Stated preferences with and without external value cues

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1. Introduction

Stated preference techniques such as the contingent valuation method and choice experiments are increasingly used to estimate the benefits of environmental changes and related public policies. However, there remains much scepticism about the validity of these survey-based valuation methods, especially when public goods with passive-use value are concerned. (e.g., Diamond and Hausman 1994). A main concern is that, due to lack of familiarity with the specific commodities being valued, preference elicitation questions place an extremely difficult task on the respondents. Surveys cannot simply retrieve existing references for particular environmental goods. There seems to be a consensus among most researchers in the field that respondents need to somehow "construct" these preferences from their underlying values.

Empirical phenomena observed in survey experiments and described as "embedding effects", "part-whole bias" and "scope insensitivity" are today widely interpreted as evidence for the difficulty of many respondents to contextualise the proposed environmental improvements and to provide an economically meaningful response. Moreover, it is known from verbal protocol analysis that many respondents, when asked to process difficult preference questions, resort to simplified heuristics in order to frame a reply. The phenomenon of "anchoring effects" – the observation that responses can be influenced by unintended value cues contained in the valuation questions – are a particularly well-studied consequence of such heuristics (Green et al. 1998).

Stated preference surveys have many similarities with ballot decisions on public financing propositions. In the context of public referendum decisions, individuals also have to make their private choices about often complex environmental issues. However, there is an important difference in information context between the choices in ballot decisions and the choices in valuation surveys. The pre-referendum process in ballot decisions spontaneously generates additional sources of information available to the respondents. The process of preference formation may be influenced not only by official voter guides, but also by media coverage of the issue, interest group recommendations, and various forms of public debate. The "externally" generated information available to voters constitutes a discursive element that sets the processes of preference formation in referendum decisions apart from those in stated preference surveys.

In authoritative papers, including the NOAA-panel report, the view has been expressed that referendum decisions represent a useful guide to the development of environmental valuation survey instruments (Arrow et al. 1993, Hanemann 1994). In this paper we explore a new survey approach that would appear to make the survey more similar

to a public referendum. Specifically, we explore how voting recommendations affect respondents' stated choices about public goods. While it would be difficult to experimentally manipulate the types of information available to voters in a real referendum decision, this can be done in the context of a controlled survey experiment. We thus conducted an environmental valuation survey experiment in which the preference questions were formulated as a policy referendum. A split sample design was used to examine the effects of a "voting recommendations" (VR) treatment, in which participants were supplied with choice recommendations from political parties and relevant interest groups.

We asked the following specific questions: (1) How does the availability of voting recommendations from large national political parties and interest groups affect choices about public goods in an dichotomous choice experiment setting? (2) How does the availability of voting recommendations affect choice behavior across sub-samples from urban, suburban and rural population strata with typically distinct voting patterns in decisions about the particular public goods concerned?

The paper is organized as follows. In the next section we briefly review the literature regarding survey "biases" that have been attributed to the difficulty of valuation tasks, particularly anchoring effects. Sections 3 and 4 present the methods and results, respectively. Section 5 offers a discussion and Section 6 concludes.

2. Literature background

At least since the publication of the NOAA panel report, the (single-bounded) dichotomous choice format is widely regarded as a preferable contingent valuation format (Arrow et al. 1993, Hanemann 1994). However, an important issue in the recent literature on dichotomous choice contingent valuation is that bid amounts presented in the elicitation of preferences may induce value cues that affect survey responses. For instance, McFadden (2001) observes, for a specific referendum contingent valuation study, that the effect of a one-dollar increase in the bid was to increase mean response by 28 cents. This "bid anchoring" or "starting point bias" effect represents one prominent type of effects in a wider class of undesired response effects due to value cues contained in survey instruments (Tversky and Kahneman 1974).

Psychometric studies have found that anchoring effects are strongest when "primitive values" – in our valuation context the pre-existing preferences about a good – are weak or absent (Green et al. 1998). In environmental valuation surveys there is frequently a general lack of familiarity with the environmental good being valued. Valuing marginal changes of the good is therefore often an extremely difficult task. Most verbal protocol studies exploring

perceptions during valuation surveys show that respondents are not easily in touch with underlying preferences and struggle with the task (Schkade and Payne 1994, Burgess et al. 2000; but see Brower et al. 1999 for an opposite result). Many psychologists stress that survey respondents do not retrieve pre-existing preferences for specific environmental goods but rather "construct" their choices about specific environmental goods from underlying values (e.g., Gregory et al. 1993). McFadden (1994, p. 706) concludes that the patterns he finds are more easily explained by "constructed preferences rather than by rational individualistic stationary preferences."

