a novel theoretical model, which provides an explanation for gender specific susceptibility to biases. We conclude that biases can indeed be gender dependent. Hence, researchers should not simply disregard potential gender differences, but rather take them into account and examine the extent of them when performing surveys. Finally, we give suggestions for future research in this area.

Keywords

Choice Experiment, Gender, Hypothetical bias, Preference Uncertainty, Starting point bias

JEL Codes

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1 Introduction

When conducting a welfare economic evaluation of a new policy that affects some good, monetary figures are essential for assessing the overall policy impact on welfare. This is referred to as Cost Benefit Analysis. The economic figures on the cost side are generally found to be rather straightforward to assess. However, when considering non-market goods, as is often the case for public programs in the environmental area, it is typically not possible to derive complementary market good and environmental good relations. Accordingly, relying on people's actual behavior in a market (Revealed Preferences) would not be sufficient for inferring the economic value of the benefits of the policy. One solution to this is the Stated Preference Methods (SPM), such as the Contingent Valuation Method (CVM) and Choice Experiments (CE). Here people are asked to make choices in a well defined hypothetical market targeting the good in question, thus stating their preferences in terms of hypothetical Willingness–To–Pay (WTP) for the benefits. However, the use of these methods is not unproblematic as they are prone to a range of biases, such as for instance starting point bias and hypothetical bias. As these biases have been found to severely invalidate results from SPM surveys, methods for dealing with them have received a fair amount of attention in the literature, especially in the CVM literature (e.g. Harrison 2006, Boyle et al. 1985, Mitchell and Carson 1989, Bateman et al. 1995).

However, when conducting a review of the literature dealing with biases in SPM it seems evident that a potentially important aspect has been largely disregarded. To our knowledge, surprisingly few papers have dealt with the obvious potential for biases being gender dependent[3].

[3]Several studies look at gender differences with regard to WTP estimates. However, findings are ambiguous. Some studies find men's WTP estimates to be higher than women's (Cameron and Englin 1997, Dupont 2004, Brown and Taylor 2000), others find women's WTP estimates to be the highest (Berrens et al. 1997, Swallow et al. 1994), and others again find no marked differences in WTP estimates for men and women (Riera and Mogas 2004, Farreras et al. 2005). The above findings are likely to be related to the fact that the different surveys consider different types of goods. Johansson-Stenman and Martinsson (2006), Eckel and Grossman (forthcoming), Zelezny et al. (2000), Andreoni and Vesterlund (2001) and List (2004) all find that women are generally more environmentally concerned than men. On this basis it might be expected *a priori* that women would tend to have higher WTP than men in surveys concerning policies involving environmental benefits. However, these results do not shed light on potential gender specific susceptibility to biases in the surveys which, if present, would offer another explanation the differences in WTP.

It is a well-known fact that men and women are indeed different in many aspects. Research psychologists have a long tradition for examining differences between males and females, especially focusing on cognitive abilities and social behavior (see e.g. Eagly 1995). Turning to marketing research, the topic of gender differences has also received much attention. Meyers-Levy (1989) establishes the "selective hypothesis" to explain observed gender differences in cognitive human expressions. In this hypothesis, male respondents are categorised as *selective information processors*, whereas female respondents are *comprehensive information processors*. The selective hypothesis is in line with the work of Gilligan (1982) who finds that women generally think about and act on moral dilemmas in a more inclusive manner when compared to men. Building on this, Cadsby and Maynes (1998) argue that females are more likely to respond to context than men. Brown and Taylor (2000) further elaborate by arguing that women would then be more likely to respond to the *market* context used in stated preference surveys. Hence, women would be more likely to truthfully state their preferences in a hypothetical market.

SPM surveys rely strongly on preference elicitation by presenting respondents with a significant amount of new information, which displays the features of the environmental good in questions and sets up the "rules" of the constructed hypothetical market. Depending on the type of survey instrument this is done either in writing (mail or internet survey) or spoken word (telephone or personal interview). Furthermore, most of the proposed methods for dealing with the mentioned biases work by adding different types of specific reminders and information to the scenario description. As such, an inevitable premise of the SPM elicitation process is the conveyance of new information to respondents (enclosed information), which they must weigh against their prior information and subsequently express a perceived value of the good in question.

Nevertheless, despite the obvious non-trivial level of information conveyed in SPM surveys, when modeling and interpreting the elicited preferences it is common to implicitly assume that respondents have actually read and taken into consideration all the information given to them in the scenario description. However, this assumption might be unrealistic, and if so, the selective hypothesis would lead us to suspect that the impact of biases might differ between men and women.

For example, the numerous studies concerning the reduction of hypothetical bias by budget reminders, substitute reminders and cheap talk have found ambiguous results (see Harrison (2006) for an excellent review). However, most of these studies have focused on

the sample overall. Again, turning to the selective hypothesis, the ambiguity of the results when looking at sample averages could in fact be caused by more distinct effects pulling in opposite directions when breaking the samples down by gender.

