# Sensitivity to scope of environmental regulation in contingent valuation of forest cutting practices in Finland

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## Abstract

This study applies contingent valuation in measuring the environmental benefits of a forest regeneration cutting policy that is designed to encourage cutting practices in Finland to take environmental concerns into account. This study examines the benefits of the program, which regulates landowners to follow environmentally-oriented cutting practices either in limited or extensive scope. The dichotomous choice between status quo and environmentally-oriented cutting is found to be insensitive to the scope of the environmental alternative, as the scope variable was insignificant in the logit model. Even though, the truncated means of willingness to pay did not differ between the levels of scope, the overall means were statistically different. The measurement of respondents' beliefs indicated that the negative side effects of the extensive program, e.g. beliefs about unemployment effects or restricted operating freedom, were one reason for insensitivity.
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## 1. Introduction

The recent discussion of the validity of contingent valuation (CV) has, to a great degree, focused on the issue of sensitivity of valuation to the scope or scale, of an environmental good (Carson and Mitchell, 1995; Hovenagel, 1996; Carson, 1997; Frederick and Fischhoff, 1998). The lack of such sensitivity is also called embedding. Economic theory suggests that if an individual is willing to pay something to obtain a certain environmental good, she should be

willing to pay more to obtain more of that good. The issue of embedding has arisen especially in cases involving large absolute changes (Kahneman and Knetsch, 1992; Desvouges et al., 1993). Since then, many studies have shown sensitivity to scope (Carson and Mitchell, 1993; Smith and Osborne, 1996; Carson, 1997; Smith et al., 1997) or insensitivity (Diamond et al., 1993; Schkade and Payne, 1994; Svedsäter, 2000), and some have even shown both insensitivity and sensitivity (Loomis et al., 1993; Giraud et al., 1999).

Varying the quantity of the public good has been a typical technique used to test the effects of scope in cases involving endangered species or in connection with other wildlife conservation issues (Desvouges et al., 1993; Giraud et al., 1999). The

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effect of scope in terms of the size of the forest area to be conserved has also been tested (Loomis et al., 1993; Li et al., 2001). Although forest-related valuation studies of scenic quality or quality of forest for recreational use have been conducted, they have not taken scope into account by including varying numbers of quality attributes in valuation. In these studies, forest quality has been defined, for example, in terms of the number of trees remaining after an insect invasion (Walsh et al., 1989, 1990), in terms of silvicultural management and tree species composition (Mattsson and Li, 1994) as well as in terms of the scenic properties of camping sites, based on tree age classes, densities, stories and species (Daniel et al., 1989). This study tests the effect of scope by varying the number of quality attributes in a program designed to improve forest cutting practices by requiring that environmental consideration be taken into account.

In Finland, forests and forestry issues have high public relevance, and the public's interest in forests and forestry is high. In as much as all forests are open to public access for recreation purposes, forest management practices influence most Finnish citizens' everyday living environment. Over 90% of Finns enjoy outdoor activities, mainly in forested environments (Pouta and Sievänen, 2001). Consequently, in the 1960s and 1970s commercial forestry was criticized for large-scale clear-cutting, which had a negative visual effect on the landscape, and for intensive land surface management on clear-cut areas, which hindered forest recreation. In Finland, forest regeneration consists either of clear-cutting and planting or of natural regeneration with seed trees left for some years on an otherwise clear-cut area. In the 1980s and 1990s, criticism of regeneration cuttings was motivated by biodiversity concerns (Hellström, 2001). The absence of decaying wood in timber production forests was suggested to endanger species that favored old-growth forests. In addition, siltation due to regeneration cuttings played a role in these discussions.

