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Participation and compensation claims in voluntary forest landscape conservation: The case of the Ruka-Kuusamo tourism area, Finland

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ABSTRACT

The expansion of nature-based tourism on private land requires new mechanisms to coordinate tourism industry and commercial forestry interests. This attribute-based contingent valuation study elaborated the supply side of potential payments for ecosystem services (PES) mechanism named Landscape and Recreational Values Trading (LRVT), proposed to enhance the provision of amenity values in privately owned forests located in tourism and recreation areas. Using a mail survey data set, we analyzed forest owners' willingness to participate in LRVT and the related compensation claims in the Ruka-Kuusamo area, Finland. We found that more restrictive rules regarding forest management practices decrease the probability of participating and increase forest owners' compensation claims in LRVT. Furthermore, forest owners seem to claim more compensation if, instead of private negotiations, competitive tendering is used to make contracts. Moreover, besides the protection of landscape values, biodiversity protection may be a motive for participation. This indicates that, in addition to improved landscape quality, respondents gain personal benefits from enhanced biodiversity in their own forests. The results can help in designing and implementing a future payment mechanism for the provision of forest landscape and recreational values in terms of how to proceed and whom marketing and recruiting efforts should target.

Introduction

Nature-based tourism in forested regions

Nature-based tourism (NBT) is an important and growing economic sector in Central and Northern Europe and has high potential in the forest-rich countries in Eastern Europe. In Finland, Norway and Sweden, the growth potential for new tourism business is included in the current bioeconomy strategies (Finnish Bioeconomy Strategy, 2014; Sustainable Innovatio, 2013; Swedish Research and Innovation Strategy, 2012), and the growth relies strongly on an increased number of foreign visitors, including those from outside Europe (e.g., Roadmap for Tourism, 2015; Tyrväinen et al., 2017b). NBT companies typically operate in rural regions. They are often small, and they cooperate with other companies, resource users and resource owners — namely, landowners. NBT entrepreneurs, however, face different socio-political contexts, protection regimes and ownership statuses in different regions and countries (Bell et al., 2008; Fredman and Tyrväinen, 2010). Some entrepreneurs have established their service mainly in publicly owned protected areas, but, in some areas and regions across Europe, the businesses are based largely on the utilization of privately owned forests.

NBT builds on attractive nature, nature experiences and activities and is highly dependent on the quality of the natural environment (Margaryan, 2016; Tyrväinen et al., 2008). Particularly in the Nordic countries, free access to all nature areas, independent of the land ownership, i.e., the Right of Public Access, is an important asset (Kaltenborn et al., 2001; Sandell and Fredman, 2010). As a result, managed forests act as an important resource for outdoor recreation. In regions with intensive wood (biomass) production, short rotation cycles — for example, less than 60–70 years — and large management units, are often common practices in forest management. These may negatively affect the amenities of the forest landscape and thus decrease the environmental quality of forests for tourism.

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The forest preference studies conducted in Northern Europe and in the United States have concluded that people appreciate mature forests with good visibility, some undergrowth and a green field layer with no strong visible signs of forest management (e.g., Gundersen and Frivold, 2008; Ribe, 2009). In contrast, large regeneration cutting areas and direct traces of cutting, such as signs of soil preparation and logging residue, reduce the recreational quality of forests. It is, however, obvious that demand for modified forest management from tourism differs between different recreation activities and tourism seasons. A downhill skier on a mountainside may enjoy scenery located farther away than a hiker within a forest (Silvennoinen, 2017). During the summer, the traces of cutting often are more disturbing than in winter, when snow covers the ground (Tyrväinen et al., 2017a). Consequently, areas with growing tourism and recreational use are facing demands to modify forest management to maintain and enhance the landscape, recreational and biodiversity values. Adapted landscape management methods are called for in active recreational or tourism areas, in particular along trails and paths and near other tourism services and structures.

In Finland, as in some other countries, legislation poses specific requirements for the management of state-owned commercial forests to provide social and environmental services, along with timber (Act on Metsähallitus, 2016). Consequently, for example, in forest cuttings, buffer zones are left along lakes, rivers, and hiking trails to preserve wooded scenery. In practice, different uses and management goals, including the needs of tourism entrepreneurs, are negotiated within a participatory planning process. In contrast, private lands management decisions are made by individual landowners, while current forest legislation is mainly designed to safeguard renewal of forest stands and protect valuable sites for biodiversity; not to maintain landscape and recreation values (Act on changes in Forest Act, 2013). Therefore, new mechanisms in private forests are needed to enhance production of landscape and recreation values and also help in integrating tourism and commercial forestry needs and interests.

The social and economic forest benefits from amenity values can be significant, although they are not always reflected in the market prices. In fact, visitors are shown to be willing to pay for an enhanced supply of forest amenities in tourism areas, in particular for enhanced landscape and biodiversity values (Tyrväinen et al., 2014). According to a choice experiment study by Mäntymaa et al. (2018), a conservative estimate of an average willingness-to-pay per visitor for increasing quality of landscape and biodiversity in the Ruka-Kuusamo area would be 7 euros per visitor per week (i.e., 1 €/visitor/day). Assuming an estimated annual number of 500,000 registered overnight stays in the area, such a payment could eventually result in an annual revenue of half a million euros.

In privately owned forests, however, economic incentives for landowners to support the production of amenity values for public use are lacking. Therefore, the provision of these values is not adequately taken into account in forest management. Moreover, most subsidies for private-forest owners (for example, in Finland), target the enhancement of timber production (Hänninen et al., 2017). Therefore, new funding instruments that support the provision of amenity benefits on private land as well as compensation mechanisms that bring income to landowners have attracted attention in recent studies (e.g., Mäntymaa et al., 2018; Thorsen et al., 2014).

New ways to integrate nature-based tourism and commercial forestry

In Finland, a new idea for a PES system has been proposed, called Landscape and Recreation Value Trade (LRVT), in which forest owners would be compensated for voluntarily enhancing the provision of landscape and recreational values in their own forests (Tikkanen et al., 2017; Tyrväinen et al., 2014). It has been suggested that the funds for the mechanism can be collected from the visitors and tourism entrepreneurs using the area. The funding may, however, also be gathered from a combination of actors and sources from both the public and the private sector in a way that locally works the best (e.g., Payments for Ecosystem Services, 2013). To evaluate the prerequisites of the future system, it is important to assess the acceptability of the mechanism and the compensation claims among forest owners.

In Europe, public forest owners are often more inclined to consider the provision of long-term production values and public goods, while private owners are more oriented towards short-term benefits and private goods (e.g., Gorriz et al., 2014). However, private-forest ownership studies show diverse motivations, attitudes and goals linked to their ownership (Boon et al., 2004; Kuuluvainen et al., 1996; Majumdar et al., 2008). In a study by Leppänen (2010) on Finnish forest owners' objectives, owners were grouped into multi-objective owners, recreationists, self-employed owners, investors and indifferent owners. The mix of goals has increased due to urbanization and a decrease in owners' dependence on forest-based incomes. The diversification of goals may also be linked to general value changes in society (Dominguez and Shannon, 2011; Karppinen and Korhonen, 2013). In principle, the more the owners' objectives are in line with producing multiple benefits or amenity benefits, the more likely it is that they will be willing to adopt the use of voluntary instruments that enhance the provision of ecosystem services (Gorriz et al., 2014; Mäntymaa et al., 2009).

In Finland, a country with 5.4 million inhabitants, 737,000 forest owners manage some 347,000 forest holdings exceeding 2 ha of forestland (Finnish statistical yearbook of forestry, 2014). Finnish studies have recognized the increased share of multi-objective or amenity value-oriented forest owners during the past decades (e.g., Hänninen et al., 2011; Valkeapää and Karppinen, 2013). A recent study by Häyrinen et al. (2017) dealing with the future use of forests and the perceptions of non-industrial private-forest owners in Finland found that forest owners were emphasizing future value creation based on forest ecosystem services. This would mean that the use of forests would be diversified in the future beyond the dominant raw material-driven mindset. Thus, new possibilities may emerge for the provision of forest-based recreational services, cooperation with NBT and increasing value-added wood products.

So far, a lot of research on environmental benefits in a PES framework has been conducted regarding agricultural environments (Christensen et al., 2011; Lienhoopa and Brouwer, 2015 Villanueva et al., 2015, 2017). In addition, water-related issues have received extensive interest (see Martin-Ortega et al., 2013). Research on private-forest owners' willingness to engage in producing amenity benefits with PES schemes has focused largely on biodiversity conservation (e.g., Horne, 2006; Lindhjem and Mitani, 2012; Mäntymaa et al., 2009; Vedel et al., 2015a, b). There is considerably less research on how to enhance landscape and recreational values (Ovaskainen et al., 2014). As far as we know, some important topics, such as the use of competitive tendering or private negotiations in the organizing of PES, or forest owners' possible reactions to different levels of restrictions in forestry practices, have not been analyzed. Thus, there are several open questions related to participation and the compensation that forest owners would claim for making voluntary agreements to provide landscape and recreational values. There is a clear need to analyze the details of the feasibility of LRVT, as they may be crucial for the acceptance of and the willingness to participate in the mechanism, as well as the compensation, claimed by forest owners. In addition, this study sheds light on a methodological aspect. Except for the study by Moore et al. (2011), there are not very many studies in valuation literature that apply attribute-based contingent valuation method (AB-CVM). This study gives new information about the pros and cons of the use of AB-CVM.