Dupont (2004) emphasizes that future environmental valuation work should pay more attention to the respondent's gender, as neglected gender differences in WTP might ultimately affect the bottom line of cost-benefit analyses in environmental policy appraisal. But what can actually be concluded if a specific survey finds women's WTP to be higher than men's? Are women really willing to pay more than men, or is it rather the case that they are simply more or less biased than men? To our knowledge, only a couple of papers dealing with potential gender differences in relation to well-known biases in SPM have been published.

In a survey of the relationship between scale bias in CVM and respondents' cognitive abilities, Andersson and Svensson (2007) find some evidence of gender differences in relation to scale bias. They find that respondents with a higher cognitive capability are generally less flawed by the scale bias. In the first part of their regression analysis considering a "weak" scale sensitivity validity test (testing whether WTP is strictly increasing and concave with increasing mortality risk reductions), they find no significant gender differences. However, when considering a so-called "strong" scale sensitivity validity test (testing whether WTP is near-proportional to the size of a mortality risk reduction), they do find a significant gender difference. Male respondents have a significantly larger propensity of stating a near-proportional WTP than female respondents – a result implying that men are less susceptible to scale bias than women. As the subject of gender differences is not the main focus of Andersson and Svensson's paper, it is unfortunately not treated further.

Brown and Taylor (2000) focus directly on gender as a possible explanation of hypothetical bias in CVM. In a survey involving contributions to a nature conservancy agency, Brown and Taylor subject one group of respondents to a hypothetical treatment where no actual payments are expected, and another group of respondents to a real treatment, where actual payment is expected if a respondent states a positive WTP. Results indicate that both men and women suffer from hypothetical bias, but interestingly, men are significantly more biased than women. In particular, the results show that the hypothetical bias is almost three times larger for male respondents than for female respondents. Brown and Taylor conclude that this result supports their hypothesis

of women responding better than men to the market context put forward in the hypothetical valuation scenario. In a concluding remark Brown and Taylor note that a single survey is of course not enough evidence to establish unequivocal conclusions. However, Brown and Taylor's results are supported by Mitani and Flores (2007) who, in a similar survey, also find that men are more susceptible to hypothetical bias. They further conclude that women are more likely to state their true value in a hypothetical market than men are. Obviously, these results are in line with Meyers-Levy's (1989) selective hypothesis.

In the current paper we set out to continue this line of research as requested by Brown and Taylor (2000). The case of potential gender specific sensitivity towards different biases is clearly an area warranting more research. We bring a novel contribution to the literature by exploring into this area. Specifically, based on previous findings in the research psychology literature, we hypothesize that biases found in economic valuation studies differ between men and women. We present a novel theoretical utility framework which allows and accounts for such gender differences. Furthermore, we take a closer look at three different empirical choice experiment studies in which we relate gender differences to starting point bias, hypothetical bias and certainty in choice[4]. In all three studies we find significant gender differences. Women are apparently more susceptible to starting point bias and hypothetical bias than men. We argue that these findings are closely related to the third finding, namely that women are generally less certain in their choices than men.

The paper is organized as follows. In section 2 we set up a theoretical framework to obtain an *a priori* theoretical basis for explaining potential gender differences. In section 3 we continue with a review of each of the three different studies. Finally, section 4 offers a discussion of the results from the three studies and some concluding remarks.

2 Theoretical framework

Elaborating on the work by Ladenburg and Olsen (2008), a suitable frame for modelling gender specific biases is an extended version of the theoretical model setup first presented

[4] Though, strictly speaking certainty in choice is not a bias, the concept is closely related to hypothetical bias (Blumenschein et al. 2008) as well as starting point bias (Flachaire and Hollard 2007).

by Levitt and List (2007). In the model by Levitt and List, the choice of action influences the individual's utility (U_i) through two separable components; a wealth component W_i and a moral component M_i. Within this model, gender specific biases can be accredited to gender specific levels of susceptibility to the different elements defining the moral utility. Preference elicitation using SPM entails a strong information processing element, which is not explicitly accounted for in the model by Levitt and List (2007). However, as mentioned in the introduction, gender specific differences in information processing have been established in the marketing literature, e.g. by Meyers-Levy (1989). Consequently, the model is extended by taking into account that the perceived utility of the environmental change (U_i) is a weighted function of both the initial knowledge/background information on the environmental change (prior information) and the information presented to the individual in the scenario description (enclosed information), see Blomquist and Whitehead (1998)[5].

Assume that a utility maximising individual *i* is faced with a choice *a* related to a single action, $a \in (0,1)$. More specifically, in the present setup respondents choose from a choice set one alternative among several alternatives each representing different levels of environmental changes. As mentioned, the choice of action influences the individual's utility through two separable components; a wealth component W_i and moral component M_i.

$$\mathrm{U_i(a, v(q(\theta, I), c), n, s) = M_i(a, v(q(\theta, I), c), n, s) + W_i(a, v(q(\theta, I), c))} \quad (1)$$

Here *v* represents the perceived utility associated with the specific level of the environmental change. This is based on the cost *c* of the alternative related to action *a*, and a perceived quality element *q*, which is a function of the prior information θ and the enclosed information *I*. The term *n* is the cost of social norms[6], and *s* is the impact on moral behaviour from feeling scrutinized by participating in a survey. The wealth component W_i depends on the perceived utility *v* of choosing action *a*. Specifically, $\partial W / \partial q > 0$ and $\partial W / \partial c < 0$ meaning that *W* increases as the perceived value of the environmental change increases and costs decrease.