Private, non-industrial forests account for approximately 53% of the forest land in Finland and 73% in most densely populated southern part of the country. Non-industrial forests are distributed among a large number of forest owners, for about every sixth Finn is a forest owner. To ensure the quality of private forests for recreation and nature conservation, public agencies have issued instructions to guide forest owners in their present cutting practices (PP). However, changes in these practices outside biotopes under special protection have been based on the voluntary actions of private forest owners. For forest policy-making purposes it is interesting to determine to what extent Finnish citizens value programs of varying scope, which, by law or by mandatory regulation, would force landowners to follow a particular environmentally-oriented forest regeneration cutting practice (EOP).

The influence of considerations of scope on willingness to pay for an environmentally-oriented harvesting practice is investigated here by measuring the support for a limited program vs. an extensive program using a split sample survey design. A limited program determines only the number of trees that must be left on the cutting area to provide habitats for species living in the decaying wood. An extensive program, on the other hand, includes a wide range of other attributes, in addition to the number of living trees left in a cutting area. In addition to testing, the sensitivity of WTP with respect to the scope of the environmental change, the respondents' decision-making processes—especially differences in them, depending on the scope of the good—are also studied. The study focuses on the question of whether the number of regulated attributes influences the beliefs an individual uses to make valuation choices. Respondents' beliefs can help us to understand valuation behavior, not only in general, but also specifically in connection with insensitivity to scope. By analyzing the differences in the beliefs of these two sample splits regarding the effects of the program, it is possible to determine whether the respondents realized the differences between the policy packets or, conversely, whether they valued the benefits of the two packets equally.

The next section reviews the discussion of the issue of scope in CV. Then we present the theoretical basis for analyzing the issue of scope in this study. Thereafter, the sample, measurements and estimation are explained. In Section 5, the effects of scope are tested, and analyses are presented to explain them. Finally, conclusions are drawn concerning the reasons for insensitivity to scope.

## 2. Insensitivity to scope

The issue of scope gained prominence in the discussion of the validity of CV in connection with a study published in 1992 in which Kahneman and Knetsch reported evidence of insensitivity to scope and suggested that CV measures willingness to pay for the moral satisfaction of contributing to a public good, not for the economic value of that good.

Several concepts, including perfect embedding, regular embedding, part-whole bias and nesting have been used in the discussion of the validity of CV with respect to the matter of scope. 'Perfect embedding' means that the value of the specific good is the same as the value of the more comprehensive good (Hovenagel, 1996), whereas in 'regular embedding', a good receives a lower value in connection with a more comprehensive good than when valued on its own. Carson and Mitchell (1995) clarified the concepts connected to the issue of insensitivity to scope by referring to 'quantitative nesting' and 'categorical nesting'. In quantitative nesting two goods are measured with a common scale and the first is more extensive than the second, e.g. project A might protect 300 trees/ha from damage, while project B undertakes to protect 200 trees/ha. In this study, we focus on categorical nesting, which occurs when goods are distinguished by changes in more than one attribute in a multivariate utility function, e.g. project A might seek to improve biodiversity, scenic conditions and recreation opportunities, while project B might seek to improve only one of these attributes.

There are two competing explanations for insensitivity to scope (Hovenagel, 1996). Critics of the CV method argue that because of the hypothetical nature of the method, respondents will always express similar WTPs across related goals. They argue that the reason for the insensitivity is that the respondents will perceive moral satisfaction, or a 'warm glow' from their altruistic contribution, and they will contribute similarly, regardless of the scope of the good. They also argue that respondents have a kind of mental account book for 'good causes', and irrespective of the description of the environmental good, they will contribute from the balance of that account in the form of WTP.

