# **Appendix**

## A1: **Decision-Making Under Uncertainty**

Prior to the decision-making task, the respondents were given the following information (the text in the brackets was excluded from half of the questionnaires):

Imagine that you work as a bureaucrat in year 2020 and you are tasked with proposing one out of several programs for reducing the emissions of GHGs from the transport sector. The programs will reduce the average energy use per kilometer and also the emissions of CO2 by the year 2030. [The goal is to reduce emissions by 70% by the year 2030]. The benefit of reducing CO2 emissions to society are estimated to lie in the interval of 0.8 and 1.2 SEK per kilogram. The interval indicates that there is an uncertainty because the means used for reducing emissions can impact other societal goals such as biodiversity or accessibility. The other assumptions are as before. [As a bureaucrat, you should economize with public funds because they can also be used for other purposes.]

The different programs contribute to increased use of alternative fuels including electricity. Increased use of electricity in the transportation system leads to a lower level of energy use (kWh) per kilometer. Increased use of alternative fuels would reduce total CO2 emissions from 11 billion kg in the year 2020. The impact and costs of the different programs differ, however, since different technical solutions are used. The impacts and costs are influenced for instance by whether byproducts from other production are used to produce alternative fuels, or whether there is a need to invest in new infrastructure.

## A2: **Data and Assumptions Underlying the Graphical Illustrations With Empirical Survival Functions**

Since we are presenting the respondents to alternatives that involve different kinds of investments, the programs presented include both fixed and variable costs. Therefore, unlike ordinary willingness-to-pay studies, we calculate the average cost for per kg CO2 reduction over the 10 years assuming a linear decrease over the period, see calculations and results in the table. The average cost estimate can be directly compared with the benefit per kg (0.8–1.2 SEK per kg). To provide a graphical illustration of the response behaviors, we use this average cost estimate as the bid that was presented to the respondents.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   | Emissions in 2030  | Total reduction in CO2 until 2030 | Total cost | Average COST(the BID) | TOTAL BENEFIT |
| Program 1 | 9.1 billion kg | (1.9 billion/2)\*10 = 9.5 billion kg | 5 billion SEK | 0.52 SEK/kg CO2 | 7.6 – 10.64 billion SEK |
| Program 2 | 4.5 billion kg | (6.5 billion/2)\*10 = 32.5 billion kg | 20 billion SEK | 0.62 SEK/kg CO2 | 26 – 39 billion SEK |
| Program 3 | 8.4 billion kg | (2.6 billion /2)\*10 = 13 billion kg | 0.5 billion SEK | 0.03 SEK/kg CO2 | 10.4 – 15.6 billion SEK |
| Program 4 | 1.9 billion kg | (9.1 billion/2)\*10 = 45.5 billion kg | 200 billion SEK | 4.39 SEK/kg CO2 | 36.4 – 54.6 billion SEK |

From the table it is clear that Program 3 is superior to Program 1 since the reduction in CO2 is larger but comes at a much lower total and average cost. Hence, respondents choosing Program 1 have not behaved according to the expectations from economic theory and were therefore excluded from the non-parametric analysis. Program 4 achieves a somewhat larger reduction in emissions than Program 2 but at a much higher total and average cost. Which of Programs 2 and 3 that is superior depends on the assumptions used in the calculation. The following six net present value results are possible:

* If B=1.2 SEK per kg the NPV for program 2 is 19 billion SEK.
* If B=1.2 SEK per kg the NPV for program 3 is 15.1 billion SEK.
* If B=1.0 SEK per kg the NPV for program 2 is 12.5 billion SEK.
* If B=1.0 SEK per kg the NPV for program 3 is 12.5 billion SEK.
* If B=0.8 SEK per kg the NPV for program 2 is 6 billion SEK.
* If B=0.8 SEK per kg the NPV for program 3 is 9.9 billion SEK.