[5] This model was used in Ladenburg (2007) to describe differences in perceptions and preferences for visual impacts from offshore wind farms.
[6] Here the term "cost of social norms" covers other similar expressions from the literature such as "social costs", "moral costs" or "prescription costs".

The utility originating from the moral component M_i entails four elements; *a*, *v*, *n* and *s*. In Levitt and List (2007) the *v* element represents the financial externality an action can impose on other individuals. In other terms, individual *i*'s perceived gain, *v*, from action *a* might impose a loss for other people, thus increasing the moral cost utility component. Applied in an environmental evaluation setting, choosing a high cost environmental change 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 she chooses action *a*[7]. However, the financial externality might also be present in relation to the impact on others by choosing a cheap and/or negative change in the environmental good. More specifically, individual *i's* choice of an alternative with no protection of nature can impose a loss for others. Consequently $\partial M/\partial q > 0$ and $\partial M/\partial c < 0$[8].

The cost of social norms is denoted by *n*. In the choice of alternative environmental protection schemes (action *a*), individual *i* might feel obliged to choose a level of increased protection even though he/she finds such a policy generated alternative too expensive. Conversely, individuals might derive utility specifically by accepting high cost of protection, because they see themselves as honest and socially responsible individuals (Andreoni and Vesterlund 2001, Nyborg 2000, Akerlof and Dickens 1982). Independently of motivation for the cost of social norms (negatively motivated by not doing or positively motivated by doing), the cost of social norms positively influences M_i so that $\partial M_i / \partial n > 0$.

The final term *s* refers to the fact that moral concerns might be greater if the individual by filling in the questionnaire feels scrutinised (e.g. knowing that the results from the survey might be used in a political setting or the feeling of being watched when answering the questions). As with the cost of social norms term, the individual might thereby feel obliged to express a high level of concern for nature, so that $\partial M_i / \partial s > 0$.

[7] In Ladenburg and Olsen (2008) it is assumed that the scenario description and payment vehicle presentation do *not* motivate the respondent to establish such a link between own actions and the financial burden on others. They thus assume that $\partial M/\partial c = 0.$

[8] To make things simple, it is assumed that the respondents do not hold altruistic preferences. The *v* element should therefore not be interpreted in an altruistic utility setup, but rather in a kind of reverse "warm glow of giving" framework.

Based on *v*, *n* and *s*, gender specific biases could emerge if males and females systematically differ with respect to these elements affecting the moral utility component. For example, Johansson-Stenman and Martinsson (2006), Eckel and Grossman (forthcoming), Zelezny et al. (2000), Loureiro and Lotade (2005) and List (2001) find that women are generally more socially concerned than men. Referring to equation 1, we would then expect that $M_{female} > M_{male}$. Consequently, this could cause gender specific biases, all else being equal.

Unfortunately, none of the above papers go into a deeper elaboration on whether the observed gender differences are expressions of a fundamental difference between male and female respondents or whether there is some other mechanism at work. In this sense, an important feature of this model is the inclusion of the perceived quality element *q* in both the moral and wealth component. Following Blomquist and Whitehead (1998), the perceived quality of the environmental change can be expressed as:

$$q[\theta, I] = \beta\theta + \delta I \qquad (2)$$

The parameters β and δ are so-called "learning parameters" summing to unity. β represents the level of prior information the respondent has about the objective quality of the environmental change. By assumption $\beta > 0$ which ensures that the perceived quality q is correlated with the objective quality θ of the good. If the respondents have perfect information about the quality of the resource, then $\beta = 1$, and consequently $\delta = 0$ and $q = \theta$. Consequently, with perfect information on the resource quality, the enclosed information I does not have an influence on the choice of action and thereby stated preferences, i.e. $\partial M_i / \partial I_{|\beta=1} = 0$. More specifically, if the respondent has perfect knowledge about the objective value of the environmental change, then the enclosed information in the scenario description should not be a source of bias[9]. However, importantly this assumption also prescribes that, if the respondents do *not* have perfect information, i.e. $\beta \neq 1$ and $\delta > 0$, then the enclosed information can influence the utility of action a through both the wealth and the moral component.

Focusing on the moral utility component *M*, a gender specific susceptibility to different biases can consequently be caused by differences in the information processing, $\delta_{\text{male}} \neq$

[9] Referring to List (2001) such an assumption seems reasonable. In his paper, experienced card traders were not influenced by hypothetical bias, whereas non-experienced respondents were.

δ_{female}. More specifically, if the cognitive processing of enclosed information differs between males and females, and some of this information (unintentionally) triggers one of the three mentioned elements in the moral component or even acts by itself in the moral component[10], then this model would prescribe a gender specific bias[11]. Referring to Meyers-Levy's (1989) selective hypothesis, male respondents are categorised 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 (Meyers-Levy and Tybout 1989). This translates into men effectively basing their judgements on only a subset of the available information, whereas women generally try to comprehend all of the available information before making their judgements. This suggests that males and females process information differently. Depending on the type of information, this could trigger a gender specific moral utility component. In this sense, research in the field also indicates that difference in responses can be caused by the nature or the context of the enclosed information. Females are thus found to have a lower threshold for elaborating on enclosed information compared to males. If influencing the moral utility component, differences in information processing across gender can occur if the enclosed information exceeds the threshold for females but not for males (Meyers-Levy and Sternthal 1991). In relation to the model, such a difference in information processing could be expected to result in gender specific susceptibility to biases.