The other line of explanations has attributed insensitivity of scope to poor survey design and/or problems in administering the survey (Carson, 1997). According to this line of thought, a vague description of the good can cause any of several biases. In symbolic bias, the respondent reacts to an amenity's general symbolic meaning instead of to the level, or scope, of provision. A poorly designed good may be perceived as symbolic of a larger good. A metric bias means that the researcher might be defining the good in different units than those used by the respondent. In probability of provision bias, respondents might be skeptical that the good will actually be provided. Another reason for insensitivity has been seen in the possibility of different interpretations of joint production: the researcher believes that one good encompasses another, but the respondent finds the two goods to be indistinguishable. For example, the researcher attempts to value the health effects of clean air, but the respondent also takes the effects of clean air on visibility into account. Carson (1997) concluded that studies reflecting insensitivity to scope tend to suffer from small sample sizes or poor survey design. He also suggested that beliefs that the good will be provided vary among sub-samples involving different scopes. As one reason for this, he mentions ways of administering the survey that do not encourage respondents to pay close attention to the questions being asked. As examples, he mentions telephone or shopping mall intercepts. However, the respondent's familiarity with the good and the high personal relevance of the good is assumed to improve the sensitivity of the respondent to the scope of the good (Carson, 1997).

Sensitivity of scope has been tested internally within subjects and externally between subjects. In internal tests, the same respondent is asked about willingness to pay for different levels of the good in question. In external tests, several respondents are asked about a single level of the same good. External tests between subjects using split sample survey designs have been considered a reliable way to test the insensitivity hypothesis (Arrow et al., 1993), and this method is also used here.

## 3. Economic model

The economic model of benefit measurement considers the utility of a respondent before and after the

implementation of the EOP. It includes the scope of the program as an attribute of the utility function. The utility level can be described by an indirect random utility function (Hanemann, 1984):

$$V_i = V(w_i, \ x_a, \ c_i) + \varepsilon_{ia},\tag{1}$$

where $V_i$ is the utility level of individual $i$, $w_i$ is the income of individual $i$, $x_a$ is the scope of the program A, $c_i$ is a vector of variables describing the respondent and $\varepsilon_{ia}$ is a stochastic component.

The welfare measure compensating surplus (CS) can be defined as an amount of money which can be subtracted from (added to) an individual's income after environmental change without altering his/her utility level from the level which existed before the EOP:

$$V(w_i, \ x_0, \ c_i) + \varepsilon_{i0} = V(w_i - CS, \ x_a, \ c_i) + \varepsilon_{ia},\tag{2}$$

where $x_0$ is status quo of forest state and CS is compensating surplus (willingness to pay).

In the referendum question, an individual faces an offer to pay a given sum of money (Bid) to gain a better quality forest environment. The probability of accepting the proposed program instead of the status quo can be written as follows:

$$\Pr(\text{project}) = \Pr[Vw_i - \text{Bid}, \ x_a, \ c_i) + \varepsilon_{ia} \\ > V(w_i, \ x_0, \ c_i) + \varepsilon_{i0}],\tag{3}$$

where $V(\cdot)$ is the observable component of utility.

If the cumulative distribution of error term $\varepsilon$ is logistic, the logit model can be used for the estimation. The probability of choosing the status quo can be written as follows:

$$F_\eta(\Delta v) = \Pr(No) = \frac{1}{1 + e^{\Delta v}},\tag{4}$$

where $\Delta v = v_1 - v_0$ is the change in welfare and $F_\eta(\Delta v)$ is the cumulative distribution function of standard *logistic* variate $\eta = \varepsilon_0 - \varepsilon_1$.

Let us assume that the survey respondent is presented with forest program B, which covers attributes of program A along with other attributes that increase forest quality with scope $x_b$. If the bid is the same,

according to economic theory, the probability that program B will be chosen is higher than the probability of choosing program A. Thus, the hypothesis we are testing in this study can be stated as follows:

$$\Pr[V(w_i - \text{Bid}, \ x_b, \ c_i) + \varepsilon_{ib} \\ > V(w_i, \ x_0, \ c_i) + \varepsilon_{i0}] \\ > \Pr[V(w_i - \text{Bid}, \ x_a, \ c_i) + \varepsilon_{ia} \\ > V(w_i, \ x_0, \ c_i) + \varepsilon_{i0}].\tag{5}$$