Contrary to more narrow concepts of the neoclassical assumptions, many authors would argue that "constructed preferences" do not represent a fundamental problem for stated preference methodology (Hanemann 1994, p. 28). This view is supported by evidence indicating that the preferences for many private market goods may have to be similarly "constructed" by consumers. However, given the abovementioned tendency of uncertain survey respondents to anchor their preferences in value cues induced by the survey instrument, there remain important open questions. How can we make sure that those slight changes in bid levels or wording known to affect survey results do not lead to uninteded (or even intended) effects on survey results? And how should we correct for anchoring effects when we know they occur but are unable to suppress them? There seem to be no simple answers to these questions.

Unfortunately, bid anchoring as perhaps the most important anchoring effect cannot be easily resolved by using different question formats. This is because anchoring represents only one particular manifestation of a more general underlying problem, which is fundamental uncertainty on the part of the respondents. Thus, when open-ended formats are used, the problem has been found to reappear in other disguises, for instance as "insensitivity to scope" (Boyle et al. 1994), "embedding" (Green et al. 1994) or anchoring based on perceptions of actual costs or "fair" contributions (Schkade and Payne 1994). McFadden (1994) writes[1]:

> "If evidence accumulates that CV measurement of existence value is encountering fundamental failures of preference theory, in which preferences are constructed for each situation and are highly sensitive to position and context, then more sophisticated survey methods that strip away one level of cognitive distortions will simply reveal, or induce, new distortions."

Although contingent valuation surveys in some ways intend to "simulate" actual referendum decisions (Hanemann 1994) it is also important to realize that the question: "How would you vote?" is hypothetical beyond the obvious fact that the survey referendum is not binding. It is

[1] McFadden refers to existence values but the same may apply also to some of the more difficult questions involving use values.

also different from a real referendum in terms of the available information context[2]. Survey respondents have to make their choices in isolation. A survey respondent who takes his task seriously might answer: "How can I know how I would vote? After all, I don't have the sources of information that I would have in a referendum on this issue". In that sense, answering surveys is more hypothetical than buying unfamiliar or infrequent commodities (cf. e.g. Hanemann 1994, p. 20). The additional sources of information available in referendum decision, including learning from the opinion of others, could make an important difference in the process of preference formation.

Against this background, offering additional sources of information that would likely be available in an actual referendum context could be expected to help in efforts to more accurately simulate actual public good financing referenda. One such additional source of information would be to provide opportunities for debate among groups of respondents. The option we pursue here, is to supply respondents with the voting recommendations from well known political parties and interest groups. Voting recommendations (henceforth: VR) are an integral part of opinion formation in actual referendum processes. Ideally, and as in real referendum decisions, the VR to be included together with an environmental valuation survey questionnaire should be issued by political parties and interest groups representing the entire spectrum of political opinions concerning the policy issue at hand. In the context of a stated preference survey, such VR would have to be obtained from parties and interest groups when the (otherwise) final version of the survey instrument is available.

Similar to the situation in actual referendum choices, VR could serve as external cues that are uncontrolled by the experimenter and which may help uncertain respondents in making their personal decision. As with internal value cues such as bid anchors, VR may only weakly influence those well-informed respondents who feel competent enough to properly contextualize the environmental proposition and to make an informed decision on their own. However, there are likely to be many respondents in stated preference surveys who simply do not know which choice would best correspond with their underlying values. To these, VR representing diverse interests offers a system of reference which may enable them to make a personal decision more reliably in line with their preferences and budget restriction. By the same token VR may "crowd out" other, less desirable simplified heuristics which uncertain respondents tend to use in framing their replies.

3. Methods

[2] A further "hypotheticality" in dichotomous choice survey questions concerns the hypothetical bid levels (see Flores and Strong 2003).

Experimental design

For the present study we applied the relatively new variant of stated preference elicitation techniques broadly referred to as attribute-based methods (e.g., Louviere et al 2000, Bennett and Blamey 2001, Holmes and Adamowicz 2003). In attribute-based stated preference questions, a policy alternative is decomposed into *k* singularly and precisely specified attributes, one of which is the bid amount. Experimental design procedures are used to construct alternatives from the attribute set. Respondents are asked to choose one alternative from a choice set containing two or more policy alternatives. One of the policy alternatives is typically the status quo. Questions may be posed in the referendum vote format recommended by the NOAA panel, but in contrast to many contingent valuation studies, repondents are given a series of choice sets.