3 Surveys

3.1 Study 1: Starting point bias in Choice Experiments (Ladenburg and Olsen 2008)

A well-known bias that seriously questions the usefulness of stated preference methods is what is commonly dubbed as "starting point bias" [12]. 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

[10] In this case, the proposed model is a generalization of a more advanced model, in which both n and s are functions of q, i.e. $n(q(\theta,I))$ and $s(q(\theta,I))$.
[11] The enclosed information might unintentionally indicate social cues, which can influence the moral utility component. Croson and Gneezy (2004) suggest that women are more sensitive to social cues in determining appropriate behavior, which in the context of the model translates into $M_{male} \neq M_{female}$.
[12] In the literature, the term 'anchoring' is often used instead of starting point bias to describe the same concept. For simplicity, only the term starting point bias will be used here.

"correct" value and therefore they anchor their stated WTP in this value (Harris et al. 1989, Kahneman et al. 1982, Mitchell and Carson 1989). 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 would prescribe. Several surveys have found starting point bias to be a significant problem, especially in double bounded dichotomous choice CVM (see e.g. Alberini et al. 2005, Boyle et al. 1985, Cameron and Quiggin 1994, Chien et al. 2005, Herriges and Shogren 1996, Whitehead 2002). However, considering the close relationship between this method and CE, surprisingly few papers have considered the potential for starting point bias to be equally present in CE surveys (Ladenburg and Olsen 2008). Moreover, it seems no one has considered potential gender differences.

In a CE study concerning people's WTP for protecting Danish nature areas from encroachment by new motorway development, Ladenburg and Olsen (2008) test whether preferences and WTP estimates are susceptible to starting point bias. In a split-sample design they find that varying the price levels displayed in a so-called instructional choice set presented prior to the actual sequence of preference eliciting choice sets, significantly impacts respondents' preferences. Specifically, using a higher set of prices in the instructional choice set leads to markedly higher WTP estimates, clearly indicating the presence of a starting point bias. However, it turns out that the starting point bias is gender specific. Women are significantly affected by the differing price levels displayed in the instructional choice set whereas men apparently express stable preferences regardless of this starting point. This finding is verified by three different tests. First, Ladenburg and Olsen compare the distributions of choices in the two splits. Applying Pearson χ^2-tests for identical distributions, they find that using a lower set of prices in the instructional choice set leads to female respondents significantly shifting their choices towards lower priced alternatives. Turning to the male respondents, the χ^2-test cannot reject that the distributions of choices in the two splits are identical. In other words, the male respondents do not change behaviour when the price levels in the instructional choice set are varied. Secondly, a multinomial probit model is utilized to obtain attribute level WTP estimates for male and female respondents in the two splits. Comparing corresponding WTP estimates across splits for male respondents, t-tests for overlapping confidence intervals cannot reject equality of WTP in any of the five estimated nature type attribute parameters. Turning to the female respondents, significant differences are however established for the two highest valued attribute levels (maximum protection of forest and maximum protection of wetland) in terms of significantly lower WTP

estimates in the split using low prices in the instructional choice set. Again, this suggests that only women are subject to the starting point bias. Finally, to test the hypothesis of overall identical parameter estimates in the two splits, a likelihood ratio test for nested models is conducted. The LR-test statistic for the female respondents is 31.41, which is highly significant. It is thus affirmed that female respondents have expressed different preferences across the two splits. For male respondents, the LR-test statistic is only 5.95 which is not significant at the 95% significance level. Thus, again it cannot be rejected that male respondents in the two splits have stated identical preferences. In other words, the presence of starting point bias in the CE study is established, but it can only be ascribed to female respondents.

Interestingly, Ladenburg and Olsen find some evidence that the impact of the starting point bias is decreasing as the respondents go through the sequence of choice sets. Looking at only the last three choice sets (out of a total of six choice sets) the LR-test no longer rejects identical preferences for female respondents in the two splits. Though this result rests on a rather strict interpretation of confidence limits, it does suggest that some kind of learning effect is taking place, effectively reducing the impact of the starting point bias as female respondents evaluate more and more choice sets.

3.2 Study 2: Reducing hypothetical bias in Choice Experiments - Testing an Opt-Out Reminder (Ladenburg et al. 2007)

One of the biggest problems associated with SPM is hypothetical bias (Carlsson and Martinsson 2001, Mitchell and Carson 1989, Harrison 2006). In standard economic theory it is assumed that consumer behaviour in a market is independent of whether the market is actual or hypothetical. However, in practice, this has turned out to be an assumption which rarely holds. Preferences stated in a hypothetical market are most often found *not* to be equal to the preferences revealed on an actual market. It is generally acknowledged that hypothetical bias drives a wedge between *true* and *hypothetical* WTP (Arrow et al. 1993, Carlsson et al. 2005, Diamond and Hausman 1994, Hanemann 1994). Consequently, hypothetical WTP is most often found to be an overstatement of true WTP, see e.g. Harrison and Rutstrom (2005), List and Gallet (2001) and Murphy et al. (2005a).