In addition to testing hypothesis Eq. (5), we apply a theory and methods from social psychology to study the decision process of individuals facing programs of different scope. The attitude-behavior framework can be used to clarify the belief and attitude structure behind dichotomous choice (Pouta and Rekola, 2001). The attitude-behavior research in social psychology focuses on attitudes as a predictor of behavior. One example of this research tradition is the theory of reasoned action, developed by Ajzen and Fishbein (1980). According to it, an attitude is a function of salient beliefs about the attitude object, i.e. behavior in question. Each salient belief is linked to an attribute of the attitude object. The attitude is determined as a function of the strength of these beliefs ($b_i$) and the evaluations ($e_i$) associated with the attributes related to the behavior. The products of beliefs and evaluations are called expectancy-value components ($be$). They can also explain attitudes toward the public good before and after implementation of the EOP, as well as attitudes toward a policy dealing with the public good.

## 4. Methods

### 4.1. Sample

The data for this study were collected in 1998. The sample used for the mailed questionnaire consisted of 1100 Finns from age 18 to 70 and was drawn at random from the census of Finland. After the first mailing, reminder postcards and, after that, reminder questionnaires were sent to those respondents who did not respond to the earlier contacts. This produced a response rate of 49%, i.e. 541 at least partially

completed forms. Gender and age distributions of respondents were similar to those of the general population. In addition, the proportion of forest owners among our respondents corresponded to the proportion of forest owners in the general population.

## 4.2. Measurement

The questionnaire began with items that first measured participation in forest-related activities. After these warm up questions, the questionnaire elicited information about purpose, procedure, magnitude and effects of forest regeneration cuttings in Finland. The attributes of forest regeneration cuttings were also clarified with a drawn illustration of a cutting area. After that the environmentally-oriented cutting practice (EOP) was introduced to the respondent.

The sample was randomly divided into two subsamples of equal size. One sub-sample was asked to respond to a limited EOP program and the other was asked to respond to a more extensive program. The limited program included only one environmental attribute: the amount of trees left on the cutting area. In addition to the amount of trees left on the cutting area, which was 35 trees for both levels of scope, the more extensive program included five environmentally meaningful attributes (Table 1). The attributes were selected based on the public discussion concerning forest management in Finland and on the opinions of a pool of experts representing forest and environment administration and environmental organizations.

In addition to these attributes, the effects of the policy on cutting potential and expenses to respondents household were clarified in the choice table. From respondent to respondent, the expenses varied from the lowest bid of FIM[1] 100 to the highest of FIM 2500 and the respondents were informed that these were the result of compensation paid to landowners. The same bids were used for both levels of scope. In the choice table the first alternative was the PP (alternative A) and the second one was called alternative B, but it constituted of EOP following either the limited or extensive program. After being presented with the alternatives, each respondent was asked to make a choice between the status quo

practice and either the limited or the extensive program depending on which questionnaire they received.

For half of the sample we implemented the measurement of the attitudes and beliefs. In this sample the number of questionnaires containing the limited program was the same as of those containing the extensive program. The included attitude and belief items did not effect response rate, which was 50% in this sample split. For the other half of the sample attitudes and beliefs were not measured.

To determine the items for belief measurement, an elicitation study was carried out by telephone interview. A systematic sample of 50 people selected from the telephone directory answered open-ended questions about the positive and negative outcomes of forest regeneration cuttings and their regulation in Finland. Belief statements in the mailed questionnaire were constructed for the beliefs determined to be most salient in the telephone interviews. They focused on the PP, the EOP and the policy implementing the EOP. Belief and evaluation measurements concerned the effects of cuttings with PP or with EOP on forest scenery, future growth of the forest, forest fauna, flora, accessibility of forest and economic profitability of timber production. The policy beliefs concerned the effects of EOP on administration, forest planning, timber supply to forest industry, conflicts between interest groups, decision power of forest owner, unemployment and the economic status of forest owners. To determine the belief strength ($b_i$) of the six statements concerning the outcome of regeneration cutting alternatives, respondents were asked whether they agreed or disagreed on a 7-point scale (ranging from $-3$ to $+3$). A belief evaluation ($e_i$) was obtained by asking respondents to state the importance of the outcome on a 7-point scale ranging from somewhat important to extremely important.