The valuation scenarios of the present study were structured around alternative policy options concerning of agri-environmental policy for the Swiss Plateau, or the lowlands between the Jura mountain range and the Alps. Each choice set consisted of two alternative landscape outcomes, one of them the status quo, which were characterized by n=6 landscape attributes and their price in terms of the tax money required to maintain the landscape pattern, for instance through land-use incentive schemes. These six land uses were "forest", "high-intensity grassland", "crop land", "low-intensity meadows", "orchards, hedgerows, and trees", and "nature reserves". The six landscape attributes described the extent of five main land uses as a percentage of the total land surface. Given current political pressure to rather reduce than increase public subsidies to farmers, attribute levels were chosen in such ways that most changes from the status quo would be less expensive, albeit possibly at the cost of a reduced aesthetic value of the landscape, for instance due to an increase of forested area (Table 1). We framed the choice problem as in a referendum in which citizens were to vote in favor or against propositions offering alternative land-use policy outcomes.

The program *Gosset* was used to generate the fractional factorial design of the choice model (Hardin and Sloane 2003). Either three or two attribute levels were chosen for individual attributes, depending on whether linear and quadratic or only linear effects were of interest. We specified design type "i" and a target of 40 choice sets (alternative landscape outcomes), which is sufficient to estimate all main effects and one-way interations, while still keeping 15 extra design points to further reduce the average prediction variance. To keep the choice task of an individual manageable, the fourty choice sets were distributed to five blocks (different questionnaires) consisting of eight choice sets each. Since percentages of land in the n different uses must sum to a constant land surface, only $n-1$ land use attributes were

experimentally varied in the factorial design, while the level of the last attribute (high-intensity grassland) was given by the difference of total undeveloped land, which amounts to 74% of the total land surface, minus the sum of the levels of all other attributes (land uses). As a consequence, each change in a particular land-use type is a change at the expense (or to the favor) of the land use represented by the free variable.

We used stratified sampling to identify potential variation of responses between different (urban, periurban and rural) parts of the populations. Within a study region near Zurich that appeared to be topographically representative of the entire Swiss Plateau we selected one urban (Zuerich), two suburban (Faellanden and Greifensee) and two rural municipalities (Baeretswil and Grueningen) from which to recruit potential respondents. The specific municipalities were selected to represent three sufficiently large contrasting sub-populations in terms of income, agricultural employment, and voting behavior in past land-use related referendum decisions (Table 2).

Corresponding to the aims of the present study we factorially crossed the treatments (blocks) and strata of this experimental design with our "voting recommendations" (VR) treatment. Thus, one half of the potential respondents of each block × stratum combination were supplied with voter recommendations, while the other half served as the control group.

Survey procedures

We initially determined a set of land use attributes to represent useful descriptors of the landscape. Status quo levels of land use were collected from the Swiss land use Statistics (FSO 1992/1997), the Swiss Federal Office of Agriculture, and the Canton of Zurich Office for Nature and Landscape. Based on a sequence of focus group sessions with representatives of the Federal Office of Agriculture, the Canton of Zurich Office for Nature and Landscape and two regional non-governmental organizations active in regional nature conservation, the set of attributes was slightly modified and realistic and policy relevant alternative attribute levels were determined. About 15 selected individuals were then asked to complete the questionnaire and later interviewed about their experience with the task. Finally a mail pre-test with n=70 addresses (yielding about 50 responses) was conducted to check understanding and response distributions. Ten respondents of this pre-test were individually contacted by phone and asked about their experience and satisfaction with the content and illustrations of the questionnaire. For one attribute, attribute levels were changed as a consequence of the pre-test results.

The questionnaire consisted of five parts. In the first part, respondents were asked about their genaral attitudes towards the landscape and the role of the government in resource and

landscape protection in agricultural areas. In the second part, the individual landscape components “forest”, “high-intensity grassland”, “crop land”, “low-intensity meadows”, “orchards, hedgerows, and trees”, and “nature reserves” and their functions were individually briefly described and illustrated with three or four photographs. Third, respondents were introduced to their task of choosing their prefered landscape in sets of two possible future landscapes in the Canton of Zurich, taking into account their tax payment. This text was accompanied by a pie chart showing the current allocation of land to the six different uses in the Canton of Zurich and by an example of a choice set (Figure 1). The fourth part contained the choice sets, numbered 1 through 8. Landscape attribute leves were illustrated in horizontal bar charts and the alternatives labelled “Landscape A (Alternative)” and “Landscape B (Status Quo)”. The tax bill attribute was given in words such as “2 percent less (corresponding in my case to ... Francs.)” or “unchanged”. A pictogram of a bill was inserted near the words “tax bill” in order to match the high visibility of the land use attributes illustrated in the bar charts. Respondents could choose among A, B, and “no choice”. The choice sets were followed by a question about how certain respondents felt about their choices. The final section contained six questions concerning socio-economic characteristics. Instead of the usual income question, we asked for the amount of the last year’s total personal tax bill, to the nearest 500 SFR.

