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Abstract. The purpose of this study is to estimate hunters' valuation of wild boar in Sweden. However, hunters have access to hunt, not only wild boar, but also other game such as moose and roe deer. Therefore, wild boar is regarded as an attribute of hunting together with other game, which includes moose, roe deer, and small game. A discrete choice experiment framework is used to elicit hunters' trade-offs between wild boar, moose, roe deer and small game. Estimates with a mixed logit model showed that the average annual willingness to pay (WTP) for a wild boar is approximately SEK 330/animal, which corresponds to 1/8 of the average WTP for a moose and ¼ of that for a roe deer. The range in WTP is determined by the activity of the hunters, as measured by number of hunting days per year, the least active gives the lowest WTP (SEK 113) and the most active the highest WTP (SEK 529). This can be a result of the specific challenges when hunting the wild boars, which are active in night time and equipped with excellent hearing and smell. Hunters that are farmers also give a relatively low WTP (SEK 134), which can be explained by the damages on crops created by the animal.

Key words: wild boar, hunting value, Sweden, game as attributes, choice experiment

JEL codes: Q29, Q57

1. Introduction

Wild boar (*Sus scrofa*) are among the most wide spread mammals in the world (Massei et al., 2014). Its natural range extends from Western Europe to East Russia, Japan and South-East Asia. It has increased in most countries during the last decades. In Sweden, the population increased from approximately 25,000 in 2004 to 126,000 ten years later (Gren et al., 2015). Costs of wild boar, which mainly occur from the wild boars' natural habitat selection and the rooting behavior in the field layer and soils during foraging, have been documented in several studies (e.g. Frederick, 1998; Rao et al., 2002). Other sources of damages are mechanical failures on agricultural machinery due to their bedding behavior in the fields and quality damage on silage due to mixture of soil. Wild boar also provide values, such as value of meat and recreational value of hunting. Unlike studies on costs of wild boar, estimates of the values provided by wild boar as game for hunters and as meat are almost non-existent. In principle, the value of meat can be assessed from prices of meat at the market. The assessment of hunting value provides more of a challenge since there exists no explicit market for wild boar hunting. The purpose of this study is to estimate hunters' WTP for wild boar in Sweden.

In Sweden, every landowner has the right to hunt all game on his/her own land. Hunting of moose and red deer requires registration of the land to county boards. The owner can also lease land to an individual or association of hunters with hunting licenses. The most common game, as calculated in number of bags, are moose, roe deer, wild boar, and small game. Except for wild boar, hunting of all game is subject to regulation with respect to when and how many animals to shoot. Given this package of game available for the hunters we perceive hunting as the main activity or good and the different game as attributes of this good. This implies that the value of wild boar needs to be estimated together with other game in order to obtain unbiased estimates. In this study, we therefore conduct a survey of Swedish hunters' preferences for different game with the of a stated preference method, the choice experiment approach, in order to quantify hunters' trade-offs between different game.

Starting in early 1970s there is a relatively large body of literature on the estimation of the value of hunting, which applies revealed and stated preference methods in equal proportions (see Häggström-Svensson et al., 2014 for a review). The travel cost method is the most commonly applied revealed preference approach and contingent valuation method the most common stated preference method. A few studies make use of a choice experiment (Boxall et al., 1996; Bullock et al., 1998; Horne and Petäjistö, 2003; Kerr and Abell, 2014; Delibes-Mateos et al., 2014; Fisher et al., 2015). Common to almost all studies irrespective of valuation method is the estimation of WTP of one game, typically moose, elk, or deer, or a group of game, such as big game of upland game, without any tradeoffs among game. The choice experiment studies then estimate trade-offs in WTP among hunting attributes, such as the quality of game (Delibes-Mateos et al., 2014), abundance of animals (Bullock et al., 1998; Horne and Petäjistö, 2003), and the use of hunting fees (Fisher et al., 2015).

To the best of our knowledge, there is no study estimating hunters' WTP for wild boar. One study attempted to do this, but did not obtain significant results (Mensah and Elofsson, 2015). Similar to current study, Mensah and Elofsson (2015) estimates WTP for several game in Sweden and they include moose, roe deer, fallow deer, and wild boar. A difference with current study is that Mensah and Elofsson (2015) uses a hedonic method where the values of the games are derived from the equilibrium lease prices of hunting land. They obtain significant estimates of values of moose and fallow deer, but not for wild boar. One reason for the insignificant result for wild boar can be the relatively small sample, 54 observations. Another can be the difference in preferences among hunters that are farmers and other hunters. Feeding habits of wild boar can reduce the yield by up to 60% (Clarin and Carlsson, 2010).