## 4.3. Estimation

In the following analysis, we used all available usable observations to, first, test the scope sensitivity with $\chi^2$-test of dichotomous choice results. We also used the same observations to build a logit model of dichotomous choice and to test the significance of scope variable in that model. The difference in models for limited and extensive program was tested with

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[1] FIM 1 ≈ USD 0.17 (October 1999), FIM 1 ≈ € 0.17 (since the beginning of 2002).

Table 1
Choice settings

| Forest regeneration cutting alternatives | Alternative A (present practice) | Alternative B[a] |
|---|---|---|
| *Limited program* | | |
| Amount of trees to be left on the cutting area[b] | 15 trees/ha | 35 trees/ha |
| Cutting potential | 14% more than actual use | 12% more than actual use |
| Increase in annual tax of your household 1999 | No change | Tax increase of FIM 100[c] |
| | | |
| *Extensive program* | | |
| Amount of trees to be left on the cutting area[b] | 15 trees/ha | 35 trees/ha |
| Valuable biodiversity sites | Existing sites are conserved | Existing sites are conserved and sites are restored from timber production |
| Share of large (over 5 ha) cutting areas | 4% | 0% |
| Adequate scenery consideration | In 80% of cutting areas | In all cutting areas |
| Adequate water quality zones | In 80% of cutting areas | In all cutting areas |
| Ruts of land surface management | Visible 10–20 years | Disappear in 2 or 3 years |
| Cutting potential | 14% more than actual use | 12% more than actual use |
| Increase in annual tax of your household 1999 | No change | Tax increase of FIM 100[c] |

[a] Environmentally-oriented cutting practice (EOP).

[b] In addition to giving the level of attribute in each alternative, the effects of varying attribute on forest environment were described. However, exact effects in quantity terms were mostly unknown. For example, information about the effects of the trees left on the cutting area were as follows: trees left on the cutting increase slowly the amount of decaying wood in the forest. Decaying wood is necessary for old-growth insect and plant species. We have very little information about the effect of varying amounts of decaying wood on endangered species. Trees left on the cutting area have an effect on the scenery.

[c] Bid levels were FIM 100, 700, 1300, 1900, 2500 in the limited and in the extensive program.

Table 2
Choice between status quo and environmental cutting practice (EOP) according to the program scope

|  | Limited program | Extensive program | $\chi^2$ value | Significant value | $N$ |
|---|---|---|---|---|---|
| Supporters of the EOP | 42.6% | 41.3% | 0.085 | 0.771 | 503 |
| Supporters of the EOP with no cost | 70.6% | 74.2% | 0.738 | 0.390 | 453 |

Hausman test. Logit models were used to estimate truncated and overall willingness to pay for both programs. After that we, secondly, focused on those observations in which attitudes and beliefs were measured, and use analyses of variance to compare beliefs between sub-samples.

## 5. Results

Against assumptions, the share of supporters of the EOP did not vary with respect to the scope of the practice (Table 2). The split sample test did not show a statistically significant difference between limited program and the extensive program. In the extensive program with six environmental attributes, the support for EOP was even lower (41%) than that for the limited program with only one attribute (43%), although, the difference was not significant. This reveals insensitivity to the scope of the good.[2] One reason for this insensitivity might be that some respondents did not consider the sum total of the five additional attributes of the program as good. Table 2 reports the share of the respondents who considered the EOP as good. If EOP had not resulted in additional costs to the respondents, 71 and 74% of them would have supported it in a limited form or an extensive form, respectively. Although, the difference is not significant, it nevertheless excludes that explanation that most respondents considered additional attributes of extensive program as bad.