The national offices of political parties and important interest groups concerned with land use issues were then contacted by phone and asked if they would be willing to provide choice recommendations for the 40 choice sets of the survey. Six of the eight parties and interest groups we contacted agreed to participate. The final questionnaire, but with 40 instead of 8 choice sets, was sent out to these organizations by mail. In most cases, specialized policy staff took charge of the task, jointly providing choice recommendations from the entire spectrum of parties and relevant interest groups. Recommendations from the following parties and interest groups were obtained: People’s Party (SVP, right-wing), Christian Democrats (CVP, center), Social Democrats (left-wing), Swiss Farmers Union, Swiss Consumer Forum (large consumer organization), and Pro Natura (largest NGO in Swiss nature conservation). For each block of the experimental design a sheet with the recommendations was then printed and included as a supplement in the questionnaires of the VR sub-sample. The recommendations (choice A or B) were presented in tabular form, with questions one through eight in rows and parties/interest groups in columns. Names and functions of these organizations’ representatives who had provided the recommendations were listed below the table (Fig. 2). The frequencies of A (“alternative”) and B (“status quo”) recommendations and of “no recommendation” for each party and interest group are listed in Table 3.

Potential respondents of the mail survey were recruited by telephone. To obtain a sample that corresponded well with the structure of the sampled population the target persons were drawn in a two-stage process. First, random samples were drawn from the electronic list of phone lines in the survey municipalities. The household structure was then surveyed, yielding number, age, and gender of all potential target persons in the household (citizens with right to vote). A random sample of target persons was then drawn from the potential target persons of the households. Households were contacted five times (on different days) before target respondents were replaced. A computer-assisted algorithm for selecting replacements ensured that the age and sex distribution in the sample remained close to census distributions. A detailed description of the resulting samples is available from the authors. Within a few days, the questionnaires were sent by mail to the persons who had agreed to participate in the survey. About two weeks after their receipt of the questionnaires, all participants were reminded of the deadline by a short letter.[3] The response rates, based on returned questionnaires and based on questionnaires in the final data set, were 70 and 66 percent, respectively (Table 4).

Statistical analyses

Chi-square and t-tests were used to compare respondent characteristics between the two experimental treatments. Discrete choice models to explain "alternative" *vs.* "status quo" policy choice were calculated using Limdep (Greene 1997). Although a mixed model with individual-specific constants[4] improved model performance with the present data, we here report standard Probit models, since our objective is to explain choice in terms of observable attributes only (e.g. Adamowicz et al. 1997, p. 73). The effects of the VR treatment were analyzed by fitting interactions of the attributes with a dummy for the presence/absence of VR. Since the effects of the attributes differed among the three population strata and, moreover, error variances tended to be smaller in the VR treatment, we also ran separate regression models for the six treament × stratum sub-samples. Based on significant choice model coefficients we derived percentage effects of the VR treatment on the ratios of the coefficients on each land-use attribute to the coefficient on the tax attribute.

[3] To ensure anonymity of the survey it was not possible to control which questionnaires had already been returned, and therefore it was necessary to send the reminder to all the participants.
[4] See e.g. Holmes and Boyle (2003) for an application of this model to attribute-based dichotomous choice data.

4. Results

T- and Chi-square tests revealed no undesired differences in respondent characteristics between the VR and control respondent subsamples (Table 5). The VR treatment affected respondent choices as follows.

The VR treatment reduced the proportion of "no choice" or item non-response in the choice sets by 39 percent (from 14.5 percent to 8.9 percent; $\chi^2(1) = 33.02$, $p < 0.001$), suggesting that the voting recommendations reduced information costs as in actual voting decisions (Schneider 1985, Lupia 1994). Further, the VR treatment tended to increase the proportion of status quo land use policy choices ($\chi^2(1) = 3.34$, $p = 0.068$).

In the Probit model with all observations (including urban, periurban and rural populations) the tax price attribute and all land use attributes except the forest attribute were highly significant (Table 6, model 1). Except for the forest attribute (FOREST), coefficient signs on land uses were all positive, implying that a marginal increase of these land uses (at the expense of the free-variable land use 'grassland'; see Experimental design) increased choice probability. The voting recommendations significantly influenced the effect of the forest attribute. VR also increased the effect of the tax price attribute (DTAX), although this effect was only weakly significant (Table 6, model 2).