The aim of the study is to discover private-forest owners' willingness to engage in voluntary contracts and compensation agreements to enhance the amenity benefits of forests in the Ruka-Kuusamo tourism area in northeastern Finland. Using a data set from a mail survey, we analyzed the acceptability of a new local PES system (LRVT) among forest

owners. The key research questions were: i) what is the participation rate and what are the determinants explaining the participation of forest owners in LRVT; ii) what is the average level of compensation payments claimed by forest owners and what are the determinants explaining the compensation claims; and iii) how do the compensation claims differ between segments of forest owners? In particular, we assess how the potential ways of implementing LRVT affect owners' willingness to participate and their stated compensation claims (i.e., willingness to accept, WTA). The assessment of the potential ways to implement include two attributes: first, the scope of limitations set for forest management (clear cutting versus all cutting prohibited in forests with an important landscape for nature tourism) and second, the method of making contracts (competitive tendering versus private negotiations). The comparison of the two methods of making contracts is an important methodological aspect of the study related to organizing a PES mechanism. The information on the average compensation claims is not sufficient to assess the feasibility of a new policy mechanism such as LRVT. The average stated WTA may be high, but some forest owners might be willing to participate in LRVT at a lower compensation level. Hence, it is important to consider in greater depth how the compensation claims differ between forest owners by identifying segments of respondents who are willing to participate with low compensation payments. From the policy point of view, this information helps the organizer(s) of LRVT to identify and communicate better with the potential participants in the PES system. In the case of a new system that does not yet exist, this kind of hypothetical setting is the only feasible option to study the questions.

The paper proceeds as follows. The next section presents the theoretical framework of the study, which is followed by the presentation of the case study area, survey questionnaire, data collection and sample representativeness as well as the econometric models and variables. Subsequently, the results related to forest owners' participation and compensation claims in possible LRVT is given, followed by an analysis of heterogeneity in compensation claims. Finally, the results are discussed and conclusions reached particularly from the perspective of their policy implications.

Theoretical framework

The empirical analysis utilized in this paper relies on a theoretical model, which covers the key factors affecting forest owners' decisions to participate in LRVT. A similar model has been applied previously in the context of biodiversity conservation (Langpap and Wu, 2004; Lynch and Lovell, 2003; Mäntymaa et al., 2009; Mitani and Lindhjem, 2015; Nielsen et al., 2018). In the model, forest owners have two options. First, they can choose not to participate in the incentive program and manage their forest optimally according to their forest management objectives. Second, they may choose to participate in LRVT and manage their forest as agreed in the contract during the contract period. After the contract expires, they can manage their forests again according to their objectives. The model is based on the assumption that forest owners' behavior is consistent with a well-defined utility function. Accordingly, forest owners will choose to participate in LRVT if the utility from participating (V_1) is higher than the utility from not participating (V_0), that is, $V_1 \geq V_0$.

The forest owner's utility is determined by several factors under the two options (see, e.g., Langpap and Wu, 2004 for a formal presentation). One important factor is the net harvest revenues. A forest stand yields net harvest revenues over an infinite period, and the forest owner derives utility from the net harvest revenues by managing and harvesting his or her forest stand. The contract reduces net harvest revenues by imposing restrictions on harvesting. Along with net harvest revenues, the utility consists of potential non-timber income. In addition, many forest owners value amenity services from their forests, in which case the utility depends on non-consumptive values, such as landscape scenery and biodiversity. Forest owners have heterogeneous preferences; therefore, the demographic characteristics of the forest owner, such as gender and age, as well as their attitudes, are also important factors (see, e.g., Boxall and Adamowicz, 2002; Hynes et al., 2008). Finally, the utility depends on the payment received from participating in the program. If the payment is omitted from the utility derived from the participation (V_1), the forest owner's compensation claim is defined as $C \geq V_0 - V_1$ (Mäntymaa et al., 2009). Hence, the factors that determine the participation decision also determine the forest owner's compensation claim. It is expected, however, that the factors related to the decision and the claim are not exactly the same. For example, it is likely that net harvest revenues have a stronger impact on the compensation claim than on the decision to participate, simply because harvest revenues and compensation payments are both monetary concepts. Similarly, non-monetary amenity services may have a stronger impact on the participation decision than on the compensation claim. In general, the decision to participate is mostly principled, while the compensation claim is more tangible.

Case study area, materials and methods

Case study: the Ruka-Kuusamo tourism area

Kuusamo, a town and municipality with the acreage of 5809 square kilometers, is located in northeastern Finland in an area rich in hills and fells. The population density is low (3.2 inhabitants per square km), with 70% living in the town center and the rest living in sparsely populated rural areas. About two-thirds of employed people work in services such as tourism, one-sixth work in processing industries, and about 10% work in agriculture, forestry and reindeer husbandry. As much as 84% of the municipality's total land area is forested, and 82% of the forest has non-industrial private ownership (National Forest Inventory 9, 2016).

Tourism plays a significant role in the region's economy. One of the largest ski resorts in Finland, Ruka, is situated in Kuusamo. Annually, around 1 million tourists visit Kuusamo, leaving behind a total revenue of over 90 million euros and providing full-time employment to over 800 people. The annual number of registered overnight stays in hotels with over 20 beds (excluding stays in one's own or rental cottages) is 490,000. About 23% of visitors who stay overnight are international tourists. The key tourism activities include downhill and cross-country skiing, snowshoeing, snowmobiling and husky safaris, as well as hiking, cycling, canoeing and the observation of birds and other boreal species. The current accommodation capacity is 12,000 beds, including hotel rooms and holiday homes, and 6900 holiday apartments and cottages (Facts about Ruka and Kuusamo, 2017). The area's strategic goals for developing the tourism sector include increased all-year-round tourism, increased international tourism and an increased occupancy rate of accommodation sites.

Questionnaire, data collection and sample representativeness

The survey was targeted to private-forest owners in the Ruka-Kuusamo area. The questionnaire of the survey included four sections. The first section asked for background information on the respondents' forest property and management operations over the past few years. The second section described LRVT in detail, including the main objective of preserving the beauty of landscape and preventing the disadvantages of regeneration felling by delaying cutting for 5 years. No other restrictions, e.g., hunting rights, were introduced. The structure of preserved forests would stay as they currently are or may very slowly change in the long run if the owners prolong the 5 years agreements several times. In addition, the section sought the respondents' views on the conditions of the proposed system. The third section aimed to determine the respondents' willingness to participate and the

compensation that they would claim for making a contract in LRVT. The fourth section requested a few background details on the respondents.[1] Although we presented the facts as neutrally as possible, we acknowledge that this ordering in the questionnaire could create a mental bias and affect respondents' answers. However, this ordering stimulates a more focused mental mode and prepares the respondents for providing more valid replies.

In the third section, four alternative LRVT models were presented to each of the respondents. The alternatives comprised four different combinations of two important attributes related to the implementation of LRVT. More precisely, the attributes are the potential limitations of forest management practices (clear cutting versus the prohibition of all cutting in forests that are considered to be important for nature tourism and the landscape) and the method of making contracts (competitive tendering versus private negotiations). In the survey, each respondent was asked to give a compensation claim related to these four choice sets representing different combinations of attributes resulting in a panel-type data set. The valuation technique used was an application of the attribute-based contingent valuation method (AB-CVM)[2] (Moore et al., 2011). The stated claims can be seen as WTA measures for producing a public good, in this case landscape and recreational benefits, under the considered PES initiative.

A payment-card method was used for the value elicitation. The respondents were shown a list of ascending euro amounts and asked to indicate the lowest amount of their compensation claim. For the sake of comparison, the bid vector was the same as in the study by Ovaskainen et al. (2014), which utilized a choice experiment. The bid vector was €30, €60, €120, €180, €240 or €300 per annum per hectare; that is, the stated WTAs were reported in 6 interval categories. The respondents were told that the contract period is 5 years[3] and the payment is received annually. In defining the bid vector, the highest bid was determined as the level that at least covers the opportunity cost caused by joining LRVT and resulting from the lost timber revenues in typical mature forest stands in the vegetation zone where Ruka-Kuusamo is located. However, to ensure that the range of bids shown on the card would not truncate the distribution of the WTAs, there was also an option "larger than €300," in which the respondents were able to give an exact monetary value (a point value) in case their WTA exceeded the bid vector. In addition, the choice sets included the options "I would not be willing to participate" and "I would make a contract without any compensation." The latter equals a zero value (€0) response.

Two versions of the questionnaire were developed. In contrast to the basic version, the framing in the other version was altered to emphasize that the harvest restrictions for enhancing the landscape quality would also increase the biodiversity in a forest stand included in LRVT. One half of the respondents were asked to answer the basic version of the questionnaire without such an emphasis and the remaining respondents were given the modified version with the emphasis.