Hence, with a preference for larger reductions in CO2 emissions, Program 2 is preferred. Program 3 is preferred if the low benefit estimate is used, or if the decision rule is the benefit cost ratio. In the latter case if the benefit estimate used is 1 SEK per kg, the benefit cost ratio is 0.625 for Program 2 and 25 for Program 3.

## A3: **Non-Parametric Analysis – Data and Test Results**

In Table 10 we present for each participating governmental agency the number of respondents choosing each program (freq.) and the share of the total responses for each agency (percent). Zero indicates the group without *Infotext*, 1 those with. For alternative P2, the total benefit is approximately equal to total cost. It receives the highest share of responses for all agencies except for Transport Analysis group 0, for which we have very few observations.

Table 10. Summary statistics per agency for program choice frequency with and without Infotext.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Program | Agency | Freq.(0) | Percent(0) | Freq.(1) | Percent(1) |
| P2  | STAdmin | 58 | 55.77  | 52 | 61.18  |
| P3 | STAdmin | 20 | 19.23  | 16 | 18.82  |
| P4  | STAdmin | 20 | 19.23  | 13 | 15.29  |
| SQ  | STAdmin | 6 | 5.77  | 4 | 04.71  |
| Total |  | 104 | 100.00 | 85 | 100.00 |
| P2  | STAgency | 6  | 54.55  | 9  | 64.29  |
| P3 | STAgency | 1  | 09.09  | 3 | 21.43  |
| P4  | STAgency | 3  | 27.27  | 2  | 14.29  |
| SQ  | STAgency | 1  | 09.09  | 0 | 0.00  |
| Total |  | 11  | 100.00 | 14 | 100.00 |
| P2  | SEA | 32  | 68.09  | 32 | 68.09  |
| P3 | SEA | 5 | 10.64  | 5 | 10.64  |
| P4  | SEA | 8  | 17.02  | 2 | 04.26  |
| SQ  | SEA | 2 | 04.26  | 8  | 17.02  |
| Total |  | 47 | 100.00 | 47 | 100.00 |
| P2  | SEPA | 25 | 67.57  | 17 | 39.53  |
| P3 | SEPA | 0 | 00.00  | 10 | 23.26  |
| P4  | SEPA | 10 | 27.03  | 6 | 13.95  |
| SQ  | SEPA | 2 | 05.41  | 10 | 23.26  |
| Total |  | 37 | 100.00 | 43 | 100.00 |
| P2  | Trafa | 1 | 33.33  | 4  | 57.14  |
| P3 | Trafa | 2  | 66.67  | 2 | 28.57  |
| P4  | Trafa | 0 | 0.00  | 0  | 0.00  |
| SQ  | Trafa | 0 | 0.00  | 1  | 14.29  |
| Total |  | 3 | 100.00 | 7 | 100.00 |

Information in Table 10 has been used to provide input to the empirical survival functions shown in Table 11. We have assumed that the respondents choosing a higher bid, for example Program 4, would also be willing to accept Programs 2 and 3. Again, 1 indicates the groups for each agency receiving *Infotext*. The numbers in the rows for each agency and for each treatment group (0 or 1) are the shares accepting a certain bid. In the non-parametric tests, we compare the number of respondents accepting a certain bid for the two treatment groups for each agency.

**Table 11. Data used for the empirical survival functions.**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| AC (BID) | 0 | 0.03 | 0.62 | 4.39 | AC (BID) | 0 | 0.03 | 0.62 | 4.39 |
| STAdmin0 | 0.94 | 0.75 | 0.19 | 0.00 | **STADMIN1** | 0.95 | 0.76 | 0.15 | 0.00 |
| STAgency0 | 0.91 | 0.82 | 0.27 | 0.00 | **STAGENCY1** | 1.00 | 0.79 | 0.14 | 0.00 |
| SEA0 | 0.96 | 0.85 | 0.17 | 0.00 | **SEA1** | 0.83 | 0.72 | 0.04 | 0.00 |
| SEPA0 | 0.95 | 0.95 | 0.27 | 0.00 | **SEPA1** | 0.77 | 0.54 | 0.14 | 0.00 |