Hypothetical bias has received a lot of attention in the CVM literature, and a number of different approaches to mitigating or eliminating it have been proposed. Budget reminders and reminders of substitutes in the scenario description have been tested and found to be ineffective as means of mitigating hypothetical bias (Loomis et al. 1994, Neill 1995). Even though test results in the mentioned studies cannot verify an effect of substitution or budget reminders, it has become standard practice to include them in stated preference surveys (Bateman et al. 2002). In the continued attempt to mitigate hypothetical bias, a different type of reminder known as "Cheap Talk" (CT) was tested in a CVM study by Cummings and Taylor (1999). CT directly addresses hypothetical bias by explicitly informing respondents that people in these kinds of surveys have a tendency to overestimate how much they are willing to pay compared to their actual (true) WTP. In the study by Cummings and Taylor (1999), CT effectively eliminated the hypothetical biases observed in three independent surveys. However, Aadland and Caplan (2003), List (2001) and Lusk (2003) find that CT only influences the preferences of specific sub-groups. Other studies find that CT only has an effect on those respondents who are presented with bid levels in the higher end of the bid range in dichotomous choice or referendum CVM surveys (Brown et al. 2003, Murphy et al. 2005b). Further, Samnaliev et al. (2003) and Carlsson and Martinsson (2006) do not find CT to effectively reduce WTP, and Aadland and Caplan (2006) even find that the CT increases WTP. In CE, the number of studies testing CT is much fewer. Carlsson et al. (2005) and List et al. (2006) both use relatively short CT scripts and find evidence that CT reduces hypothetical bias. However, in List et al. (2006) CT seems to decrease the internal consistency of respondents' preferences. In Carlsson et al. (2005) 7 out of 10 attributes were valued significantly lesser with a CT script provided than without one. Overall, CT seems to reduce the hypothetical bias in stated preferences studies. However, as the differing results indicate, at its present state CT is not a *hypothetical bias panacea*.

In the continued effort to mitigate hypothetical bias, Ladenburg et al. (2007) suggest improving the effectiveness of CT by adding a new entreaty, dubbed an "Opt-Out Reminder" (OOR). The OOR is a short script presented to respondents prior to the preference eliciting choice sets in a CE, simply reminding respondents to choose the opt-out alternative[13] if they find the proposed policy generated alternatives in the choice set too expensive. The motivation of the OOR is to make respondents consider the price of the alternatives representing a change from the status quo situation more carefully.

[13] In the literature the opt-out, alternative is sometimes referred to as the "status quo", "present situation" or the "do nothing" alternative.

Ladenburg et al. hypothesize that adding the OOR to CT will reduce hypothetical bias beyond the effect of CT alone. They test their hypothesis in a CE study concerning people's preferences for stream characteristics of a potentially re-established stream in an urban park area. A two-split sample approach is used. In both split samples, the scenario description included a short-scripted CT. In addition to the CT, respondents in split A were given an OOR, while those in split B were not. The questionnaire and thus the choice set designs were kept exactly identical, except for the OOR.

On the basis of responses obtained in the two split samples, Ladenburg et al. find support for their working hypothesis as they find significant differences between the two splits. Using a χ^2-test for identical choice distributions in the two samples reveals that introducing the OOR leads to a significant higher propensity of choosing the zero-priced opt-out alternative, especially when the prices of the two policy-generated alternatives in a choice set are relatively high. This tendency is confirmed in a parametric analysis applying a multinomial probit model. Though, comparing attribute level WTP estimates across the two samples exposes no significant differences, the WTP associated with the status quo alternative differs significantly between the two splits. In other words, the marginal values of the stream attributes between the two splits are identical but the propensity to choose no re-establishment of the stream (the opt-out alternative), attributes held constant, is higher in the split given the OOR treatment. Unfortunately, Ladenburg et al. (2007) do not present the comparisons of choices and of WTP estimates in the two splits broken down by gender. They do however present likelihood ratio tests testing the hypothesis of overall identical parameter estimates in the two splits for male and female respondents, respectively. Interestingly, these tests show that there is no significant differences between men in the two splits (*p*-value = 0.5108). Turning to the female respondents, the picture is the opposite. With a p-value of 0.0011, the LR-test strongly rejects that women have stated similar preferences in the two splits. Thus, only female respondents are significantly affected by the OOR, and it seems reasonable to deduce that it is actually the female respondents who are responsible for the identified differences in choices and WTP estimates at the average sample level. Consequently, these results suggest that introducing the OOR effectively reduces WTP stated by women, but not men.

3.3 Study 3: Choice Experiments and certainty in choice: A test of the influence of utility difference on self-reported certainty levels and evaluations of two recoding approaches to handle uncertain responses (Lundhede et al. 2008)

As mentioned above, survey results concerning the ability of CT to mitigate hypothetical bias are ambiguous, and even though the addition of the OOR as applied by Ladenburg et al. (2007) seems promising, a single survey is not enough to establish a strong conclusion. Consequently, another approach to mitigating hypothetical bias has evolved in the CVM literature. This approach is based on a concept that is closely related to hypothetical bias as well as starting point bias, namely respondents' self-reported certainty about their choices/WTP[14].