Using the register of the members of the Forest Management Association, Kuusamo (the local forest owners' association), the sample of the survey, consisting of 1335 persons, was selected from the population of approximately 3050 private citizens owning forests in Kuusamo municipality. More precisely, the sample was formed so that all the forest owners (1151) in the Ruka-Kuusamo hotspot area, that is, the area around the Ruka tourism resort and the Kuusamo town center as well as the area between them, were included in the sample. An additional randomly selected group of forest owners (184) who own forests across the rest of Kuusamo municipality and located near the NBT companies operating in the area was included in the sample.[4] Note that, although they own forests in this specific area, these persons may live anywhere in the country. The survey was conducted as a postal survey between December 2016 and February 2017 and produced 476 responses, achieving a response rate of 35.7%.

We assessed the representativeness of our results to findings of a national Finnish forest owner survey conducted by Hänninen et al. (2011). We compared some socio-economic characteristics between the respondents of the Ruka-Kuusamo survey and the forest ownership structure of the forestry center region Northern Ostrobothnia, to which Kuusamo belongs (Table 1). The respondents of the Ruka-Kuusamo data are more often male and more often older than those in the national study. Notably, however, the results by Hänninen et al. (2011) describe the situation in 2009, and since that year the average age of Finnish people, including forest owners, has increased steadily. The fact that the acreage of forest property is larger in the Ruka-Kuusamo study than in the Northern Ostrobothnia region, specifically 73.4 vs. 39 ha, seems to show that the present study more often reached those who own larger-than-average areas of forests. As a conclusion, the results of this article do not necessarily represent typical Northern Ostrobothnian forest owners' views. Instead, the survey probably received answers from those owners who are more interested than average in the relationship between forestry and tourism in the region.

Econometric models

In our quantitative analysis of forest owners' willingness to participate in LRVT and the potential compensation claimed from the system, we used a Heckman-type sample selection model (HM) including a two-step estimation procedure as follows: The first step of HM involves a binomial random-effects probit model of forest owners' participation in LRVT. The second step involves a model for explaining the stated WTAs relating to an agreement for the protection, and increasing the quality, of the forest landscape within LRVT. In the following, these two models are named the forest owner participation model and the compensation claim model. Only those respondents who were willing to participate in LRVT revealed their WTA in the survey; therefore, a sample selection model is appropriate for the analysis. In the Heckman two-step estimation method, a bias correction term is estimated in the first step and used as an additional independent variable in the second step (Heckman, 1979). A similar modeling approach has been used previously in the context of biodiversity conservation (Mäntymaa et al., 2009). In contrast to the previous study, we utilized an interval model suitable for analyzing observations obtained by a payment card (interval) method in the second step.[5] In the model

[1] A group consisting of 10 forest owners and forestry experts was asked to comment and refine the survey instrument. Overall, the respondents were comfortable with the survey and did not perceive any bias in the material. However, minor formatting changes were made as a result of the comments.

[2] In addition to AB-CV, we also tested the use of choice experiments (CE) in this context. We found that the test respondents had difficulties responding to the CE choice sets we presented. The reason for this may be that answering a CE survey is cognitively more demanding than that of an AB-CV survey. In this case, this fact may be more serious than usual, as the average age of forest owners both in Finland and in the case study area is high, at about 62 years. This fact might have lowered response activity and reduced the data set. On the other hand, despite using AB-CV, we included in the questionnaire the two most important attributes of our case study, i.e., potential limitations of forest management practices and the method of making the contract. In addition, for bringing costs to respondents' thinking process, the former attribute reduces the danger of the scope effect of the valuation.

[3] The length of a contract period in voluntary forest biodiversity conservation was tested by Horne (2006). It was found that short contract periods were preferred to longer ones. The advanced age of forest owners may be a reason why many respondents did not want to tie the hands of their heirs with a long-standing contract. In our study, the choice of a 5 years period was a part of our strategy to attract more respondents to reveal their preferences related to contracts.

[4] The same sample was used in an earlier study conducted in the same region in 2012 (Ovaskainen et al., 2014).

[5] Yuan et al. (2015) used the two-step procedure, linking a probit model and an RPL model in valuing farmland conservation easements.

Table 1
Socio-demographic characteristics of the Ruka-Kuusamo respondents and the Northern Ostrobothnia region.

		Kuusamo	Northern Ostrobothnia[a]
Sample size[b]		367	
Gender (%)	Female	16.1	28
	Male	83.9	72
	All	100	100
Age (years,%)	Below 45	6.9	13
	45–54	12.1	18
	55–64	26.1	31
	65–74	34.1	22
	75 or above	20.9	15
	All	100	100
	Mean	64.3	60
Area of forest property (ha)	Mean	73.4	39

[a] Source: Hänninen et al. (2011).
[b] The number of observations varies between questions.

estimations, the SAS LIFEREG procedure (SAS Institute Inc., 2015) was used, in which the WTAs from the payment card were treated as interval censored. In addition, the exact WTAs that exceeded the bid vector of the payment card (> €300) as well as zero values (€0) were treated as uncensored observations.[6]

In addition to HM, we utilized latent class models (LCMs) to further investigate forest owners' heterogeneous preferences for compensation claims in LRVT. Regarding the feasibility and cost efficient implementation of a new PES such as LRVT, it is important to identify the forest owners with low compensation claims and the factors that characterize them. These respondents are most likely to be willing to make a contract with affordable compensation in LRVT. Therefore, we investigated forest owners' heterogeneous preferences for LRVT using LCMs to analyze the data set. As LCMs allow the identification of distinct segments of preferences, with their relative sizes, the approach is particularly relevant from the policy perspective. In this sense, we were interested in how the stated WTAs differ between respondents.

LCMs are widely applied in analyzing choice experiment data (see, e.g., Boxall and Adamowicz, 2002 for a seminal study and Juutinen et al., 2017 for a recent application). In contrast, we applied LCMs in the context of contingent valuation. The LCMs were estimated using the LIMDEP GROUPED DATA procedure with panel data specification (Greene, 2012).

Variables

In the model estimations, we employed the variables shown in Table 2. The binary dependent variable in the forest owner participation model (the first step of HM), PARTICIP, describes the forest owner's decision on whether or not to participate in LRVT with any compensation. The dependent variable WTA1, i.e., monetary amount of compensation claimed by forest owners within LRVT for 5 years, was used in the second step (the compensation claim model). It describes the stated WTAs obtained by the survey, including both exact responses and categorical responses. The dependent variable WTA2, used in the LCM analysis, includes only categorical data. For that purpose, the original exact WTA responses were categorized using two alternatives. First, the responses larger than €300 and smaller than or equal to €1000 were assigned to the second-to-last category and the responses larger than €1000 were assigned to the last category. In the second alternative, the responses larger than €300 were dropped from the data, which allowed us to elaborate the impact of large WTAs on the results.[7]

The potential explanatory variables for the models used in the analysis were selected following the theoretical framework presented in the previous section. However, as many potential variables represent different indicators of the theoretically justified factors, we included only the statistically significant variables in the final models.

The theoretical model suggests that harvest revenues (i.e., opportunity costs of contracting) should be taken into account when examining landowners' decisions to participate in LRVT and their compensation claims. Information on stand characteristics is needed to assess the future net harvest revenues of a forest stand (see, e.g., Juutinen et al., 2013; Mäntymaa et al., 2009). As we did not consider a specific stand, it was not possible to estimate the net harvest revenues. However, the future net harvest revenues depend on the features of a contract; that is, the harvest restrictions that are agreed between the forest owner and the program authority to maintain and enhance the landscape values. For that purpose we used the variable RESTRICT, which takes the value 1 if all cutting is prohibited and 0 if only clear cutting is prohibited. Hence, the expected sign of RESTRICT is negative, because the tighter the harvest restriction, the larger the lost harvest revenues (Lindhjem and Mitani, 2012). We also included a binary variable CCUT, which takes the value 1 if a respondent has used clear cutting as the main method of final felling in his or her forests and 0 otherwise. The expected sign of CCUT is negative, because a forest owner may have a negative attitude towards a contract that prohibits the management practices that he or she has used as the main harvest method.

The variable BIODIV was used to capture forest owners' preferences for biodiversity benefits and to assess whether biodiversity arguments would be effective in marketing LRVT. BIODIV is a binary variable that splits the sample into two sub-samples on the basis of whether BIODIV = 1 or not (BIODIV = 0). The framing in the questionnaire emphasized the fact that harvest restrictions for enhancing the landscape quality would also increase the biodiversity in a forest stand included in LRVT. Respondents who received the questionnaire emphasizing the biodiversity benefit should be more willing to participate in LRVT (they may also claim smaller compensation payments) than respondents who received the basic version of the questionnaire if they value biodiversity benefits. This has been shown in previous studies by Langpap and Wu, 2004,; Juutinen et al. (2013), and Vedel et al. (2015b), for instance. In this case biodiversity arguments in marketing LRVT would be likely to increase the participation rate. If the effect of framing is not significant, respondents' preferences for biodiversity are minor. The variable SUPPL describes the proportion of forest hectares that a respondent is ready to supply for LRVT. Therefore, it indirectly captures forest owners' preferences for amenity services, such as landscape values. The more a forest owner appreciates the amenity services, the larger the share that he or she may be willing to offer. This is because optimal rotation of a forest stand will be longer and opportunity costs of contracting lower, when the contract enhances the amenity services, i.e., the marginal valuation of amenity services increases with

[6] Our data consist of both interval and point value responses. The SAS LIFEREG procedure is theoretically consistent with this data structure. However, it was not possible to take into account the panel structure of the data when applying the SAS LIGEREG procedure; that is, the responses were treated as independent in the second step of the Heckman model. In addition, it was not possible to estimate the joint probability of the likelihood functions of the two models; therefore, the Heckman two-step model was utilized. Selection models have not been developed for more complex response data and panel data for limited dependent variables (Yuan et al., 2015).