A specific purpose of current study is to investigate whether WTP differs between farmers and other hunters because of the damages perceived by the former. Our hypothesis is that the WTP for wild boar is lower for hunters that are farmers than for other hunters because of these damages on agriculture land. To account for random variation in individual preferences for the attributes (i.e. type of games) as well as for a separation between observed and unobserved error components we use the mixed logit model. This approach can approximate any random utility model (McFadden and Train, 2000) and is increasingly applied in environmental economics (see Hoyos 2010 for a review), but few applications are found on valuation of game (Delibes et al., 2014). In our view, the main contributions of this study is the estimation of WTP of wild boar, the perception of wild boar as an attribute of hunting together with other game, and the application of the mixed logit model to hunters' valuation of game.

The study is organized as follows. First, we present the study design. Section 3 describes the econometric approach. Results from the questionnaire are presented in Section 4 and regression results from the choice experiment are provided in Section 5. The study ends with a discussion and conclusions.

2. Study design

Hunting in Sweden is a popular recreational and social activity. Approximately 305.000 hunters were registered in 2013/14 (Swedish Environmental Protection Agency, 2015). Wild boar, moose (*Alces alces*) and roe-deer (*Capreolus capreolus*) provide the largest game in Sweden. Approximately 100 000 animals of each of these game where shot in 2012/2013 (Svenska Jägarförbundet, 2015). Small game, including red fox, birds, etc, is also important and the number of shot animals can be more than 10 times as large as for the ungulates included in this study. Ungulate game not included in this study is fallow deer and red deer, where 34000 fallow- and 6000 red-deer were shoot in 2012/2013 in Sweden. These game constitute considerable values for hunters in terms of trophy- and meat-value, but are not included because of their local abundances especially in the southern parts of Sweden. A credible introduction in the survey design was regarded as impossible.

Wild boar populations are vulnerable to cold winters because of the low survival rates of the off springs, and there are therefore no populations in the north of mid Sweden (e.g. Jansson et al., 2010). Therefore, this study is applied to 13 counties located in the mid and southern part of Sweden. Despite this geographical limitation of the study, hunting conditions can differ quite extensively within the study area with respect to access to hunting ground and availability of game, which makes the design of an appropriate trade-off/choice situation rather difficult.

The number of hunters per area is highest in Southern Sweden and decreases towards the northern parts (Mattsson et al. 2008). This is also the case for wild boar and roe deer. In average 15 wild boars and 13 roe deer per 1000 hectares are shot in southern regions, and 3-4 wild boars and roe deer per 1000 hectares in the northern part of the study area. The density of moose is rather constant compared to the other species and ranges between 2.5 to 4 moose averagely bagged per 1000 ha. The most important small game is red fox, badger, hare, mallard, pigeon and pheasant, the average bag of which ranges from 30 up to 300 individuals per 1000 hectares (Svenska Jägarförbundet, 2015).

In order to account for this heterogeneity in hunting conditions, a base-scenario is introduced to place all respondents at the same starting point. This base scenario includes a description of a representative hunting area with respect to size and access, and potential hunting bags. A policy experiment is then introduced where choice alternatives, or attributes, are derived as deviations in number of the four included game from the base scenario together with a cost. In the following, we describe the base scenario, policy and survey design.

2.1. Base-scenario

In environmental valuation studies it is important to describe credible and accurate environmental conditions and their change in order to obtain unbiased results (Artell et al., 2013). In this study, the reference scenario is described by an average sized hunting area, cover of forest and agriculture land, and numbers of killed moose, deer, wild boars and small game that hunters find reasonable. The aim is to introduce a scenario with characteristics of hunting conditions that can be found in vast parts of the country and that hunters can relate to. The size of a hunting ground in Sweden can be a few hectares in the south and a couple of (ten-) thousand hectares in the north. The area of the base-scenario is a 400 ha hunting ground covered with 35 % arable and 65 % forest land. There are no official numbers on sizes of hunting ground in Sweden, and the average size of 400 ha was determined by investigating public announcements and postings of hunting leases or hunting opportunities on popular hunting websites in different counties and at different times (Hittajakt, 2015, Jaktförmedling 2015).

The average number of shot animals per year for a 400 ha area was determined by using the data collected by the Swedish hunting agency (Svenska Jägarförbundet, 2015). The number of shot animal was denoted as a five-year-average, 2009-2014, to account for annual fluctuations. Svenska Jägarförbrundet (2015) provides comprehensive and detailed information on hunting bag figures in the whole country, which rests on reports by individual hunters and is summarized per hunting district[1]. Therefore, the number of shot animals per 1000 hectares, adult/offspring ratios etc. were easily obtained and a credible average of shot animals could be derived for a 400 hectare hunting ground, see Table 1.