Logit models were used to analyze the nature of the scope variable further (Table 3). In the logit model for all observations the bid, some socioeconomic background variables, responses to some opinion statements and the scope variable were tested to determine their ability to explain the probability that the EOP would be chosen.[3] The coefficient of the bid was negative and significant. Of the socioeconomic variables, higher education increased the probability of supporting the EOP. On the other hand, the coefficient of the income was not significant in the model. Those respondents who lived in southern Finland were more likely to support the EOP than respondents from other parts of the country. Those respondents who managed their own forest lands as a leisure activity were more likely to support the status quo than an EOP. Some of the coefficients of the opinion statements were very significant. If respondents reported that they could not afford the EOP or that they were pleased with the current cutting practice, they were more likely to support the status quo. However, the main goal of the logit model was to analyze the coefficient of the scope variable. The logit model confirms the scope insensitivity shown in Table 2, as the coefficient of the scope is not significant.

To analyze possible differences between sample splits in greater detail, logit models for both scopes of EOP were built. Although, the Hausman test between both models did not reveal any structural differences in the data of the sample splits, there were differences in the statistical significance of some coefficients. Education increased the probability of choosing the EOP only if the EOP was extensive. This can be related to the ability to weigh larger amount of arguments of extensive program. Living in southern Finland, on the other hand, increased the likelihood of choosing the EOP only if the program was limited. Managing forest land as a leisure activity decreased the probability of choosing the EOP only in the case of extensive program.

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[2] The same analysis was also applied to the group of forest owners, but because there was no significant difference between either scope, we do not report it here.

[3] In addition, we tried many other socioeconomic variables including gender, age and forest ownership. However, all of them were excluded as non-significant. In addition, the variable that indicates whether attitudes and beliefs were measured was tested, but then excluded from the model as non-significant (for comparison see Pouta, in press).

Table 3
Logit model for dichotomous choice

| | All observations | | Limited program | | Extensive program | |
|---|---|---|---|---|---|---|
| | B | Significant value | B | Significant value | B | Significant value |
| Constant | 4.168 | 0.0000 | 0.8219 | 0.4519 | 0.3093 | 0.7816 |
| Bid | − 0.4278E − 3 | 0.0073 | − 0.42845E − 3 | 0.0606 | − 0.4693E − 3 | 0.0452 |
| Education | 0.2271 | 0.0052 | 0.0885 | 0.4280 | 0.3621 | 0.0031 |
| Income | − 0.0371 | 0.5940 | − 0.0083 | 0.9333 | − 0.0665 | 0.5274 |
| Living in south | 0.5107 | 0.0618 | 0.7876 | 0.0458 | 0.2138 | 0.5931 |
| Forest work as a hobby | − 6513 | 0.0354 | − 0.0622 | 0.8905 | − 1.0817 | 0.0163 |
| Statement: EOP more important than income | 0.6386 | 0.0000 | 0.6738 | 0.0000 | 0.6111 | 0.0000 |
| Statement: income more important than EOP | − 0.1684 | 0.0675 | − 0.1147 | 0.4023 | − 0.1891 | 0.1475 |
| Statement: cannot afford | − 0.2586 | 0.0003 | − 0.2890 | 0.0037 | − 0.2280 | 0.0315 |
| Statement: pleased with current practice | − 0.4466 | 0.0000 | − 0.5486 | 0.0001 | − 0.3968 | 0.0025 |
| Scope | 0.0697 | 0.7935 | | | | |
| | | | | | | |
| N | 424 | | 221 | | 203 | |
| Model $\chi^2$ | 228.87 | | 128.62 | | 108.33 | |
| Restricted log likelihood | − 290.45 | | − 151.28 | | − 139.16 | |
| Log likelihood | − 176.01 | | − 86.97 | | − 84.99 | |
| Percent correct | 79.72 | | 82.35 | | 80.30 | |
| Hausman test statistic between limited and extensive program | | | 7.8401 | | | |
| Hausman test significance | | | 0.4069 | | | |