A key assumption in stated preference methods is that respondents know their own true preferences and are able to assess (without any error) the utility they may derive from the good presented to them. Based on this, respondents are assumed to give precise replies to the valuation question (Hanemann 1984). However, as suggested by Alberini et al. (2003), this assumption might be too strong. Responding to a hypothetical question about WTP for a non-market good is a difficult task for most people. They may be uncertain as to the exact value of the good for them, about the meaning of the scenario description, or simply unfamiliar with valuing the good. This gives rise to preference uncertainty, as described by Li and Mattson (1995).

Previous research has primarily analyzed preference uncertainty in CVM studies. Lundhede et al. (2008) present a novel contribution to the literature by treating the issue of preference uncertainty in a CE setting and by attempting to transfer approaches and knowledge gained from CVM to CE. Focusing particularly on testing the hypothesis of Wang (1997) - hypothesizing that respondents' level of certainty-in-choice is driven by utility differences between alternatives in a choice set - Lundhede et al. use datasets originating from two independent Choice Experiment surveys: one that examines the recreational merits associated with reducing the impact of new motorways on different types of nature[15], and one that examines preferences for new national parks in Denmark. In both surveys, respondents report their level of certainty-in-choice following each

[14] Blumenschein et al. (2008) find that certainty statements can effectively be used to remove hypothetical bias in CVM. Harrison (2006) further elaborates on the linkage between the elements underlying respondent uncertainty and hypothetical bias. Furthermore, Flachaire and Hollard (2007) and Rollins and Rodriguez-Barahona (2007) find starting point bias to be dependent on respondent certainty.

[15] Though originating from the same survey, the dataset used in Lundhede et al. (2008) is not identical to the one used in Study 1: Ladenburg and Olsen (2008), due to different split samples being used.

choice set evaluated. Using random parameter logit models, Lundhede et al. model respondent preferences in order to assign estimates for the aggregate utility of each alternative, consequently obtaining a constructed measure of the utility difference across alternatives in each choice set. Next, these measures of utility difference are included, among other variables, as explanatory variables in probit models aiming to expose significant determinants for respondents' self-reported level of certainty. In both datasets, the results of the analyses are in support of Wang's hypothesis. Hence, a higher level of within-choice-set utility difference significantly increases the level of certainty in choice. Interestingly, in relation to the present paper, it turns out that another highly significant determinant of the self-reported certainty-in-choice is gender. With t-test values of 7.17 and 3.23 for the gender variable in the probit models for the two datasets respectively, Lundhede et al. find a strong tendency of men reporting a higher level of certainty than women when choosing their preferred alternative from a choice set[16].

4 Discussion

Biases are commonly reported as being uniform across the sampled population in SPM surveys. As such, the respondents in a sample are implicitly assumed to be equally susceptible to potential biases. In the present paper we have made an effort to open up the discussion for whether such a relatively strong assumption can be justified. More specifically, we suggest that this assumption could indeed be violated, and consequently biases might not be uniform across all respondents in the sample. In particular, we hypothesize that the impact of biases differs between female and male respondents. To explain such a potential gender difference, we present a model and a theoretical setup that allows for gender specific susceptibility to biases. Results from three independent surveys that find biases to be gender specific are presented. In the following, these results will be discussed and elaborated on in relation to the theoretical framework put forward in

[16] As an aside, one of the variables taken into account in the probit models is the choice set number. This variable is only significant in the motorway dataset in terms of increasing certainty-in-choice as respondents progress through the sequence of choice sets. This result seems obviously related to the findings of Study 1: Ladenburg and Olsen (2008) concerning decreasing impact of the starting point bias as a consequence of some learning effect. In other words, it makes good sense that the concepts of certainty-in-choice and susceptibility to starting point bias are interrelated when it comes to learning effects. However, where Ladenburg and Olsen, based on a rather strict interpretation of confidence limits, suggested that such learning effects might eradicate the gender differences with regard to biases, Lundhede et al.'s results suggest that this might not be the case. Even after accounting for a potential learning effect in the probit models, the gender difference is still highly significant.

section 2. Furthermore, the implications of the observed gender specific biases are addressed with regard to future research needed within this line of research.

An initial result from the two first surveys is that male and female respondents apparently respond differently to information in the scenario description. In the first survey, female respondent react on differences in the enclosed information, i.e. the price levels in the instructional choice set, whereas male respondents do not. In the second survey, the preferences of female respondents are influenced by an opt-out reminder, while male respondents are not. These results are jointly in support of our main hypothesis, consequently suggesting that gender specific biases are indeed present in CE. The theoretical model we propose gives some indication of the origin of, and underlying mechanisms leading to, the observed gender specific biases. Interpreting results in the realm of the model, biases arise when one or more elements in the moral utility component are triggered and subsequently influence respondent behavior, i.e. the observed choices. Accordingly, gender specific biases can emerge in the survey data whenever the elements in the moral component are triggered systematically different in male and female respondents. Such systematic differences can be attributed to differences in social norms, financial externalities perceptions, sensitivity to scrutiny, the influence of the enclosed information in the scenario description and combinations of these.