Table 1: Characteristics of the base scenario.

Attribute	Extent	Notes
Hunting ground	400 ha	65% forest, 35% field
Moose	1 adult	Mostly male but also females
Roe-deer	5 per season	50% adult males, 25% adult females, 25% fawns
Wild boar	8 per season	50% adults, 50% piglets
Small game	35 per season	40% pigeon, 30% mallards, 10 % rabbit, fox and badger respectively

The characteristics of the base scenario have been chosen such that every hunter could have access to such a hunting area within proximity of their residency in South and Middle Sweden.

2.2. Policy scenario

In order to induce potential trade-offs between the species, a policy scenario was introduced. In this policy, a Swedish Wildlife Program (SWP) is established to manage wild life in the country by increasing the abundance of different game by centralized and concentrated efforts, such as extensive feeding, enhanced monitoring, creation of artificial retreats, etc. In order to convince the respondents that the payments will generate the increases in wild life it is stated in the questionnaire that the increases of different game in each choice is guaranteed. The SWP is managed by the Swedish Environmental Protection Agency (SEPA), which is currently responsible for the collection of hunting fees. The incomes from these fees are used by hunter organizations and SEPA for wild life management, and the establishment of SWP would imply an increase in funding and opportunities to improve wild life management. This policy scenario is close to the suggestion made in a governmental investigation where it was recognized that current budget for wild life management is insufficient (SOU, 2013).

[1] Swedish: Jaktvårdskrets; Each county is divided in a number of hunting districts, typically managed by a group of hunters that are hunting on the area of the district and who plan, coordinate and/or conduct measures to support and protect wildlife and environment.

It was stated in the questionnaire that SWP can target abundance of specific species by the choice of specific measures. The allocation of measures depends on hunters' preferences for increases in different game, who state their willingness to pay an annual charge to the fund for alternative increases in the game species. The decision is made as choice sets with a discrete choice frame, where each set represents an allocation of game and associated cost, see Table 3 in Section 2.3 for examples of choice sets.

It was noted in the survey-text, that the fee to the wildlife fund had to be paid by all hunters on the hunting ground that was described in the base scenario. The number of hunters in the base scenario is not fixed. Therefore, it was explicitly stated that the payments and the game will be shared among the hunters. That is important in order to interpret the results on a "per-animal" scale.

Charge payments to fund SWP were used as a payment vehicle because it appeared to be credible to the hunters since the hunting community's current influence on wild life management at SEPA is transferred to SWP. Alternatively, a tax collected by the government could have been used as a payment vehicle. This would not, however, guarantee that the tax incomes are used for management of the wild life at the advantage of the hunters.

3.3 Attributes and levels

The determination of the levels of attributes is based on results from the pilot studies, which included individual interviews with hunters and experts in hunting organizations as well as from a focus-group meeting, and studies of relevant literature. The attribute levels of moose, roe-deer, wild boar and small game are determined in the base scenario of a 400 ha hunting area. Credible increases in animals from this base level, which provide the choice sets, are determined the SWP program and its impacts on the population dynamics. The population of wild boars currently increases relatively rapidly in Sweden, but at different degrees in various regions (Kindberg et al., 2009, Jansson et al., 2010; Gren et al., 2015). Roe deer and moose belong to the same biological family/subfamily (Cervidae/Capriolinae) and therefore have the same biological reproduction patterns. A female gives birth to one to two fawns per year. The probability of more offspring increases under good food conditions and even triplets are possible. At last, "small game" included several species which all have rather high reproduction rates. In the interviews, the majority of hunters stated that they found the suggested attribute levels displayed in Table 2 as credible.

Table 2: Attributes and levels

Attribute	Levels[a]	Description
Adult Moose	0,1	Additional numbers of moose animals a hunter can expect to shoot
Roe-deer	0,1,2	Additional numbers of roe deer a hunter can expect to shoot
Wild boar	0,1,2	Additional numbers of wild boar a hunter can expect to shoot
Small game	0,35,70	Additional numbers of small game a hunter can expect to shoot
Cost	0, 700,1500,2600	Cost of the respective nurture program

Note: [a] Refers either to number of "shot games", or the payment to the wildlife fund.