Table 4
Willingness-to-pay estimates (FIM 1 ≈ USD 0.17 in October 1999, FIM 1 ≈ € 0.17 since the beginning of 2002)

| | All observations | Limited program | Extensive program |
|---|---|---|---|
| The truncated mean[a] | 1782 | 1742 | 1680 |
| Standard deviation[a] | 452 | 639 | 548 |
| 95% confidence intervals[a] | [1739, 1825] | [1658, 1826] | [1605, 1755] |
| The overall mean[b] | 313 | 241 | 388 |
| Standard deviation[b] | 467 | 590 | 526 |
| 95% confidence intervals[b] | [269, 357] | [163, 319] | [316, 460] |
| | | Test statistic | Probability |
| $t$-Test for truncated means | | 1.0749 | 0.2830 |
| $t$-Test for overall means | | 2.7119 | 0.0069 |

[a] The willingness-to-pay distribution is constrained to be non-negative.
[b] The willingness-to-pay distribution is not truncated, and the support range from $-\infty$ to $+\infty$.

Table 4 reports the mean willingness to pay for implementation of an EOP. In the case of means that were truncated to be non-negative there were no significant differences between the two scopes. Mean of one program fitted inside the 95% confidence intervals of the other program. Instead, based on the estimates of overall means, the respondents in fact were sensitive to scope. There, $t$-test showed that WTP estimates differed significantly. The mean WTP for the extensive program was significantly higher than the mean WTP for the limited program. From the estimated means of WTP and from coefficients of the bid in logit models, we can see that likelihood of choosing the EOP was higher in the extensive program than in the limited program with low bid levels but lower if the level of the bid was high. From these two contrasting means the overall mean can be recommended for policy purposes. The overall mean does not truncate the WTP so that it becomes non-negative, and the data reflected some negative WTPs in this study (Table 2).

We used analysis of variance to test if the beliefs about the effects of the regeneration cutting in a limited or in an extensive program differed (Table 5). The results show that the means of beliefs regarding each outcome of cutting did not differ significantly in any of the cases (first six statements). This suggests that respondents in the limited program group considered the environmental benefits of new cutting practice similarly as did the group of respondents who were given the extensive program.

However, in the beliefs concerning the implementation of the policy, there were significant differences between the sub-samples of varying scope. The extensive program was regarded more as a source of increased administration ($P$-value 0.004), but also as a source of forest management based on forestry plans ($P$-value 0.076). The respondents who faced the extensive program considered that the EOP would increase unemployment more than the respondents in the limited program group ($P$-value 0.001). This happened in spite of the fact that both groups were informed that implementing EOP will not have an effect on employment. Also, forest owners' control over their forest property was considered to be restricted more in the group of extensive program ($P$-value 0.001).

## 6. Conclusions

Our study reports the results of a split sample scope test that compared the valuation results of two levels of environmentally-oriented cutting practices. Two program levels were tested by introducing two different sets of regulated attributes of cutting areas, viz., a limited program and an extensive program. Increasing the number of attributes of the good had no effect on the probability of choosing the environmentally-oriented forest regeneration cutting practice. In that sense the respondents were insensitive to the scope of the good. The scope variable was not significant in the logit model of dichotomous choice. However, the