4.1 Starting point bias

Croson and Gneezy (2004) suggest that women are more sensitive to social cues in determining appropriate behaviour. Further, Croson and Gneezy (2004, p.38) state that *"Participants of both genders are likely maximizing an underlying utility function, but the function that men use is less sensitive to the conditions of the experiment,…, than the function that women use. This causes what appears to be inconsistent results in our experimental studies…primarily what we see is women's behaviour is more context-dependent that that of men"*. Even though the issue of context-dependency is difficult to spell out, it conforms nicely to both the results in Ladenburg and Olsen (2008) and the proposed model. In the same line, Carlsson et al. (2008), find in a CE survey that only women's WTP for ecologically friendly coffee increases when they are told that a large

share of consumers choose the ecologically friendly[17]. For male respondents, the results are actually to some extent the opposite. In the realm of the proposed model, the higher sensitivity of women to social cues might translate into social norms having a stronger influence on the moral utility component of females, i.e. $M(n)_{female} > M(n)_{male}$. In the same line, the gender specific context-dependent behaviour might also be interpreted in an information processing context. Accordingly, the reported differences in sensitivity to social cues could also be accredited to females reading and processing the premises of the experiment differently than males i.e. $\delta_{male} \neq \delta_{female}$. Independently, the results from Croson and Gneezy (2004) and Carlsson et al. (2008) can be interpreted as support of the proposed model and give an insight into the potential mechanism at work in the three presented studies. As such, the female respondents in Ladenburg and Olsen (2008) might have perceived the presented prices in the information choice set as cues of the true value of the environmental change, whereas male respondent have not. Mason et al. (1991) give another indication of the gender specific bias mechanism at work. They suggest that in a first-time market setting where experience is limited, men and women tend to reach qualitatively different outcomes. Conditional on these differences in outcome also being expressed through the moral utility component, the results are in line with the enclosed information processing element in the moral utility component. This suggests that gender specific biases emerging in a survey can be accredited to differences in information processing, just as found in Ladenburg and Olsen (2008) and Ladenburg et al. (2007).

Interpreting the gender specific starting point bias in relation to Lundhede et al.'s (2008) results concerning certainty in choice, it makes good sense that women, who are more susceptible to starting point bias than men, are also generally more uncertain about their choices. Rollins and Rodriguez-Barahona (2007) find that people who are uncertain about their preferences are also more likely to use the bids they are given as cues for the true value of the good in a dichotomous choice CVM survey. Furthermore, Flachaire and Hollard (2007) find that uncertain respondents tend to answer "yes" to a dichotomous choice question. In the psychology literature, men are generally found to be more self-confident than women, see e.g. Bengtsson et al. (2005) and Lundeberg et al. (1994). As Gilligan (1982, p.160) elegantly puts it, men *"radiate the confidence of certain truth"*. Hence, it is not surprising that it is the more uncertain gender which in an economic

[17] In the survey, the respondents were divided into three sub-samples. In the three sub-samples, the respondents were told that 10%, 50%, and 90% of all other consumers chose the alternative with 100% ecological beans, respectively.

valuation task searches the survey instrument for cues of the true value of the good as part of the information processing, and consequently gets biased by the starting point.

Another interesting result in Ladenburg and Olsen (2008) is that they find evidence of a learning effect effectively reducing gender differences. This is in line with Mason et al. (1991) who suggest that as experience is gained through repetition of the game, differences in choices that could be attributed to gender disappear. This is also within the framework of the proposed theoretical model in terms of β converging to 1 and δ converging to 0 as the number of choice sets evaluated goes towards infinity. However, with the above established linkage between certainty in choice and starting point bias in mind, Lundhede et al. (2008) find a significant gender difference even after accounting for the learning effect. This suggests that the learning effect might not eradicate the bias. However, a single study is not enough for unequivocal conclusions so this is clearly an area warranting further empirical research.

4.2 Hypothetical bias

Hypothetical bias is generally acknowledged as one of the most severe problems for SPM. Even though the experimental literature on hypothetical bias is vast, the bulk of this literature focuses on "instrument calibration" as a means of mitigating hypothetical bias (Harrison 2006). However, few studies have elaborated significantly on the deeper underlying behavioral mechanisms actually causing hypothetical bias. The importance of this is underlined by Champ and Bishop (2001, p. 383): *"Identification of the respondents responsible for the hypothetical bias is the first step toward developing an understanding of the causes and possible remedies"*. Interpreted on the foundation of the proposed theoretical framework, this translates into $M_i \neq M_j$ and for some elements of i or j M_i=0. Ladenburg et al.'s (2007) results provide some insight into this topic, as they find females to be influenced by the OOR script while male respondents are not. The straightforward interpretation of the established gender specific sensitivity towards the OOR is that only women are susceptible to the OOR whereas men are not. This implies that $M_{female} \neq M_{male}$. However, this interpretation presupposes that both men and women have actually read the OOR, which might not have been the case. According to Meyers-Levy and Tybout (1989) women tend to be thorough in their information processing whereas men typically are more superficial. Thus, it might be rendered premature to conclude that the reason for men not being affected by the OOR is that their stated preferences are stable (true or not).