The number of attributes and levels was kept at a low level in order to avoid unnecessary cognitive burden and information overload (Gao et al., 2010, Street and Burgess, 2007). To determine the cost of the programs provided in the choice sets, the hunters in the interviews and focus group have been asked about their willingness to pay for bagging an individual of all attribute species.[2] Then, a full factorial design with the wildlife attributes has been created and the cost for each program combination computed. To obtain the cost attributes, all programs were divided into three parts (from cheapest to most expensive) and the average cost taken as levels. To account for variations in values as obtained by the hunters in the focus groups, the lowest value was decreased and the highest value increased by 30%. A status quo (SQ) variable was not observable for the hunters in the choice sets. SQ was coded as 1 if a respondent opted out and has been used in the specification of the model.

2.3. Experimental design

A blocked fractional-factorial design including 2*(3^4) = 162 combinations of levels (Table 2) was created in SAS JMP (V.10) for the discrete choice experiment (DCE). A The D-efficiency of the design was 97.8%. Unrealistic combinations of choice alternatives were excluded from the full

[2] At that time, hunter respondents knew about the idea and function of the Swedish wildlife fund. Therefore their stated WTP might be subject to strategic bias.

design following Terawaki et al. (2003) and Street and Burgess (2007). For example, a choice set was considered unrealistic if the number of additional animals in all categories could be shoot at a lower payment than an alternative with lower number of animals. The D-efficiency of the restricted design was 78.2%.

An example of a choice task used for the DCE is given in Table 3. In scenario 1, the hunter could expect to shoot one more adult moose, two more roe deer and 35 individuals of small game at a yearly program cost of SEK 2600 SEK. Similarly, in scenario 2 the number of wild boar increases by 2 at the cost of SEK 700.

Table 3: Example of a choice set

Species	**Base scenario, status quo (SQ)**	**Scenario 1**	**Scenario 2**
Adult moose	1	+1	0
Roe-deer	5	+2	0
Wild boar	8	0	+2
Small game	35	+35	0
Yearly cost	0 SEK[a]	2 600 SEK[a]	700 SEK[a]
Your choice (For the given change I am ready to pay the amount that is stated)	☐ (No change)	☐	☐

[a]1 Euro=9.25 SEK (December 15, 2105)

The study design included a status quo (SQ) alternative for hunters not willing to make a costly change. This establishes a link to random utility theory and avoids the unfeasibility problem (Louviere et al., 2010). Further, as suggested by Adamowicz and Boxall (2001) and Hanley and Wright (2001), one option must always be in the respondent's feasible choice set. Because some hunters might regard the scenarios as unfeasible, the SQ option should prevent these from providing unreasonable answers.

On completion of the DCE, respondents were asked two classes of questions: *i)* personal information and hunting habits, and *ii)* hunter's perception of wildlife abundance, with a focus on wild boar. Personal information includes age, gender, occupation as a farmer, and type of hunting land. It is expected that farmer respondents has a lower WTP for wild boar than other hunters because of the damages caused by the animal. The damages can also create differences in preferences depending on property right of the land, if hunting is carried out on own or on leased land.

Because of the difficulties to hunt wild boar, there can also be differences in WTP depending on experiences and hunting activities. Wild boars are active in the nights, and stand hunting in night is then often used, either at wild boar paths or at feeding places to which the wild boars are curled. However, they do have extraordinary smell and hearing, and every movement of a hunter reveals his/her location. Wild boars can also be hunted in day time, but this requires a dog for mobilization of the animal. In addition to personal information of the hunter and access to land, the second class of questions therefore includes hunting experience and activity, see Table 4.

Table 4: Personal information and hunting habits

Attribute	Content	Description
Gender	Male, Female	Gender of the respondent
Age		Age of the respondent in years
Experience		Amount of years since hunting license was achieved
Hunting days		Approximation of hunting days per year
Hunting ground	Coded as: 1) Own hunting area 2) Hunting lease 3) Hunting-team 4) Others	Current hunting ground of the respondent (Multiple answers allowed)
Farmer	Yes, No	Question, if the recipient is farmer or forester, either professionally or as a hobby

The second class of questions provides ordinal variables on respondents' attitudes towards wild life and wild boar in particular, see Table 5. They are scaled from 1 ("I completely disagree") to 10 ("I completely agree").

Table 5) Hunter's perception of wildlife abundance, scale 1 (= I do not agree) to 10 (= I completely agree)

	Question
Q1	"I perceive the wildlife abundance being too high"
Q2	"I perceive the wild boar abundance being too high"
Q3	"The future of wild boar abundance is influencing me very much"
Q4	"I see an increasing wild boar abundance positively"
Q5	"The hunt on moose is important for me"
Q6	"The hunt on deer is important for me"
Q7	"The hunt on wild boar is important for me"
Q8	"The hunt on small game is important for me"

In addition to these two classes of questions we added a question on the respondent's understanding of the questionnaire, which is also scaled from 1 (= no understanding) to 10 (= complete understanding).