[7] We tested several grouping alternatives for the exact WTAs larger than €300, but the results were qualitatively similar. The zero WTA values were taken into account in the LCM analysis by setting the first limit value equal to one in the grouped data model; that is, the zero values belong to the first interval, which is smaller than €1. The second limit value is 30. Hence, the bid €30 belongs to the second interval, which is larger than or equal to €1 and smaller than €30. We also tested another functional form for the WTA equation by taking the natural logarithm of the limit values, but this did not improve the performance of the model. For technical details of the grouped data model, we refer interested readers to Greene (2012).

Table 2
Description of the variables used in the analysis.

Variable	Description	Mean	Std dev.
Dependent variables			
PARTICIP	Whether a forest owner would make a contract or not; binary variable: 0 = no, 1 = yes (43%).		
WTA1	Monetary amount of stated compensation claimed by forest owners within LRVT for 5 years; revelation technique: payment card; bid vector: €30, 60, 120, 180, 240, 300/year/ha; more than €300 (= the exact value given by a respondent)/year/ha; the answer "I would not ask for any compensation" equals €0/year/ha.	348.49[a]	403.26[a]
WTA2	Monetary amount of stated compensation claimed by forest owners within LRVT for 5 years; WTAs are coded into 1, 2,…, 9 categories; the first category (zero WTAs) equals the interval $y^* < 1$; the second category (€30): $1 \leq y^* < 30$; the third category (€60): $30 \leq y^* < 60$ and so on; the eighth category: $300 \leq y^* < 1000$; and the ninth category: $y^* \geq 1000$.	n.a.	n.a.
Independent variables			
RESTRICT	Restrictions of management practices in forest stands included in the agreement of LRVT; binary variable: 0 = clear cutting prohibited, 1 = all cutting prohibited (50%).		
CCUT	Respondent used clear cutting as the main method of final felling in her/his forests; binary variable: 0 = no, 1 = yes (27%).		
BIODIV	The framing of the questionnaire emphasizes that total cutting prohibition to enhance the landscape quality would also increase the biodiversity in a forest stand included in LRVT; binary variable: 0 = no, 1 = yes (52%).		
SUPPL	Proportion of forest hectares that a respondent is ready to supply for LRVT; ratio, continuous variable.	0.20	0.31
RURAL	Importance of the allocation of more money to increase the quality of the rural landscape in the respondent's opinion; four-grade scale: 4 = high priority … 1 = no priority.	3.30	0.75
INCOME	Respondents earning more than €6000/month after taxes; binary variable: 0 = no, 1 = yes (7% or 22 obs.).		
GEND	Respondent's gender; binary variable: 0 = female, 1 = male (84%).		
INTER	Respondent was interested in joining LRVT; five-grade Likert scale: 5 = very interested … 1 = not interested at all.	2.55	1.27
NOCUT	Respondent refrained or interested in refraining from all cutting in her/his mature forests; binary variable: 0 = no, 1 = yes (35%).		
NEGOT	Method of making contracts; binary variable: 0 = with competitive tendering, 1 = with private negotiations (50%).		

[a] Calculated from the class midpoints of the bid vector of the payment card.

stand age (Hartman, 1976; Koskela and Ollikainen, 2001; Juutinen et al., 2013). Similarly, at a more general level, the variable RURAL reflects amenity services, as it describes a respondent's view of the importance of the allocation of more money to increase the quality of the rural landscape.

The binary variable INCOME takes the value 1 if the respondent's monthly income is more than €6000 and 0 otherwise. It is typical that WTP values increase with income, but the impact of income is not clear when the WTAs are examined. For example, the respondents with high incomes may be more likely to participate and claim a lower compensation payment, because they are not particularly dependent on the harvest revenues (Langpap and Wu, 2004; Uusivuori and Kuuluvainen, 2005). In addition, Kuuluvainen et al. (2014) have shown theoretically that in the single-stand forest rotation model, which accounts for amenity valuations, forest owners' increasing permanent income lengthens the rotation. For our case, this indicates that forest owners with high incomes have higher amenity values leading to smaller compensation claims. On the other hand, they may claim high compensation amounts, because marginal utility of money diminishes as income rises.

The variable GEND takes the value 1 if a respondent is male and 0 otherwise, capturing respondents' heterogeneous preferences in the analysis. Previous studies have shown that females typically have stronger positive preferences for environmental concerns than males (e.g., Xiao and McCright, 2015; Zelezny et al., 2000). However, there are also evidence that males are participating more eagerly and requiring smaller compensations than females in incentive programs targeted to forest biodiversity conservation (Lindhjem and Mitani, 2012; Mitani and Lindhjem, 2015). The variables INTER and NOCUT were merely used as control variables to assess the validity of the results. The larger the INTER value, the more interested a respondent is in joining LRVT. Hence, INTER should have a positive sign in explaining participation. The variable NOCUT receives the value 1 if a respondent has refrained or is interested in refraining from all cutting in his or her forest, indicating that the opportunity costs of participation in LRVT are low. Hence, this variable should have a negative sign in explaining compensation claims. Finally, to provide information for mechanism design, we included the variable NEGOT to capture the method of making contracts; that is, if contracts are made through private negotiations, NEGOT takes the value 1, and, if competitive tendering is applied, NEGOT takes the value 0.

Results

Participation and compensation claims

Both the forest owner participation and the compensation claim model show a reasonable fit to the data, and the parameter estimates mostly have the expected signs (Table 3). The statistically significant coefficient of IMILLS (a bias correction term also called the inverse Mills ratio or the hazard rate) in the compensation claim model

Table 3
Parameter estimates of the forest owner participation and compensation claim models in the Landscape and Recreation Value Trade (LRVT) mechanism.

Variable	Coefficient	Std error	Pr > ChiSq
First step of the Heckman model: forest owner participation			
CONSTANT	***–9.6974	2.1873	< 0.0001
RESTRICT	***–1.3841	0.2210	< 0.0001
NEGOT	0.2032	0.1785	0.2552
BIODIV	**1.4002	0.6430	0.0297
CCUT	*1.2190	0.6737	0.0708
INTER	***2.2864	2.1873	< 0.0001
SUPPL	***3.4666	1.2762	0.0067
GEND	1.2954	0.8901	0.1460
RURAL	*0.8028	0.4434	0.0706
Fit statistics			
−2 log likelihood		536.54	
BIC (smaller is better)		592.64	
N		1042	
Second step of the Heckman model: compensation claim			
CONSTANT	***343.07	35.8425	< 0.0001
RESTRICT	*72.83	38.4113	0.0580
NEGOT	*–65.35	38.0422	0.0858
NOCUT	***–142.31	41.4136	0.0006
INCOME	**148.98	64.2678	0.0204
IMILLS	***384.01	78.0198	< 0.0001
Scale	427.49	14.0092	
Fit statistics			
−2 log likelihood		4250.09	
BIC (smaller is better)		4294.05	
N		534	

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

indicates that the use of the sample selection approach was appropriate for avoiding selection bias.

In the forest owner participation model, several factors were significant in explaining forest owners' decisions to participate in LRVT. If the restrictions to management practices in forest stands prohibited all cutting (RESTRICT), the tendency to participate in the mechanism decreased compared with a reference case in which only clear cutting was prohibited and selective harvesting was allowed. If a forest owner has to restrict his or her management options more, he or she will be less eager to join. Notably, the estimate of NEGOT is not significant, indicating that the method of making contracts — namely, the use of private negotiations or competitive tendering — was not important for the respondents when they were considering their decision to participate.

The positive sign of the BIODIV coefficient shows that emphasizing the biodiversity improvement in the framing of the valuation question of the survey increased the probability of participation. Additionally, those who have used clear cutting as their main method of final felling in their forests (CCUT) are more often willing to participate. INTER also has a positive sign, indicating that the more interested a respondent is in participating in LRVT when asked separately before the valuation question, the more often she or he shows the same interest later in the WTA section of the survey. This is, of course, a circular argument and the obvious reflection of respondents' positive attitudes towards landscape protection but advocates the validity of the forest owner participation model.

The plus sign of SUPPL means that the larger the proportion of forest area that a respondent is ready to supply for LRVT, the more likely it is that she or he is willing to participate. The positive coefficient of GEND means that if a respondent is male, he is more likely to participate. Although the estimate of GEND is not significant, we kept the variable in the model as it captures the effect of respondents' heterogeneity in the model. Finally, the higher the respondents prioritize the rural landscape in terms of the allocation of more money to public goods in general (RURAL), the greater the probability that they will be willing to participate in LRVT.

