Scope insensitivity and mental accounting

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ONLINE APPENDIX

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A Appendix: Theory

A.1 Qualitative nesting and mental accounting

Following Bateman *et al.* (2004) and Carson *et al.* (1998), we can also consider qualitative nesting, i.e., when the same respondent is offered multiple goods that differ not only in quantity but also in their attributes. This allows us to test the complementarity and substitutability of different environmental goods offered, along with advanced vs stepwise disclosure.[1]

Bateman *et al.* (2004) found that there are differences in reported WTP through stepwise vs advanced disclosure. One possible explanation for this phenomenon, as given by Carson *et al.* (1998), could be strict substitutability of the goods in consideration. Note that mental accounting is consistent with such an explanation and further exacerbates it. Consider an agent who is offered a sequence of environmental goods, all from the same mental account. Suppose the valuation of good i and good j are given by w_i and w_j respectively. Considered in isolation, but for any $i, j; i \neq j$: $w_i + w_j > w_{i+j}$. The total payoff from obtaining both the i^{th} and j^{th} good in isolation is strictly worse than obtaining them together.

Under stepwise disclosure, once the valuation for one good is already elicited, the respondent will face a stricter mental accounting constraint. This is due to a smaller residual budget and a lower additional value for the next good (by strict substitutability), which will affect the reported valuation of the second good. Thus, the first good would have the highest reported WTP, and subsequent goods will report lower WTP due to both strict substitutability and a stricter residual budget. In case of advanced disclosure, the sum of the two valuations would be lower due to substitution. But since all goods are considered, the subject will consider the same residual budget for evaluating all goods. The absence of additional mental accounting constraints for the later good would result in a higher reported

[1] In advanced disclosure, the respondent is aware of all the environmental good they will be offered in subsequent questions, whereas in stepwise disclosure, once the valuation is elicited for one good, the respondent is informed about other goods, one at a time.

valuation for them. Thus, the estimates from stepwise disclosure would be less reliable due to the existence of additional mental accounting constraints for each good.

Furthermore, the mental accounting framework can explain some behavioral phenomena observed in the qualitative nesting of the internal scope test. Let us consider the following features of the qualitative nesting problem of internal scopes. First, the WTP for the sum of the public goods is lower than the sum of WTP for each public good separately, known as the problem of embedding (Payne *et al.*, 2000; Bateman *et al.*, 2004). Second, valuation is context-dependent and depends on the position of the offered good in the sequence, known as the sequencing effect (Carson *et al.*, 1998; Payne *et al.*, 2000; Longo *et al.*, 2015). Third, the valuation of the sum of two public goods depends on sequencing, known as the anchoring effect (Payne *et al.*, 2000). Mental accounting can generate all but the last effect when applied to a multiple good elicitation problem with internal scope.

Consider a multiple public good valuation problem, where all the public goods are considered from the same mental account.[2] Subjects are asked to report their valuation of the multiple public goods sequentially, using one of the CV methods described in the paper.

First, consider the problem where subjects are asked to report their valuation for two public goods A and B separately and together as $A + B$. Since both goods belong to the same mental account, paying for one reduces the disposable income left to pay for the other good. Suppose the valuation for good A and B is w_A and w_B, and the total residual budget for all environmental goods, in the relevant mental accounting, is M_j. Consider the following set of inequalities,

$$w_A \leq M_j; \quad w_B \leq M_j; \quad \text{but } w_A + w_B > M_j.$$

Thus, the mental accounting budget constraint is more likely to bind for $A+B$, compared to A and B separately. In this case, the respondent would report a lower valuation for w_A+w_B.

[2]If different public goods evoke different accounts, then the analysis will change substantially; the discussion of this is beyond the scope of this paper.

This explains the problem of embedding. However, note that the anchoring effect cannot be explained with the mental accounting constraint, since the sequencing of $A + B$ or $B + A$ would not affect the budget constraint differently.

Second, consider a multiple good valuation problem where the public goods are offered in a sequence and all belong to the same mental account. Suppose the consumer reports a valuation of w_1 for the first public good, then for the second public good the residual budget becomes $\theta_j M - x_{-j} - w_1$, so it is more likely that the budget constraint will become binding for the consumer. Iterating the residual budget for the n^{th} good would be $\theta_j M - x_{-j} - \sum_{i=q}^{n-1} w_i$, i.e, it becomes increasingly smaller. Thus, the sequence in which the good is evaluated will have an impact on reported WTP. The earlier it is evaluated, the lower the chance of the budget constraint binding, and hence a weakly higher WTP would be reported. This explains the sequencing effect.

References

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