2.4. Survey implementation

The main survey was implemented in June/July 2015 after an initial pilot study in May. For the pilot study, the same D-efficient fractional-factorial design was sent to 90 hunters in all counties that were considered for the main study. Responses were provided by 29 hunters (32%), the majority of which gave comments and suggestions for possible improvements. Following up the results of the pilot study, wording has been shaped and uncertainties were cleared out. For example, some hunters did not understand how to actually make their choice and therefore an easy understandable and step-by-step explanation was provided as well as a short overview to simplify the decision making process.

The paper-based main survey was sent out to 1908 hunters in all counties with wild boar populations, which implies 13 counties located in South and Middle Sweden up to the borders of Dalarna and Gävleborg county. The respondents were selected by the Swedish Environmental Protection Agency. Stratified sampling was used where the selection was proportional to the number of hunters in each county and random within each county. Overall, 602 individuals provided answers, which gives a response rate of 32%. A relatively large share of the respondents, 53%, opted out throughout the whole survey or did not provide answers at all. The remaining 283 studies were used for the analysis, which gives 12381 observations.

3. Econometric approach

A choice experiment (CE) is a stated preference-technique (SP) which was first proposed by Thurstone (1927). It combines Lancaster's (1966) economic theory of value with random utility models (RUM) (Marchak, 1960; McFadden, 1973). A hunter n within a CE makes a series of choices where he/she maximizes utility U_{nj} by choosing one scenario i out of j scenarios. By observing choices in a CE, it is possible to derive probabilities about the hunter's choice of a game. The probability of choosing scenario i, P_{in}, is then written as

$$P_{in} = pr(V_{in} + \varepsilon_{in} \geq V_{jn} + \varepsilon_{jn}) \qquad for\ all\ j \neq i \tag{1}$$

where V_{jn} is the observable conditional utility for individual n of alternative j with attributes x. The unobservable utility ε_{nj} is the difference between the true and the observable utility and is treated as random. It is further assumed that V_{jn} is linear and additively separable in the attributes x_{ink} where $k=1,..,m$ attributes, and the corresponding values β_k;

$$V_{in} = \beta_1 + \beta_2 x_{in2} + \ldots + \beta_k x_{ink} + \beta Y \tag{2}$$

where Y is income, which drops out since it is assumed not to vary among the choice alternatives. With an assumption that the error term in (1) is extreme value type I (Gumbel) distributed and that the scale factor is normalized to 1, the probability of choosing alternative i, P_{ni}, can be calculated as

$$P_{ni} = \frac{e^{\mu V_{in}}}{\sum_j e^{V_{jn}}} \tag{3}$$

A development of the basic multinomial logit (MNL) model is the conditional logit model, which is used with both alternative-invariant and alternative-variant variables (Chamberlain, 1980). Alternative-invariant describes variables that are constant over hunters, such as age etc., and the alternative-variant change over choice sets. The reason for this is that in grouped data the incidental parameters (i.e. parameters that control for omitted variables in the econometric model, e.g. a constant) are not consistent as the number of groups are increasing. Conditional logit models account for this problem and are therefore more appropriate than the standard MNL model in data with group structure. The probability of choosing one alternative i out of j in a logit model conditional on $\boldsymbol{\beta}$ is given by:

$$P_{ni} = \frac{e^{(\beta' x_{ni} + \gamma` z_{ni})}}{\sum_j e^{(\beta' x_{nj} + \gamma` z_{nj})}} . \tag{4}$$

where z_{ni} represents characteristics that vary across choices. One of the attributes is the price or the cost of the alternative, and the WTP for a specific game x is then computed as the rate of substitution (i.e. trade-off) between a given game attribute and the price attribute:

$$WTP_x = -\frac{\beta_x}{\beta_{COST}} . \tag{5}$$

The most important limitations of the conditional logit model is that it 1) exhibits the independence from irrelevant alternatives property, 2) cannot represent random variations in individual preferences and 3) assumes an independently, identically distributed unobserved error component over choice alternatives and individuals (Train, 2009).