Separate Probit models for the six treatment×population subsamples are presented in Table 7. Coefficients remained stable, except for the one on tax change (DTAX) which was nonsignificant in the urban sub-sample of the control treatment. Based on choice model fit, respondents of our urban sub-sample had less clear pre-existent preferences regarding land-use policy changes than the respondents of the periurban and rural sub-samples (Table 7, top, R^2=0.05, compared with 0.12, and 0.11, respectively). However, when voting recommendations were supplied the urban respondents' choices were as consistently related to the attribute levels presented in the choice sets as the periurban and rural respondents' (R^2=0.11 in Table 7, top). Specifically, the VR treatment increased the effect of the attributes TREE and RESERVE on the the choice of landscape policy in the urban sub-sample. The preferences stated by the urban VR sub-sample thus agreed well with expectations from past referenda on land-use policy, where the urban population showed an overwhelming support for public provision of these landscape amenities (see Table 3), while the control sample did not yield this pattern. Conversely, the coefficients on TREE and RESERVE attributes remained non-significant in the rural subsample also in the VR treatment where DTAX became highly significant. This is again in line with expectations from revealed voting behavior of the rural sub-populations which showed rather limited support for measures to protect landscape amenities.

Using the coefficients of the choice models we computed marginal WTP (in tax percentages) for changes in the percentage land allocated to the five different uses. This was done whenever the coefficients on both the respective land use and the tax costs were significant in the choice models (Table 8). Based on these ratios the effects of the VR treatment were as follows. The VR treatment reduced the estimated mean WTP for cropping area by 26% in the periurban population and by 32% in the rural population. WTP for low-intensity meadow land was reduced by 56% in the rural population and WTP for nature reserves by 41% in the periurban population.

5. Discussion

The results of our experiment correspond well with the results and interpretations of the previous literature on anchoring effects. Based on this literature, one would "[...] expect the strongest anchoring effects when primitive beliefs are weak or absent, and the weakest anchoring effects when beliefs are sharply defined." (Green et al. 1998, p. 95). In the present study on land-use scenarios, one should expect that the urban residents have less clear pre-existent preferences about the presented alternatives than the periurban and rural residents. Indeed, the urban population yielded a very limited choice model fit in our control group. Interestingly, however, the voting recommendations almost doubled the pseudo-*R*-square value with the urban sub-sample, while it did not further improve the fit with the periurban and rural sub-samples.

In assessing quantitative effects of our external value cues two peculiarities of our experimental design should be kept in mind. First, the cost attribute was specified as a percentage change of the annual tax bill. This was a precondition for interest groups to be able to provide choice recommendations. Recent work by Champ et al. (2002) and Flores and Strong (2003) suggests that this formulation might have considerably reduced respondent uncertainty compared with standard formats where the cost attribute is specified in absolute money units. Second, we did not move the attribute levels of the experiment very far away from status quo levels, and we used a relatively realistic voting scenario. The "realisticness" of our scenarios was thus high compared with some other surveys, again with the potential effect of reducing respondent uncertainty (e.g., Arrow et al. 1993). The moderate variation of the attribute levels is perhaps also responsible for the generally low pseudo-*R*-square values we obtained.

Accounting for the previous point, voting recommendations as external value cues seem to have the potential to strongly affect choice model coefficients. Most importantly the

VR treatment increased the effect of the cost (tax price) attribute on the choice of land use policy outcomes. Apparently, the voting recommendations had the effect that respondents more seriously considered the costs of the policy alternatives. Furthermore, the VR treatment appears to have improved the external validity of survey responses. Differences in the demand for landscape amenities between the urban, periurban and rural populations known from past referendum decisions were more clearly reflected in the stated preferences when respondents were subject to the VR treatment. Especially the urban-rural difference in the support for increased public financing of natural areas and of agri-environmental services of past referendum decisions was well replicated by the stated preferences for the land-use categories TREE and RESERVE under the VR treatment.

The previous work on response uncertainty and anchoring effects in stated preference surveys suggests a potential benefits of voting recommendations in the context of attribute based contingent valuations. If respondents use voting recommendations as a sort of "external anchors", this may reduce or "crowd out" the influence of other, perhaps less desirable anchors, such as those induced by bid levels presented in the survey instrument. Since voting recommendations cannot be controlled by the researcher this information is clearly of a very different nature than the lists of "pro" and "contra" arguments which are sometimes included in survey questionnaires. Moreover, respondents in valuation surveys appear to be aware of the important differences between public decisions based (partly) on surveys and truly participative democratic decision processes (Shabman and Stephenson 1996, Burgess et al. 2000, Nyborg 2000, Pouta et al. 2002). One could thus expect that voting recommendations as a discursive element in the survey process might tend to improve the acceptability of valuation surveys among the public.