On the contrary, following the selective hypothesis, the explanation might simply be that men have overlooked the OOR script or at least have paid very little attention to the content of the OOR, indicating that $\delta\_OOR_{male} = 0$. Unfortunately the survey setup in Ladenburg et al. (2007) does not make it possible to assess whether this is actually the case. Nevertheless, it is worth noticing that a reminder objectively and explicitly prompting the respondents to carefully consider the price of the alternatives representing a change from the status quo situation more carefully has a gender specific effect on the choice of the respondent. Overall, this suggests a gender specific utility mechanism at work with regard to hypothetical biases. These results are supported in the literature. In Brown and Taylor (2000) male respondents are found to suffer from larger level of hypothetical biases than female respondents in a CVM study. Mitani and Flores (2007) also find such a gender difference in hypothetical WTP, but not in a real payment experiment[18]. Furthermore, their results also indicate that female respondents are more likely to truthfully reveal their value in a hypothetical setup when compared to male respondents.

Relating the above to Lundhede et al.'s (2008) results concerning certainty in choice, it is interesting that men, who are more susceptible to hypothetical bias than women, are also more certain in their choices than women. Samnaliev et al. (2003) also find that men report a generally higher level of certainty[19]. This is quite a paradox considering the previously proposed approach of using certainty statements to adjust for hypothetical bias (e.g. Blumenschein et al. 2008). While different approaches to using certainty statements have been proposed in the literature, the general idea is to recode the uncertain responses in a downward direction WTP-wise. In other words, uncertain responses are given less weight than certain responses in the estimation of WTP. This is clearly at odds with our findings. On the contrary, our findings suggest that the uncertain responses are less biased by hypothetical bias than the certain responses. In the light of this, the approach of down-weighting uncertain responses to mitigate hypothetical bias seems counterintuitive. Of course, an indisputable conclusion cannot be drawn here as our results are based on rather few studies. Furthermore, it could be a problem that our results are based on CE studies, while most research on the use of certainty statements to mitigate hypothetical bias is based on CVM studies (Lundhede et al. (2008) provides a novel attempt to transfer

[18] In their paper, the difference in hypothetical WTP between male and females is established on a 90% significance level.
[19] Though only significant with a p-value of 0.06 for certainty levels 8-10, and a p-value of 0.20 for certainty level 10, on a certainty scale from 1 to 10.

approaches and experiences regarding certainty statements from the CVM to the CE context).

5 Concluding remarks

It is a well-known fact that men and women are indeed different in many aspects. Economists, as well as sociologists and research psychologists have a long tradition for examining differences in preferences and behavior between males and females. Thus, it is surprising to find that in the bulk of literature on stated preference methods there are almost no papers dealing with the obvious potential for severe biases, such as starting point bias and hypothetical bias, being gender dependent. To deal with and find solutions for the long range of well-known biases that critically invalidate results from stated preference surveys, it is imperative to try to understand the underlying mechanisms leading to such biases.

In the present paper we hypothesize that the impact of these biases differs across gender. To formally explain such a gender difference, we present a model in terms of a theoretical framework which allows for gender specific susceptibility to biases. Based on results from three independent Choice Experiment surveys we find evidence in favor of the proposed hypothesis. Specifically, the results suggest that women are more susceptible to starting point bias than men, while men are more susceptible to hypothetical bias than women. As such, these results are in line with the existing literature, finding that men and women behave differently in otherwise identical experiments due to differences in for example social norms, moral and susceptibility to social cues. Furthermore, as emphasized in the paper, the observed differences in susceptibility to biases could also be attributed to another well-known result from the existing literature, namely that men and women differ in their cognitive processing of information, such as for instance scenario descriptions and various kinds of reminders and instructions in a stated preference survey questionnaire. Furthermore, the gender specific biases reported seem to be interrelated with women inherently being more uncertain than men when choosing from a choice set.

As our results are based on a rather limited number of studies, establishing unequivocal conclusions is not appropriate. Consequently, more research needs to be done before the extent of gender specific biases can be established and we subsequently can give specific

recommendations on how to properly handle this issue in future stated preference surveys. However, one rather strong conclusion stands, namely that important biases can indeed be gender dependent. Hence, researchers should not simply disregard potential gender differences, but rather take them into account and examine the extent of them when performing their surveys.

Finally, a couple of suggestions for further research are in place here. First of all, the extensive amount of data from previously published studies concerning biases in stated preference surveys could be exploited even further. It could be rather easily tested whether biases in these studies differ across gender, as the datasets are already there and most of them contain information on the gender of the respondent. Incorporating such information into already formulated parametric models testing for biases would seem to be a rather simple thing to do. Secondly, to account for gender differences in information processing, there appears to be a potentially large gain in the validation of surveys by pre-testing and adjusting the level of information in questionnaires according to the targeted gender, e.g. one version for men and another version for women.

Though much research in this area remains to be done, our findings offer important insights into some of the basic mechanisms causing bias in stated preference surveys. These results provide an important direction for further explorations and research as we continue to improve the methods for valuing non-market goods.

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