Alternatively, since $\boldsymbol{\beta}$ are unobserved, a distribution for the coefficients can be specified and the parameters of that distribution can be estimated. The mixed logit model (MXL), which is presented in eq. (6), provides the unconditional choice probability as the integral over $\boldsymbol{\beta}$ when individual part-worth utilities have a general density $f(\beta)$ (i.e. random coefficients). The probability P_{ni} is then the logit formula integrated over all values of $\boldsymbol{\beta}$ weighted by the density of $\boldsymbol{\beta}$. The MXL model therefore allow for individual preference heterogeneity, which is a precondition in our study. Moreover, the MXL does not exhibit independence from irrelevant alternatives (IIA) and the ratio of two mixed choice probabilities depends on all data which means that the substitution patterns are less restrictive than in the standard logit model. This is relevant to this study as it allow for one attribute level to draw proportionally more from an alternative than from another alternative. If the utility is linear in $\boldsymbol{\beta}$, the probability of choosing attribute level *i* is:

$$P_{ni} = \int \frac{e^{(\beta' x_{ni})}}{\sum_j e^{(\beta' x_{nj})}} f(\beta) d(\beta) \qquad (6)$$

The choice probabilities in (6) are approximated through simulation for a given value of the parameters of the mixing ($f(\beta)$) distribution (Train, 2009).

In addition, WTP-values are typically not derived as in multinomial and conditional logit models, where the cost attribute is assumed to be fixed (eq. (5)). In mixed logit models, the cost attribute is heterogeneous and follows an own distribution. Therefore, the two coefficients in eq. (5) are following different distributions and individual WTP-values must be computed by drawing from the respective individual distribution by post estimation. The resulting WTP-distribution can however be skewed and sometimes even without defined moments (Hole and Kolstad, 2012). To avoid this problem, a convenient but unrealistic alternative is to assume the cost- attribute to be fixed (Meijer and Rouwendal, 2006). Alternatively, assuming a log-normal distribution for the price attribute can also be a viable solution. Then, the price-attribute is constrained to be positive, making sure that it has defined moments. However, this may produce unrealistic mean and standard deviation estimates, because of the possibility of a highly skewed WTP-distribution.

To avoid this problem, Train and Weeks (2005) suggest that it might help to re-formulate the model so that estimates are made on WTP. This requires an assumption about the WTP-distributions a priori instead of ex ante for the attribute coefficients (Hole and Kolstad, 2012). This approach has been found to reduce the occurrence of exceedingly large WTP values in some cases (Scarpa et al., 2008). In general, estimations in preference space tend to fit the data better, while the other method provides more reasonable distributions of WTP (Train and Weeks, 2005). In most studies, however, the resulting WTP-estimates from the two methods have been found to be very close. In this study, we will present WTP estimates based on both these methods. We then assume all coefficients to be normally distributed in preference space, and that the cost-attribute in the WTP-space is assumed to be log-normally distributed. Furthermore, following the recommendation by Louviere (2000) a standard MNL model is estimated to provide a starting point for the empirical analysis, so as to ensure that data are clean and that parameter signs and significance can be obtained from a model that does not considered grouped data, or depends on the more complex assumption of the MXL model.

4. Results from the questionnaire

With respect to the first class of questions, it is found that a vast majority of the hunters are men, 95% male as compared with 5% female hunters, see Table 6.

Table 6: Personal information and hunting habits

Attribute	Result
Gender	95% male and 5% female
Age, years	Average of 53 years with a SD of 15.5
Experience, years	Average of 26 years with a SD of 17
Hunting days per year	Average of 30 days with a SD of 28
Hunting practice, number of responses:	
Own land	71
Lease of land	109
Team	143
Others	31
Farmer, numbers	103

Approximately 35% of the respondents are farmers, and 25% hunt on their own land. The average number of hunting days, 30, is larger than the 20 days for all hunters in Sweden reported in Boman et al. (2011) and Ericsson et al. (2010).

With respect to the second class of questions, i.e. on wild life preferences, the answers indicate that wild boar abundances is not regarded as too large, and that hunters are open towards an additional increase, see Table 7.

Table 7. Perception of wildlife abundance and importance for all respondents and for hunters who are farmers or not, with different access to land (own or lease), and who hunt in teams

	Question	All	Farmers	Non-farmers	Own land	Lease	Team
Q1	"I perceive the wildlife abundance being too high"	3.16	3.27	2.97	3.44	3.27	2.88
Q2	"I perceive the wild boar abundance being too high"	5.07	5.49	4.59	5.33	5.27	4.72
Q3	"The future of wild boar abundance is influencing me very much"	6.42	6.54	6.18	6.23	6.24	6.15
Q4	"I see an increasing wild boar abundance positively"	4.89	4.32	5.13	4.18	4.40	4.88
Q5	"The hunt on moose is important for me"	8.08	8.09	7.81	7.97	8.17	8.56
Q6	"The hunt on roe deer is important for me"	7.68	7.50	7.57	7.77	7.52	7.57
Q7	"The hunt on wild boar is important for me"	6.34	6.15	6.27	6.00	5.98	6.28
Q8	"The hunt on small game is important for me"	6.02	5.81	5.94	5.94	5.80	5.73