There is yet another potential benefit of voting recommendations which could be relevant. Arrow et al. (1993, p. 4614) write: "Since the design of the CV survey can have a substantial effect on the responses, it is desirable that – if possible – critical features be preapproved by both sides [...]." The VR treatment demands a form of preapproval by important political actors before the survey is presented to the respondents. Obtaining voting recommendations from diverse political parties and interest groups requires a very careful and balanced presentation of the issue. This creates strong incentives for high-quality survey design and generates an increased publicity of the survey process which, if political parties and interest groups cooperate, may lend the valuation survey a degree of political legitimization that is unmatched by conventional survey methods. The uncertainties due to potentially inappropriate information or framing would thus appear to be reduced in an effective way. As a consequence, the VR treatment could improve the acceptability and political impact of the survey results.

There is clearly much more to be learned from the comparison of stated preferences with and without external value cues. For instance, one could offer voting recommendations in the context of a standard referendum-format contingent valuation survey. It would also be interesting to factorially cross our VR treatment with a treatment to examine anchoring effects.[5] One could then specifically test the hypothesis that undesired anchoring effects are crowded out by the effect of the external value cues. Further, one could ask respondents whether and to what extent they made use of the voting recommendations, although there is perhaps a danger that such a question might itself influence the responses.

6. Conclusion

Over the past two decades, stated preferences techniques have become one of the most active research topics in environmental economics. However, the success of the research agenda contrasts with persisting scepticism about these methods among the wider economics discipline. Rapidly accumulating evidence of various types of biases in experimental studies and recent meta-analyses of calibration factors do not support hopes that improved survey designs will soon lead to valid and widely accepted survey techniques with an important influence on legislative or judicial processes. A possible reaction to this situation is to search for fundamentally new perspectives on these issues (Hanley and Shogren, forthcoming). An approach that has not been considered to date is the inclusion of external value cues in survey instruments. The inclusion of voting recommendations in a mail choice experiment proved feasible. Six of eight contacted political parties and interest groups agreed to cooperate in this study and provided choice recommendations within the two weeks allowed by a strict time schedule. It is difficult to say if approaches similar to the one used in this study will contribute towards better survey-based benefit estimates. However, we suggest that the most relevant criterium for judging the usefulness of such approaches will ultimately not be whether they produce more "correct" benefit estimates, which would be difficult to test. The primary criterium will rather be whether they help to increase the credibility and acceptability of the survey results.

[5] We refrained from such a design in our experiment because this would have meant asking political actors for 80 (instead of 40) choice recommendations.

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Table 1. Land use attributes and levels

Attribute[a]	Variable name	Levels[b]
Forest land (%)	FOREST	**28**, 30, 32
High-input grassland (%)	- [c]	**20**
Field crops (%)	CROP	10, 14, **18**
Low-input grassland (%)	LOWINP	**4**, 6
Field hedges, field trees, traditional orchards (%)	TREE	**3**, 4, 5
Nature reserves (%)	RESERVE	**1**, 2
Tax bill change (%)	DTAX	-2, -1, **0**

[a] Land area percentages are expressed relative to the surface of total land.

[b] Status quo levels are printed bold.

[c] Variable omitted in the model. Value in the choice sets given by 74 (percentage of undeveloped land) minus the sum of the areas (attribute levels) of all other land uses combined.

Table 2. Statistics and sampling of different voter populations

	Urban	Periurban		Rural	
	Zuerich	Faellanden	Greifensee	Grueningen	Baeretswil
Mean taxable income (1000 SFR) [a]	52.	66.8	61.5	56.0	51.3
Employment in agricultural sector (%) [a]	0.1	3.6	1.4	15.4	21.4
Approval of NHP proposal (%) [b]	65	60	57	51	45
Approval difference ag. policy proposals 1996 and 1995 [c]	47	42	44	26	28
Questionnaires distributed	212	285		285	
Final dataset	134	184		203	

[a] Data 1996 (COS 1999).

[b] Percentage yes in a cantonal referendum on a 10 million SFR increase of the annual instalments to the cantonal fund for Nature and Heritage Protection. Data: Executive Council (1996a)

[c] Difference between aggregate (municipality-level) voting returns in two consecutive national referenda on new constitutional articles to reform agricultural policy: The first (1995) proposition was controversial (and rejected in the vote) mainly because direct payments to farmers were not clearly conditioned on ecological services. The second (1996) proposition explicitly conditioned direct payments on a set of ecological requirements and was approved by a large majority of 78 percent of the voters. Data: Executive Council (1995, 1996b).