In response to the follow-up question regarding the reason for not participating in LRVT, the following arguments accounted for most of the choices: "there are no sites of special scenic importance in my forests" (16.5% of respondents), "landscape and recreational values will be preserved in my forests without agreements restricting cutting" (16.3%), "regardless of compensation, I don't want to have any constraints on what to do in my forests" (12.7%) and "I don't need a mechanism like LRVT to disturb my present practices of good forest management" (12.1%).[8] In the light of the comments given in the survey, these responses partly reflect the suspicion and skepticism that the respondents feel regarding this new mechanism.

As a starting point for the analysis of stated WTAs, we calculated that the mean value of compensation claims by forest owners was €328.9 per hectare per year with 95% confidence limits of €300.3–€357.5.[9] In the compensation claim model, the monetary amount of compensation (WTA1) claimed by forest owners in LRVT is explained by five significant variables (shown in the lower part of Table 3). CONSTANT shows the average reference compensation payment, specifically the annual monetary amount per hectare (€343) that owners claim for a contract; that is, not captured by the other explanatory variables.[10] With respect to the restrictions to management practices in forest stands included in LRVT, the case in which all cutting is prohibited (RESTRICT) tends to increase claims by €73/ha/year compared with a reference case in which only clear cutting is prohibited. The logic here is clear: if a forest owner has to restrict his or her harvesting possibilities more, he or she has to be paid more. The mechanism design also matters. If contracts are to be made through private negotiations (NEGOT) instead of competitive tendering, the owners would claim €65 per hectare per year less. Hence, the respondents seem to prefer private negotiations to competitive tendering. In addition, if a respondent has refrained or is interested in refraining from all cutting in his or her mature forests (NOCUT), he or she would claim €142 per hectare per year less compensation than otherwise. Finally, respondents who earn more than €6000 per month (INCOME) after taxes would claim €149 more compensation annually for a 1 ha increase of forest included in a LRVT contract than the rest of the respondents.

Heterogeneity in compensation claims

We analyzed heterogeneity in compensation claims estimating LCMs with two slightly different data sets. The first model included all the respondents' compensation claims. In the second model, we excluded claims higher than €300 from the data set. The excluded responses can be considered as protest bids. Alternatively, these bids can include some other values than lost harvest revenues caused by the contracting; for example, landowners' expectations of high land values in construction use. We examined respondents' "taste" variation for the harvest restrictions (RESTRICT) and the mechanism design (NEGOT). To shed further light on the differences in the stated WTAs between classes, we used INTER as a class membership variable. Two-class models were used in the LCM analysis.[11]

The WTAs differ considerably between the two classes (Table 4). The coefficient of CONSTANT presents the average reference WTA that is not captured by the other explanatory variables. Hence, class 1 clearly has a higher WTA (€712) than class 2 (€162) in the first model, which includes responses larger than €300. The outcome has a similar pattern in the second model, in which responses larger than €300 are excluded, but the WTAs are clearly lower (i.e., €319 and €82), and the difference in WTAs between the two classes is substantially smaller. The class probabilities of the models show that 23.9% belong to class 1 and 76.1% to class 2 in the first model, while, in the second model, the allocation of the observations between the classes is more equal, specifically 44.1% and 55.9%, respectively. These results indicate that about 37% of all the respondents (476) are willing to participate in LRVT with average compensation of €177 per hectare per year (large claims included) and about 20% are willing to participate with compensation of €99 (large claims excluded), respectively.

The coefficient of RESTRICT is strongly significant for both classes in the second model, indicating that forest owners claim more compensation for a contract that, instead of clear cutting, prohibits all cutting in forests included in a LRVT contract. Interestingly, RESTRICT is not significant for class 1 in the first model. Hence, this segment of respondents, which has the highest stated WTA, did not seem to take into account the harvest restriction when considering their compensation claims. Comparing class 1 in the two models, the estimate of RESTRICT more than doubles from €46 to €118, demonstrating that the

[8] Note that these percentages cannot be summed, since many of the respondents picked several reasons for non-participation.

[9] For the calculation, we used the SAS LIFEREG procedure without additional regressors, where the coefficient of the intercept term is the estimate of the mean value. With an alternative non-parametric technique, such as the Turnbull estimator, we obtained €592/ha/year for the average value of compensation. The reason why this estimate is larger than the one in the model above is that, in the WTA case, Turnbull estimation provides the higher bound mean, while, in the WTP case, it calculates the lower bound mean, giving a conservative value (see, e.g. Blaine et al., 2005; Perman et al., 2011, 421–422). The corresponding midpoint average is €348 with a standard deviation of 403 (Table 2).

[10] Notably, the coefficient of IMILLS also explains the WTAs. The mean value of IMILLS is 0.091 in the data set. Thus, the associated mean WTA is €34.94. The impact of CONSTANT and IMILLS together is thus €378.01.

[11] We also tested LCMs with more than two classes, but they did not converge. The LCMs were estimated using LINDEP 10.0 (Greene, 2012).

Table 4
LCMs estimated with large compensation claims (> €300 included) and without large compensation claims (> €300 excluded).

GROUP	Coefficient	Std error	Prob. |z| > Z	Coefficient	Std error	Prob. |z| > Z
	Large claims included			Large claims excluded		
Model parameters for latent class 1						
CONSTANT	***712.313	43.943	0.0000	***318.553	26.861	0.0000
RESTRICT	45.871	49.216	0.3513	***117.521	34.289	0.0006
NEGOT	−17.616	47.863	0.7128	−22.8992	26.021	0.3789
Sigma	***201.002	26.147	0.0000	***125.931	17.561	0.0000
Model parameters for latent class 2						
CONSTANT	***161.513	14.772	0.0000	***81.824	14.117	0.0000
RESTRICT	***48.282	17.271	0.0052	***41.495	15.055	0.0058
NEGOT	−12.865	16.950	0.4478	−2.466	14.678	0.8666
Sigma	***201.002	13.187	0.0000	***125.931	12.607	0.0000
Estimated prior probabilities for class membership						
Intercept_1	−0.390	0.467	0.4034	**1.194	0.553	0.0310
INTER_1	*–0.244	0.148	0.1000	***–0.456	0.161	0.0047
Intercept_2	0.0	(Fixed parameter)		0.0	(Fixed parameter)	
INTER_2	0.0	(Fixed parameter)		0.0	(Fixed parameter)	
Prior class probabilities at data means for LCM variables						
Class 1	0.239			0.441		
Class 2	0.761			0.559		
Log likelihood function	−1480.17			−869.82		
AIC	2980.3			1759.6		
AIC/N	3.811			2.250		
N (unbalanced panel)	782			577		
Individuals	233			172		

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

coefficient of RESTRICT for class 1 is sensitive to the treatment of the highest compensation values. At the same time, the comparable estimates of class 2 remain quite stable at €48 and €41.

NEGOT is non-significant for both classes of the models but has negative signs, hinting that forest owners might claim less compensation for a contract that uses private negotiations as the method of making contracts in LRVT. INTER has a minus sign with a weakly significant coefficient in the first model and a strongly significant coefficient in the second model for class 1, indicating that the less interested a respondent is in participating in LRVT, the more probable it is that he or she belongs to class 1. Hence, the respondents with the highest compensation claims are not especially interested in participating in LRVT.

Discussion and conclusions

We examined the supply side of the LRVT mechanism that has been proposed to enhance the provision of amenity values in privately-owned forests used for tourism and recreation. Using a data set from a mail survey and an attribute-based contingent valuation method, we analyzed forest owners' willingness to participate and willingness to accept compensation. These are two related fundamental aspects of supply that should be considered in developing and implementing a new PES mechanism. To establish an efficient and feasible mechanism, it is important to assess the potential participation rate and understand which drivers motivate landowners to participate in LVRT and which discourage them. Similarly, it is important to assess the level of monetary compensation that forest owners are likely to require and which factors determine their compensation claims. In particular, it is important to identify those segments of forest owners that are willing to participate with a lower compensation level for effective targeting and marketing of LRVT.

We found that fewer than half of the respondents (43%) were willing to participate in LRVT. In response to the follow-up question asking for their reason not to participate, a considerable share of the respondents chose at least one of the options given in the questionnaire, such as not owning a site with special importance or a willingness to preserve landscape and recreational values without agreements. In the light of the comments made in the survey, these responses partly reflected the suspicion and skepticism that the respondents felt towards a new mechanism. In the possible future design of LRVT, attention needs to be paid to clarifying the rules of the system and the transparency of its implementation. A communicative and deliberative information process, for example, that includes public hearings and discussion meetings, is needed. A typical forest owner in the studied sample and in Finland generally is quite aged. This may be a reason for many of the respondents being suspicious about the survey and the idea of LRVT and unwilling to state that they would participate in the mechanism. On the same grounds, the questions related to the monetary amounts of LRVT compensation may have been too difficult to answer. The advanced age of the respondents may also be a reason why some respondents did not want to tie the hands of their heirs by reporting their positive interest in LRVT contracts.

However, given that LRVT is a new suggested payment mechanism, which has not yet been put into practice in the area, the estimated participation rate is surprisingly high. Mitani and Lindhjem (2015) presented a similar participation rate for voluntary biodiversity conservation in Norway, but Markowski–Lindsay et al., (2011) found much lower participation rates considering forest landowner participation in carbon markets in the United States. One likely reason for the high participation rate in our study is the short contract period (5 years) presented to the respondents in the valuation scenario. The length of agreement has been found to decrease participation in voluntary payment mechanisms (Horne, 2006; Markowski–Lindsay et al., 2011). Another reason may be that Finnish forest owners are familiar with a payment mechanism for biodiversity conservation (Juutinen et al., 2008) and therefore are accustomed to making this type of participation decision.