According to Table 7, moose and roe deer receive the highest and wild boar and small game the lowest score with respect to game importance for all categories of hunters. The results do not show much difference in attitudes among hunter categories. Responses to question Q4, i.e. a positive perception of increasing wild boar abundance, give the largest variations, where farmers and hunters on own land give the lowest scores, and non-farmers the highest, as expected. The third class of question reveals a good understanding of the questionnaire and how to answer the questions.

5 Results from estimations of CE models

In the preference space, the choice experiment data was analyzed using the Mixed-Logit model (MXL) in Stata[3] and the results are presented in Table 8. A total of 283 respondents yields 4127

[3] The data was evaluated using the mixlogit command developed by Arne Risa Hole, University of York as described in Hole (2007).

choices and 12381 observations. The random-effect standard deviations were estimated with 500 Halton draws and calculated with the values of the Choleski-matrix.

Table 8: Results of the MXL specification in the preference space for all respondents

	Mean	**Standard error**
Main effects:		
Moose	3.036***	0.179
Roe-deer	0.801***	0.072
Wild boar	0.530***	0.076
Small game	0.010***	0.002
Cost	-0.002***	0.000
SQ	0.268**	0.131
Standard deviation of random parameters		
Moose	2.557***	0.158
Roe-deer	0.753***	0.072
Wild boar	1.022***	0.080
Small game	0.031***	0.002
Cost	2.6-3***	0.096-3
Model summary:		
Observations	12381	
Log-likelihood	-3 003.76	
AIC	6 029.51	
BIC	6 111.18	
Pseudo-R2	0.2476	

Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

The estimated coefficients show the expected signs which are positive for the game and SQ variables and negative for the Cost variable. The estimates suggest that an increase in the possibility to shoot one moose is most the most attractive feature in regards to other game species, followed by deer, wild boar and small game. The significance of SQ variable indicates that some combinations of alternatives were not appealing to the respondents. and they rather opted out.

In comparison with the conditional logit specification, the MXL specification improved log-likelihood by 988.64 units, showed lower AIC and BIC values as well as an increased McFadden Pseudo-R^2. From a context perspective, it is reasonable to believe that hunters are subject to a high degree of heterogeneity and that preferences for game species differs depending on their respective region. Because the MXL-specification accounts for this heterogeneity in tastes, we prefer this model. In both models, the coefficients show a positive correlation with the obtained results of the importance of hunting game presented in Table 7. Furthermore, sign of estimated coefficients are the same in both models and the relative values of the coefficients are similar in both models.

Based on the results presented in Table 8 we calculate WTP for all game as as specified by eq. (6) in Section 2. We are particularly interested in the WTP for wild boar and we therefore present these estimates in Table 10, and the trade-off between wild boar and the other game. The trade-off is simply calculated as the WTP for respective game divided by WTP for wild boar. This is made for all respondents, farmers, non-farmers, and for respondents with different hunting experience and activity, see Table 10.

Table 10. WTP calculation for hunters on different grounds, experience, and hunting days

Category	**WTP for wild boar:**		**Trade-off ratio[a] with:**		
	Mean	**Standard Error**	**Moose**	**Roe deer**	**Small game**
Hunter type:					
All respondents	327.69***	47.45	5.731***	1.507***	0.018***
Farmer	29.99	72.96	N.A	N.A.	N.A.
Non-farmer	327.02***	57.12	4.88***	1.45***	0.013***
Hunting ground:					
Own	47.51	26.58	N.A	N.A.	N.A.
Lease	312.55***	79.02	5.732***	1.795***	0.017**
Team	314.62***	63.76	6.00***	1.623***	0.012**
Experience[b]:					
Low	461.79***	90.95	4.091***	1.491***	0.018***
Medium	212.90***	67.75	8.815***	1.685***	N.A.
High	239.71***	79.03	7.300***	1.299***	0.018*
Hunting days[c]:					
Less active	15.86	69.00	N.A	N.A.	N.A.
Active	261.80***	75.29	5.721***	1.322***	0.022***
Very active	508.64***	86.85	2.984***	0.900***	0.016**

[a] WTP for moose/roe deer/small game divided by WTP for wild boar in each category; [b]Low=1-15 years, Medium =15-35 years, High= ≥35 years; [c] Less active=1-15 days, Active=15-30 days, Very active= ≥30 days

Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

Source: see Table A5-A6

The results in Table 10 show that the calculated annual WTP of wild boar for all respondents amounts to approximately SEK 328/animal. However, the estimated value is not significantly different from zero for hunters that are farmers, hunt on own land, or are less active. We can also note that the standard errors are relatively small for all significant estimates of the coefficients in the preference space, which indicates that the fraction of respondents with unreasonably high WTP is small (Tables A5-A6).