Table 5
Beliefs concerning the outcome of regeneration cutting and its implementation with regard to the scope of the program (scale 1 (totally disagree) – 7 (fully agree)) analysis of variance

| | Limited program | Extensive program | | |
| --- | --- | --- | --- | --- |
| | | Mean | F | Significant value |
| Alternative forest regeneration cuttings... | | | | |
| reduces scenic beauty | 3.33 | 3.32 | 0.000 | 0.984 |
| guarantees future growth | 4.57 | 4.47 | 0.057 | 0.811 |
| diminishes fauna diversity | 3.44 | 3.39 | 0.071 | 0.790 |
| diminishes flora diversity | 3.33 | 3.33 | 0.927 | 0.337 |
| hinders hiking in the forest | 3.41 | 3.53 | 0.310 | 0.578 |
| is economically efficient | 4.04 | 4.09 | 0.022 | 0.886 |
| | | | | |
| Implementing the program... | | | | |
| increases administration | 3.81 | 4.45 | 8.35 | 0.004 |
| increases management based on planning | 4.73 | 5.07 | 3.169 | 0.076 |
| reduces timber supply to forest industry | 3.91 | 4.06 | 0.482 | 0.488 |
| increases conflicts between interest groups | 4.55 | 4.64 | 0.203 | 0.653 |
| narrows the decision-making power of forest owner | 4.57 | 5.09 | 6.611 | 0.011 |
| increases unemployment | 3.23 | 3.99 | 10.941 | 0.001 |
| has negative effect on the finance of forest owners | 4.08 | 4.33 | 1.245 | 0.266 |

overall mean of the extensive program was significantly higher than the mean of the limited program.

Analysis of variance showed that respondents' beliefs with regard to biodiversity conservation, forest scenery, outdoor recreation environment or economics of timber production were similar regardless of the scope. Many attributes of the extensive program, including share of large cutting areas, adequate scenery considerations and regulation of ruts of land surface management, could for good reason, be assumed to have an effect on perceptions of scenic beauty and recreation opportunities. However, the beliefs of the respondents who received the extensive program concerning these matters were similar to those who received the limited program. This reveals the difficulty of describing forest attributes in a meaningful way, which can be one reason for insensitivity. In the previous literature the respondents' familiarity with the good and the high personal relevance of the good was assumed to improve sensitivity to the scope of the good as well as high quality survey design (Carson, 1997). We can conclude that despite the high relevance of forests to this Finnish sample, describing forest attributes and changes in their levels in meaningful way proved to be difficult. This difficulty is especially apparent in policy level studies that are not linked to any specific location or site (Loomis et al., 1993). In addition, the lack of existing ecological

information of the effects of proposed policies may be another reason for insensitivity. When evaluating the quality of the survey design and administration with respect to insensitivity, the only apparent improvement could have been to conduct the survey in personal interviews; however, this was not possible for budget reasons.

However, beliefs related to implementing the policy differed between the two groups. The respondents who valued the more extensive program believed that it would increase administration and unemployment and would limit the forest owners' decision-making power more than did the group valuing the limited program. It is evident that respondents considered programs as packages that included not only the good but also the policy through which the good is offered and the effects of that policy (Fischhoff and Furby, 1988). Even though both groups were informed that there would be no increase in unemployment, respondents who received more extensive environmental good nevertheless assumed larger unemployment effects. Perhaps the perceptions were based on widely accepted beliefs that stricter environmental controls would restrict operating freedom and cause unemployment, regardless of what the proposed research scenarios state would occur. It seems that scope insensitivity is related to the joint production type of situation described by Carson (1997); the

respondents related other benefits or negative effects to the extensive good than those which the researcher intended.

The attributes of the programs were selected based on the public discussion concerning forest management in Finland. In addition to criticism of the guidelines regarding the number of trees left on the cutting area, concerning other attributes included in the extensive program also came in for negative comments. However, it is possible that even though the current level of these attributes of forests was publicly criticized, respondents could more clearly visualize with the help of the additional attributes how satisfactory they perceived the current state. It is possible that information about the additional attributes caused them to recognize that the marginal increases in benefits were not worth the social costs of additional regulation.

In addition to reporting the results of the scope test, the study reported the actual willingness to pay amounts for two programs. The overall means of both programs that were designed to produce environmentally-oriented cutting practices were positive. These results provide information for cost benefit analyses to evaluate cutting alternatives for policy-making purposes.

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