The strongest management restriction (i.e., harvesting prohibited during the contract period) in LRVT decreased the likelihood of participation and increased the compensation claim compared with the weaker restriction (i.e., clear cutting prohibited, but selective harvesting allowed). These results were expected, as direct opportunity costs and financial losses increase with management restrictions. Hence, the respondents had realized the scope of the management restrictions, indicating the reliability of the results and supporting the argument that attribute-based methods are less vulnerable to a scope effect than the (non-attribute) contingent valuation method (Smith and Osborne, 1996). The results confirm the previous findings obtained by Ovaskainen et al. (2014), who investigated LRVT by applying a choice experiment. Similarly, Vedel et al. (2015b) found that management restrictions have an impact on forest owners' willingness to accept compensation for biodiversity conservation in Denmark. In addition, previous studies on participation in voluntary biodiversity conservation have found that a high harvest value of the target stand and percentage of productive forest increase compensation claims (Lindhjem and Mitani, 2012; Mäntymaa et al., 2009). Also owners who perceive conservation regulations to be too strict are less likely to participate (Mitani and Lindhjem, 2015).

We also found that the instrumental design of LRVT affected the compensation claims to some extent, but not the participation decision. In particular, forest owners claimed more compensation if competitive tendering was used as a method of making contracts instead of private negotiations. This is a novel finding. As far as we know, these methods of PES implementation have not been studied in previous environmental valuation literature. The competitive tendering as a new means to negotiate contracts for compensation is an interesting aspect of this study and an important contribution to new knowledge. The finding supports the conclusion that a method of implementation, such as competitive tendering, which treats forest owners anonymously without any face-to-face discussions, may decrease the participation

rate. In addition, it may increase the compensation claims when the payment mechanism targets non-industrial private forest owners. There is, however, evidence that private negotiations in contracting may result in high information rents (Juutinen et al., 2013).

Another interesting and important result is that, besides the protection of landscape values, the protection of biodiversity may be an additional essential motive for forest owners' participation. This is an important finding indicating that, as well as landscape quality, respondents may gain personal benefits from improving the biodiversity in their own forests. A comparable phenomenon has already been identified in a voluntary biodiversity protection program in Finland (Mäntymaa et al., 2009) and in the United States (Langpap and Wu, 2004). This indicates that emphasizing the co-production of biodiversity might be a good marketing argument to attract forest owners to make a contract within LRVT.

An additional noteworthy result is that, if a respondent has refrained or is interested in refraining from all cutting in his or her mature forests, he or she would claim a smaller compensation amount than otherwise. Similarly, Vedel et al. (2015b) found that Danish forest owners' willingness to accept contracts for ecosystem service provision is sensitive to additionality. Our result confirms the validity of the compensation claim model. Landowners' compensation claims reflect associated opportunity costs that are minor if they are refraining from cutting in their forest in any case without a contract. Hence, if the organizer of LRVT could particularly attract such owners who are environmentally minded and owners who already have spontaneously refrained or are interested in refraining from cutting in their own forests, the compensation payments might be smaller and the system more cost-efficient.

In addition, it is worth noticing that active forest owners who had used clear cutting as their main method of final felling in their forests were also more willing to participate in LRVT. One explanation for this unexpected finding may be that the owners who are active in forest management may also be open-minded and eager to understand the introduction of the new instrument as a new way of earning money (Vainio and Paloniemi, 2013). Similarly Markowski–Lindsay et al., (2011) concluded that forest owners who are actively planning to manage their land may be more open to participation in carbon sequestration programs, because the programs essentially are a type of management activity. Thus, active forest owners may see LRVT as good business opportunity and they may even be the early adopters of the new system. Through LRVT, they may avoid potential obligatory constraints for forest management in the future. Simultaneously, they are able to increase their forest incomes. When LRVT becomes operational, they probably will claim higher compensations for restrictions, which reveals a profit-seeking attitude related to forest owning. Hence, in advertising LRVT to forest owners, they should also be targeted, for example, by using economic arguments, such as the opportunity for reasonable monetary compensation for providing amenity values (Mäntymaa et al., 2009).

We also found an interesting result that the respondents willingness to participate increases in line with the proportion of forest area that a respondent is ready to supply for LRVT. Those who are willing to supply a major part for the system are likely to benefit themselves from the forest amenity services provided in their forests. In addition to landscape values, the protection resulting from a contract, for example, may increase forest owner's hunting or recreational possibilities in his or her own forest (Amacher et al., 2003; Newman and Wear, 1993).

The average compensation claim in this study was about €330 per hectare per year. This is quite a large value compared with the actual average payment paid (€176/ha/year) in the Finnish conservation program for temporal forest protection, in which harvests are not allowed during the contract period (Juutinen et al., 2008). The claim also looks rather high if it is compared to the annual operating profit in non-industrial private forestry in North Ostrobothnia, which has varied between 48 and 60 euros per hectare in 2013–2017 (Official Statistics of Finland, 2018). However, based on the results from an experiment, Nape et al. (2003) concluded that people would actually accept a smaller payment in reality than in a hypothetical situation. Hence, the actual payments in LRVT are likely to be somewhat lower than those that we estimated.[12] In addition, the average value may not be very informative, as there was considerable variation in the compensation claims. Therefore, aiming for cost-effective implementation of LRVT, the analysis of the heterogeneity of compensation claims is interesting. We identified two segments of forest owners and found that the respondents with the highest compensation claims were less interested in participating. Thus, the voluntary character of LRVT works simultaneously as a cost-reducing element, as the forest owners claiming less compensation were more eager to join the mechanism. Our results suggest that quite a remarkable share of forest owners was interested in making contracts with reasonable compensation in the Ruka-Kuusamo region. In addition, we found that forest owners claiming lower compensation were less sensitive to the restrictions of forest management practices. Thus, if the preservation of a beautiful landscape at a certain site requires the prohibition of all cutting, it might be possible to find a forest owner who will accept this restriction for reasonable compensation.

In addition to identifying and recruiting interested forest owners, the suitable location of the forest stands for the nature-based tourism activities that they could offer is important for the success of LRVT. In other words, it is more important to take care of landscape values in stands that are located on visible sites; for example, in the vicinity of hotels, the villages of holiday homes, skiing and hiking routes, the slopes and tops of hills or the banks of rivers and lakes. Therefore, our analysis may overestimate the participation rate, as some of the forest stands considered do not have the required forest characteristics for LRVT or they are not located in the most important places, or both. Thus, it is also necessary to try to find and recruit hesitating persons who own forests in the key locations of the tourism industry. This is yet another good topic for further inquiries.

Related to the relevance of the study from the governance-making perspective, the results help to identify some of the most important characteristics. These characteristics are critical in developing and implementing a future payment mechanism for the provision of forest landscape and recreational values in terms of how to proceed and whom efforts should target. There are, however, many other details that should be uncovered in future research before one can be certain that a PES mechanism such as LRVT would work in practice. The open questions include what kind of financing and payment mechanisms would be the most practical and cost effective, for example. A future step could also be to make the results of the survey spatially explicit, and link it with landscape values and forest owner specific replies or predictions. In addition, a collaborative development process (e.g., Healey, 1997; Tikkanen et al., 2017) could be implemented so that the local stakeholders would be truly able to participate in the development of an LRVT model that would be acceptable and executable in practice.

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[12] One problem related to our results is the large compensation claims stated by some of the respondents. These responses possibly reflect two things. Either the respondents may have included expectations of high current or future land values in construction in their claims due to the increasing tourism in the area, along with the hypothetical loss of timber value or the possibility that they may have purely exaggerated the claims for strategic or protest reason.

References

Act on changes in Forest Act, 1085/2013. Ministry of Agriculture and Forestry. Available: https://www.finlex.fi/fi/laki/alkup/2013/20131085. (Accessed 12 June 2018).

Act on Metsähallitus, 234/2016. Ministry of Agriculture and Forestry. Available: https://www.finlex.fi/fi/laki/alkup/2016/20160234. (Accessed 12 June 2018S).

Amacher, G.S., Conway, M.C., Sullivan, J., 2003. Econometric analyses of nonindustrial forest landowners: is there anything left to study? J. For. Econ. 9, 137–164. https://doi.org/10.1078/1104-6899-00028. (Accessed 6 June 2018).

Bell, S., Simpson, S., Tyrväinen, L., Sievänen, T., Pröbstl, U. (Eds.), 2008. European Forest Recreation and Tourism: A Handbook. Taylor and Francis Group, London.

Blaine, T.W., Lichtkoppler, F.R., Jones, K.R., Zondag, R.H., 2005. An assessment of household willingness to pay for curbside recycling: a comparison of payment card and referendum approaches. J. Environ. Manag. 76, 15–22.

Boon, T.E., Meilby, H., Thorsen, B.J., 2004. An empirically based typology of private forest owners in Denmark: improving communication between authorities and owners. Scand. J. For. Res. 19, 45–55. https://doi.org/10.1080/14004080410034056. (Accessed 21 November 2017).