Table 3. Frequency of the recommendations “alternative”, “status quo” and “no recommendation” for the six political parties and interest groups.

Party or interest group	“Alternative”	“Status quo”	“No recommendation”
People’s Party	5	35	0
Christian Democrats	6	34	0
Social Democrats	16	14	0
Swiss Consumer Forum	15	15	0
Pro Natura	31	4	5
Swiss Farmers Union	5	27	8

Table 4. Questionnaire return rates.

	VR		Control	
	Number	Percent	Number	Percent
Individuals contacted	408	52.2	374	47.8
Questionnaires distributed	374	100.0	408	100.0
Questionnaires returned	260	69.5	285	69.9
Individuals in final (useable) data set	247	66.0	266	65.2

Table 5. Statistical comparisons of respondent characteristics between the experimental treatments (with and without voting recommendations).

Variable	Description	Overall descriptive statistics [a]	Test statistic [b]
Age	Categorical variable: 1=less than 20; 2 = 20 to 29; 3 = 30 to 39; ... 7= 70 or above.	4.62 (1.55) n=517	χ^2=2.05 (6)
Gender	Binary variable: 0 = male; 1 = female.	0.54 (0.50) n=516	χ^2<0.01 (1)
Education	Categorical variable for highest educational degree: Ranging from 1 = compulsory schools only to 5 = college or university degree.	3.09 (1.32) n=512	χ^2=4.47 (4)
Residency	Years of residency in the Canton of Zurich.	39.1 (18.2) n=511	t=0.48 (509)
Taxbill	Continuous variable for total annual personal direct tax payments (SFR).	9347 (16722) n=461	t=0.25 (448)
Expend	Categorical variable for preferred level of cantonal expenditures for nature and landscape protection relative to current level: 1 = less; 2 = rather less; 3= same amont; 4 = rather more; 5 = more.	3.62 (0.98) n=478	χ^2=2.98 (4)

[a] Descriptive statistics for each variable are, respectively, mean, standard deviation, and sample size.

[b] Test statistic for the null hypotheses that the distributions of responses are the same, with degrees of freedom in parentheses (two-sided test).

Table 6. Probit model coefficients estimated from land use policy choices: Models with main effects of policy attributes (1) and including interactions with a dummy for the voting recommendations (VR) treatment (2) [a].

Variable	(1)	(2)
Constant	-2.5799****	-2.5673****
	(0.4128)	(0.4133)
FOREST	-0.0150	-0.0045
	(0.0121)	(0.0131)
CROP	0.1254****	0.1194****
	(0.0062)	(0.0087)
LOWINP	0.1214****	0.0965****
	(0.0212)	(0.0288)
TREE	0.0797***	0.0700**
	(0.0243)	(0.0332)
RESERVE	0.1673****	0.1659***
	(0.0424)	(0.0588)
DTAX	-0.0938****	-0.0587*
	(0.0243)	(0.0340)
VR×FOREST		-0.0218**
		(0.0109)
VR×CROP		0.0122
		(0.0124)
VR×LOWINP		0.0502
		(0.0402)
VR×TREE		0.0188
		(0.0465)
VR×RESERVE		0.0016
		(0.0835)
VR×DTAX		-0.0706(*)
		(0.0483)
N	3858	3858
LogL unrestricted	-2417.1	-2412.3
LogL restricted	-2670.6	-2670.6
χ^2	507.1	516.7

[a] Standard errors in parentheses. Significance levels: ****= significant at $p<0.001$, ***= significant at $p<0.01$, **= significant at $p<0.05$, = significant at $p<0.1$, ()= significant at $p<0.15$.

Table 7. Probit model coefficients estimated from land use policy choices: Separate models for the six VR treatment×population sub-samples[a].

Sub-sample with voting recommendations:

	Population		
Variable	Urban	Periurban	Rural
Constant	-3.5479***	-2.3322**	-1.0227
	(1.1371)	(0.9997)	(0.9453)
FOREST	-0.0064	-0.0292	-0.0656**
	(0.0339)	(0.0292)	(0.0280)
CROP	0.1190****	0.1389****	0.1327****
	(0.0176)	(0.0152)	(0.0145)
LOWINP	0.1907***	0.1272**	0.1089**
	(0.0591)	(0.0515)	(0.0489)
TREE	0.1603**	0.0461	0.0640
	(0.0680)	(0.0592)	(0.0562)
RESERVE	0.2360**	0.2484**	0.0290
	(0.1186)	(0.1032)	(0.0982)
DTAX	-0.0809	-0.1383**	-0.1496***
	(0.0671)	(0.0591)	(0.0562)
N	501	666	736
LogL unrestricted	-309.8	-407.7	-449.2
LogL restricted	-347.2	-461.2	-505.4
χ^2	74.8	107.0	112.3
McFadden's pseudo R^2	0.108	0.116	0.111

Sub-sample without voting recommendations (control):

	Population		
Variable	Urban	Periurban	Rural
Constant	-1.9329*	-3.8264****	-3.0064***
	(1.1338)	(1.0033)	(0.9460)
FOREST	-0.0125	0.0320	-0.0041
	(0.0322)	(0.0291)	(0.0277)
CROP	0.0895****	0.1343****	0.1330****
	(0.0165)	(0.0152)	(0.0143)
LOWINP	0.1172**	0.0205	0.1664****
	(0.0568)	(0.0510)	(0.0483)
TREE	0.0710	0.1305**	0.0340
	(0.0658)	(0.0587)	(0.0555)
RESERVE	0.1600	0.3013***	0.0820
	(0.1132)	(0.1028)	(0.0965)
DTAX	0.0480	-0.0989*	-0.1009*
	(0.0658)	(0.0585)	(0.0554)
N	520	678	752
LogL unrestricted	-342.0	-411.9	-465.4
LogL restricted	-360.4	-464.2	-520.3
χ^2	36.8	104.7	109.9
McFadden's pseudo R^2	0.051	0.113	0.106

[a] Standard errors in parentheses. Significance levels: ****= significant at $p<0.001$, ***= significant at $p<0.01$, **= significant at $p<0.05$, *= significant at $p<0.1$, (*)= significant at $p<0.15$.

Table 8. Ratio of the choice model coefficients on the five land-use attributes to the choice model coefficients on the tax change attribute for the treatments 'Control' and 'VR', and percentage change due to the VR treatment.

	Periurban			Rural		
	Control	VR	Change due to VR	Control	VR	Change due to VR
$b_{forest}/-b_{dtax}$	ns	ns	-	ns	-2.280	-
$b_{crop}/-b_{dtax}$	1.359	1.004	-26%	1.318	0.887	-32%
$b_{lowinp}/-b_{dtax}$	ns	0.920	-	1.650	0.728	-56%
$b_{tree}/-b_{dtax}$	0.758	ns	-	ns	ns	-
$b_{reserve}/-b_{dtax}$	3.049	1.795	-41%	ns	ns	-

Note: Ratios were only calculated where coefficients on both land use and tax price are significantly different from zero (see Methods).

Figure legends

Figure 1. Presentation of choice sets (example).

Figure 2. Presentation of party and interest group recommendations (english translation of the choice recommendation sheet for the 8 choice sets of block 1).

Example	Landscape **A** (Alternative)	Landscape **B** (Status Quo)
Forest	32%	28%
High-intensity grassland	18%	20%
Cropland	14%	18%
Low-intensity meadows	4%	4%
Orchards, hedgerows, and trees	4%	3%
Nature reserves	2%	1%
My **taxbill** will be … 	**1 percent less** (corresponding in my case to …… CHF)	unchanged
I prefer landscape	☐	☐ *no choice* ☐

Choice recommendations of parties and interest groups (enclosure to the questionnaire)

In questions 2.1 to 2.8 the representatives of the listed parties and interest groups recommend you to tick the following landscapes:

Question	SVP UDC	CVP	SP klar.sozial	pro natura	kf konsumentenforum	BAUERNVERBAND
2.1	B	B	A	A	A	no recommendation
2.2	B	B	A	no recommendation	A	B
2.3	B	B	B	A	A	B
2.4	B	B	B	A	B	no recommendation
2.5	B	B	A	no recommendation	A	B
2.6	B	A	B	A	B	no recommendation
2.7	B	B	B	A	B	B
2.8	B	B	B	A	B	no recommendation

Note:

These answering recommendations do not necessarily correspond with the o*fficial* opinion of the parties and interest groups. The "voting recommendations" originate from *individuals* who express the position of their party (or their interest group) regarding the future landscape development:

SVP	Jeannine Grünenfelder (scientific staff)
CVP	Michela Trisconi (scientific staff)
SP	Matthias Manz (policy field director)
Pro Natura:	Pascale Aubert (project leader agriculture & nature conservation); Ulrich Berchtold (project leader species- & habitat protection)
Konsumentenforum:	Marianne Cserhati-Hotz (President, Konsumentenforum Canton of Zurich)
Bauernverband:	Marco Baltensweiler (head, section of agricultural economics); Mr. Baltensweiler gave the answer recommendations from of a long-term, future-oriented perspective

No statement was available from the FDP and the Grüne within the time allowed.

interner Vermerk: Block **1** 2 3 4 5