Boxall, P., Adamowicz, W., 2002. Understanding heterogeneous preferences in random utility models: a latent class approach. Environ. Resour. Econ. 23, 421–446.

Christensen, T., Pedersen, A.B., Nielsen, H.O., Mørkbak, M.R., Hasler, B., Denver, S., 2011. Determinants of farmers' willingness to participate in subsidy schemes for pesticide-free buffer zones – a choice experiment study. Ecol. Econ. 70, 1558–1564. https://doi.org/10.1016/j.ecolecon.2011.03.021. (Accessed 21 May 2018).

Dominguez, G., Shannon, M., 2011. A wish, a fear and a complaint: understanding the (dis)engagement of forest owners in forest management. Eur. J. For. Res. 130, 435–450.

Facts about Ruka and Kuusamo, 2017. http://www.ruka.fi/en/facts. (Accessed 10 August 2017).

Finnish Bioeconomy Strategy, 2014. Sustainable growth from bioeconomy – The Finnish bioeconomy strategy. Ministry of Employment and the Economy, Edita Publishing Ltd., 32 p. http://biotalous.fi/wp-content/uploads/2014/08/The_Finnish_Bioeconomy_Strategy_110620141.pdf. (Accessed 10 January 2018).

Finnish statistical yearbook of forestry 2014. Official Statistics of Finland, Finnish Forest Research Institute, Tammerprint Oy, Tampere. 428 p. http://stat.luke.fi/sites/default/files/vsk14_koko_julkaisu.pdf. (Accessed 10 January 2018).

Fredman, P., Tyrväinen, L., 2010. Introduction. Fredman, P., Tyrväinen, L. (Eds.), Frontiers in Nature-Based Tourism. Scand. J. Hosp. Tour 10, 177–189.

Gorriz, E., Vedel, S.E., Stenger, A., 2014. The role of private forest owners' motivations and attitudes. In: In: Thorsen, B.J., Mavsar, R., Tyrväinen, L., Prokofieva, I., Stenger, A. (Eds.), The Provision of Forest Ecosystem Services: Assessing Costs of Provision and Designing Economic Instruments for Ecosystem Services. What Science Can Tell Us 5 Volume II. European Forest Institute, Joensuu, pp. 26–29 http://www.efi.int/files/attachments/publications/efi_wsctu_5_vol-2_en_net.pdf (Accessed 22 January 2018).

Greene, W.H., 2012. LIMDEP Version 10 Econometric Modeling Guide. Econometric Software Inc., Plainview, NY.

Gundersen, V., Frivold, L., 2008. Public preferences for forest structures: a review of quantitative surveys from Finland, Norway and Sweden. Urb. For. Urb. Green. 7, 241–258.

Hänninen, H., Karppinen, H., Leppänen, J., 2011. Finnish forest owner 2010. (Suomalainen metsänomistaja 2010. In Finnish) Working Papers of the Finnish Forest Research Institute 208. 94 p. http://www.metla.fi/julkaisut/workingpapers/2011/mwp208.htm. (Accessed 4 October 2017).

Hänninen, H., Leppänen, J., Ovaskainen, V., Uusivuori, J., Viitala, E.J., 2017. Metsätalouden uusi kannustinjärjestelmä – Teoriaa, käytäntöjä ja ehdotukset (New incentive system of forestry – Theory, practices and suggestions, in Finnish). Luonnonvara- ja biotalouden tutkimus 5/2017. 93 p. (Accessed 22 January 2018). https://jukuri.luke.fi/bitstream/handle/10024/538067/luke-luobio_5_2017.pdf?sequence=1.

Hartman, R., 1976. The harvesting decision where a standing forest has value. Econ. Inq. 14, 52–58.

Häyrinen, L., Mattila, O., Berghäll, S., Närhi, M., Toppinen, A., 2017. Exploring the future use of forests: perceptions from non-industrial private forest owners in Finland. Scand. J. For. Res. 32, 327–337. https://doi.org/10.1080/02827581.2016.1227472. (Accessed 19 June 2018).

Healey, P., 1997. Collaborative Planning: Shaping Places in Fragmented Societies. University of British Columbia Press, Vancouver, pp. 338.

Heckman, J.J., 1979. Sample selection bias as a specification error. Econometrica 47, 153–161.

Horne, P., 2006. Forest owners' acceptance of incentive based policy instruments in forest biodiversity conservation – a choice experiment based approach. Silva Fenn. 40, 169–178.

Hynes, S., Hanley, N., Scarpa, R., 2008. Effects on welfare measures of alternative means of accounting for preference heterogeneity in recreational demand models. Am. J. Agric. Econ. 90 (4), 1011–1027. https://doi.org/10.1111/j.1467-8276.2008.01148.x.

Koskela, E., Ollikainen, M., 2001. Optimal private and public harvesting under spatial and temporal interdependence. For. Sci. 47, 484–496.

Juutinen, A., Mäntymaa, E., Mönkkönen, M., Svento, R., 2008. Voluntary agreements in protecting privately owned forests in Finland – to buy or to lease? For. Policy Econ. 10, 230–239.

Juutinen, A., Mäntymaa, E., Ollikainen, M., 2013. Landowners' conservation motives and the size of information rents in environmental bidding systems. J. For. Econ. 19, 128–148.

Juutinen, A., Kosenius, A.-K., Ovaskainen, V., Tolvanen, A., Tyrväinen, L., 2017. Heterogeneous preferences for recreation-oriented management in commercial forests: the role of citizens' socioeconomic characteristics and recreational profiles. J. Environ. Plan. Manag. 60, 399–418.

Kaltenborn, B.P., Haaland, H., Sandell, K., 2001. The public right of access – some challenges to sustainable tourism development in Scandinavia. J. Sustain. Tour. 9, 417–433. https://doi.org/10.1080/09669580108667412. (Accessed 4 May 2018).

Karppinen, H., Korhonen, M., 2013. Do forest owners share the public's values? An application of Schwartz's value theory. Silva Fenn. 47, 1–16.

Kuuluvainen, J., Karppinen, H., Ovaskainen, V., 1996. Landowner objectives and nonindustrial private timber supply. For. Sci. 42, 300–309.

Kuuluvainen, J., Karppinen, H., Hänninen, H., Uusivuori, J., 2014. Effects of gender and length of land tenure on timber supply in Finland. J. For. Econ. 20, 363–379. https://doi.org/10.1016/j.jfe.2014.10.002. (Accessed 7 June 2018).

Langpap, C., Wu, J., 2004. Voluntary conservation of endangered species: when does no regulatory assurance mean no conservation? J. Environ. Econ. Manag. 47, 435–457.

Leppänen, J., 2010. Finnish family forest owner 2010 survey. Scand. For. Econ. 43, 184–195.

Lienhoopa, N., Brouwer, R., 2015. Agri-environmental policy valuation: farmers' contract design preferences for afforestation schemes. Land Use Policy 42, 568–577. https://doi.org/10.1016/j.landusepol.2014.09.017. (Accessed 25 May 2018).

Lindhjem, H., Mitani, Y., 2012. Forest owners' willingness to accept compensation for voluntary conservation: a contingent valuation approach. J. For. Econ. 18, 290–302.

Lynch, L., Lovell, S.J., 2003. Combining spatial and survey data to explain participation in agricultural land preservation programs. Land Econ. 79, 259–276.

Majumdar, I., Teeter, L., Butler, B., 2008. Characterizing family forest owners: a cluster analysis approach. For. Sci. 54, 176–184.

Mäntymaa, E., Juutinen, A., Mönkkönen, M., Svento, R., 2009. Participation and compensation claims in voluntary forest conservation: a case of privately owned forests in Finland. For. Policy Econ. 11, 498–507.

Mäntymaa, E., Ovaskainen, V., Juutinen, A., Tyrväinen, L., 2018. Integrating nature-based tourism and forestry in private lands under heterogeneous visitor preferences for forest attributes. J. Environ. Plan. Manag. 61, 724–746. https://doi.org/10.1080/09640568.2017.1333408.

Margaryan, L., 2016. Nature as a commercial setting: the case of nature-based tourism providers in Sweden. Cur. Iss. in Tour. 1–19. https://doi.org/10.1080/13683500.2016.1232378.

Markowski–Lindsay, M., Stevens, T., Kitteredge, D., Butler, B., Catanzaro, P., Dickinson, B., 2011. Barriers to Massachusetts forest landowner participation in carbon markets. Ecol. Econ. 71, 180–190.

Martin-Ortega, J., Ojea, E., Roux, C., 2013. Payments for water ecosystem services in Latin America: a literature review and conceptual model. Ecosyst. Serv. 6, 122–132. https://doi.org/10.1016/j.ecoser.2013.09.008. (Accessed 21 May 2018).

Mitani, Y., Lindhjem, H., 2015. Forest owners' participation in voluntary biodiversity conservation: what does it take to forgo forestry for eternity? Land Econ. 91, 235–251.

Moore, C.C., Holmes, T.P., Bell, K.P., 2011. An attribute-based approach to contingent valuation of forest protection programs. J. For. Econ. 17, 35–52.

Nape, S., Frykblom, P., Harrison, G.W., Lesley, J.C., 2003. Hypothetical bias and willingness to accept. Econ. Lett. 78, 423–430.

National Forest Inventory 9, 2016. VMI9: n kunnittaiset metsävarat 2016 (9th national inventory of forest resources, municipal forest resources, in Finnish). (Accessed 22 January 2018). http://www.metla.fi/cgi-bin/tilasto/vmi/vmi.cgi?VMI9.

Newman, D.H., Wear, D.N., 1993. Production economics of private forestry: a comparison of industrial and nonindustrial forest owners. Am. J. Agric. Econ. 75 (August (3)), 674–684. https://doi.org/10.2307/1243574. (Accessed 6 June 2018).

Nielsen, A., Jacobsen, J., Strange, N., 2018. Landowner participation in forest conservation programs: a revealed approach using register, spatial, and contract data. J. For. Econ. 30, 1–12.

Official Statistics of Finland, 2018. Operating Profit in Non-Industrial, Private Forestry by Region [Web Publication]. Helsinki: Natural Resources Institute Finland (Accessed 9 May 2018). http://statdb.luke.fi/PXWeb/pxweb/en/LUKE/LUKE_04%20Metsa_04%20Talous_18%20Yksityismetsatalouden%20liiketulos/?tablelist=true&rxid=001bc7da-70f4-47c4-a6c2-c9100d8b50db.

Ovaskainen, V., Abildtrup, J., Mäntymaa, E., Vedel, S.E., Thorsen, B.J., 2014. The stated preference approach to costs of provision. In: Thorsen, B.J., Mavsar, R., Tyrväinen, L., Prokofieva, I., Stenger, A. (Eds.), The Provision of Forest Ecosystem Services, Volume II: Assessing Costs of Provision and Designing Economic Instruments for Ecosystem Services. What Science Can Tell Us 5. European Forest Institute, Joensuu, pp. 50–57. (Accessed 22 January 2018). http://www.efi.int/files/attachments/publications/efi_wsctu_5_vol-2_en_net.pdf.

Payments for Ecosystem Services, 2013. Payments for Ecosystem Services: A Best Practice Guide. Department for Environment. Food and Rural Affairs, London, pp. 85. https://www.gov.uk/government/publications/payments-for-ecosystem-services-pes-best-practice-guide (Accessed 22 January 2018).

Perman, R., Ma, Y., Common, M., Maddison, D., McGilvray, J., 2011. Natural Resource and Environmental Economics, fourth ed. Pearson Education Limited, Harlow.

Ribe, R., 2009. In-stand scenic beauty of variable retention harvests and mature forests in the U.S. Pacific Northwest: the effects of basal area, density, retention pattern and down wood. J. Environ. Manag. 91, 245–260.

Roadmap for tourism, 2015. Achieving more together – Roadmap for growth and renewal in Finnish tourism 2015 – 2025. (Yhdessä enemmän – kasvua ja uudistumista Suomen matkailuun. In Finnish, summary in English) Ministry of Employment and the Economy reports 4/2015. 68 p. http://urn.fi/URN:ISBN:978-952-227-938-5. (Accessed 22 January 2018).

Sandell, K., Fredman, P., 2010. The right of public access – opportunity or obstacle for

nature tourism in Sweden? Scand. J. Hosp. Tour. 10 (3), 291–3309. https://doi.org/10.1080/15022250.2010.502366. (Accessed 17 January 2018).
SAS Institute Inc, 2015. SAS/STAT® 14.1 User's Guide. SAS Institute Inc., Cary, NC.
Silvennoinen, H., 2017. Scenic beauty of forest stands and impact of management. (Metsämaiseman kauneus ja metsänhoidon vaikutus koettuun maisemaan metsikkötasolla. In Finnish). Diss. For. 242, 86. https://doi.org/10.14214/df.242. (Accessed 5 June 2018).
Smith, V.K., Osborne, L.L., 1996. Do contingent valuation estimates pass a "scope" test? A meta-analysis. J. Environ. Econ. Manag. 31, 287–301.
Sustainable Innovatio, 2013. Sustainable Innovation in Food and Bio-based Industries – BIONAER, Work programme 2012–2021. The Research Council of Norway, 33 p. https://www.forskningsradet.no/prognett-bionaer/Programme_description/1253971968649. (Accessed 22 January 2018).
Swedish Research and Innovation Strategy, 2012. Swedish Research and Innovation Strategy for a Bio-based Economy. Formas, The Swedish Research Council for Environment, Agricultural Sciences and Spatial Plan., Report: R3:2012, 36 p. http://www.formas.se/PageFiles/5074/Strategy_Biobased_Ekonomy_hela.pdf. (Accessed 22 January 2018).
Thorsen, B.J., Mavsar, R., Tyrväinen, L., Prokofieva, I., Stenger, A. (Eds.), 2014. The Provision of Forest Ecosystem Services. Volume II: Assessing Cost of Provision and Designing Economic Instruments for Ecosystem Services. What Science Can Tell Us 5. European Forest Institute, Joensuu, pp. 90. (Accessed 22 January 2018). http://www.efi.int/files/attachments/publications/efi_wsctu_5_vol-2_en_net.pdf.
Tikkanen, J., Hokajärvi, R., Hujala, T., Kurttila, M., 2017. Ex ante evaluation of a PES system: safeguarding recreational environments for nature-based tourism. J. Rur. Stud. 52, 42–55.
Tyrväinen, L., Buchecker, M., Vuletic, D., Degenhart, B., 2008. Evaluating the economic and social benefits of forest recreation and nature tourism. In: Bell, S., Simpson, S., Tyrväinen, L., Sievänen, T., Pröbstl, U. (Eds.), European Forest Recreation and Tourism: A Handbook. Taylor and Francis Group Plc, London, pp. 35–64.
Tyrväinen, L., Mäntymaa, E., Ovaskainen, V., 2014. Demand for enhanced forest amenities in private lands: the case of the Ruka-Kuusamo tourism area, Finland. For. Policy Econ. 47, 4–13.
Tyrväinen, L., Silvennoinen, H., Hallikainen, V., 2017a. Effect of the season and forest management on the visual quality of the nature-based tourism environment: a case from Finnish Lapland. Scand. J. For. Res. 32, 349–359.
Tyrväinen, L., Plieninger, T., Sanesi, G., 2017b. How does the forest-based bioeconomy relate to amenity values? In: Winkel, G. (Ed.), Towards a Sustainable European Forest-Based Bioeconomy – Assessment and the Way Forward. What Science Can Tell Us 8. European Forest Institute, Joensuu, pp. 92–100. (Accessed 22 January 2018). http://www.efi.int/files/attachments/publications/wsctu_8_2017.pdf.
Uusivuori, J., Kuuluvainen, J., 2005. The harvesting decisions when a standing forest with multiple age-classes has value. Am. J. Agric. Econ. 87, 61–76.
Vainio, A., Paloniemi, R., 2013. Adapting to the gender order: voluntary conservation by forestowners in Finland. Land use policy 35, 247–256. https://doi.org/10.1016/j.landusepol.2013.05.017. (Accessed 6 June 2018).
Valkeapää, A., Karppinen, H., 2013. Citizens' view of legitimacy in the context of Finnish forest policy. For. Policy Econ. 28, 52–59.
Vedel, S., Jacobsen, J., Thorsen, B., 2015a. Contracts for afforestation and the role of monitoring for landowners' willingness to accept. For. Policy Econ. 51, 29–37. https://doi.org/10.1016/j.forpol.2014.11.007. (Accessed 28 June 2017).
Vedel, S., Jacobsen, J., Thorsen, B., 2015b. Forest owners' willingness to accept contracts for ecosystem service provision is sensitive to additionality. Ecol. Econ. 113, 15–24. https://doi.org/10.1016/j.ecolecon.2015.02.014. (Accessed 28 June 2017).
Villanueva, A.J., Gómez-Limónb, J.A., Arriazaa, M., Rodríguez-Entrena, M., 2015. The design of agri-environmental schemes: farmers' preferences in southern Spain. Land use policy 46, 142–154. https://doi.org/10.1016/j.landusepol.2015.02.009. (Accessed 21 May 2018).
Villanueva, A.J., Glenk, K., Rodrıguez-Entrena, M., 2017. Protest responses and willingness to accept: ecosystem services providers' preferences towards incentive-based schemes. J. Agric. Econ. 68 (3), 801–821. https://doi.org/10.1111/1477-9552.12211. (Accessed 21 May 2018).
Xiao, C., McCright, A.M., 2015. Gender differences in environmental concern: revisiting the institutional trust hypothesis in the USA. Environ. Behav. 47 (1), 17–37. https://doi.org/10.1177/0013916513491571. (Accessed 6 June 2018).
Yuan, Y., Boyle, K.J., You, W., 2015. Sample selection, individual heterogeneity, and regional heterogeneity in valuing farmland conservation easements. Land Econ. 91, 627–649.
Zelezny, L.C., Chua, P.-P., Aldrich, C., 2000. Elaborating on gender differences in environmentalism. J. Soc. Issues 65 (3), 443–457. https://doi.org/10.1111/0022-4537.00177. (Accessed 6 June 2018).