The relatively high WTP of wild boar by very active hunters is also reflected in the trade-offs with other games, which is lowest for this category of hunters for moose and roe deer. They are approximately half of the trade-off for all respondents, which amounts to 5.73 for moose and to 1.51 for roe deer. This means that the WTP for shooting 5.73 or 1.51 wild boar is the same as that of shooting 1 moose or 1 roe deer, respectively. The trade-off with small game is quite low, 0.018, which means that the WTP for approximately 50 small game is the same as for 1 wild boar.

The estimated results in the WTP space are quite similar to those in the preference space with respect to significance and relative coefficient values, see Table 11.

Table 11: Results from estimates of hunters' value of game in WTP space for all respondents.

	Mean	**Standard error**
Main effects:		
Moose	1737.99***	104.89
Roe-deer	470.02***	56.43
Wild boar	346.74***	57.43
Small game	7.42***	1.93
Cost	-6.41***	0.07
SQ	344.62***	86.07
Standard deviation of random parameters		
Moose	1610.43***	113.05
Roe-deer	638.77***	48.48
Wild boar	701.56***	65.47
Small game	23.09***	1.50
Cost	0.67***	0.07
Model summary:		
Observations	12381	
Log-likelihood	-3140.73	

The estimated coefficients of mean WTP and standard deviations are significant at the 0.01 probability level. Most of the trade-off between wild boar and other games are also in the same order of magnitude as the estimates in the preference space, see Table 12.

Table 12: WTP estimates of wild boar and trade off with other game by the MXL model in the WTP space

	WTP for wild boar:		**Trade-off ratio[a] with:**		
	Mean	**Standard Error**	**Moose**	**Roe deer**	**Small game**
Hunter type:					
All respondents	346.74***	57.43	5.012***	1.644***	0.021***
Farmers	134.88***	49.77	11.751***	2.823***	N.A
Non-farmer	439.58***	60.80	5.112***	1.417***	0.018***
Hunting ground:					
Own[b]	N.A	N.A.	N.A	N.A	N.A
Lease	371.99***	64.45	5.229***	2.158***	0.022***
Team	317.84***	95.57	7.340***	1.985***	0.018***
Experience[c]:					
Low	352.22***	71.11	5.590***	2.410***	0.029***
Medium	252.23***	81.36	7.918***	2.031***	0.019**
High	286.05***	85.30	5.364***	0.997***	N.A.
Hunting days[d]:					
Less active	113.42*	63.68	19.014***	4.911***	0.041**
Active	342.85***	47.46	5.719***	1.445***	0.027***
Very active	529.01***	75.39	2.282***	0.748***	N.A

[a] WTP for moose/roe deer/small game divided by WTP for wild boar in each category; [b]Non convexity in simulations; [c]Low=1-15 years, Medium =15-35 years, High= ≥35 years; [d] Less active=1-15 days, Active=15-30 days, Very active= ≥30 days

Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

When comparing the results in Table 12 with the WTP calculations based on regression estimates in the preference space we can note that the standard errors in relation to the mean WTP are in the same order of magnitude for most hunter categories. It is slightly lower , 15%, in the WTP space for active hunter, but slightly, 10%, higher for team hunters.

The main difference compared with the results in the preference space is the significant WTP estimate for farmers, which is approximately 1/3 of that for non-farmers. This supports our prior on low WTP by farmers because of the damages created by wild boar. Common to both methods is the insignificant or non-existent estimate for hunters on own land.

6. Discussion and conclusions

The purpose of this study was to estimate Swedish hunters' preferences and WTP for wild boar. Since hunters shoot several game during the same season, we perceived wild boar and other game as different attributes of hunting. The most common other game are moose, roe deer, and small game, which were included in our study. We used a discrete choice experiment framework with a mixed logit model to account for heterogeneity in preferences among hunters. The experiment was constructed as a wild life program which increases the number of animals to shoot on a representative hunting land. Different allocations of increases in the four included game and payment to the program provided choice alternatives. In addition to the choice alternative the questionnaire included questions on gender, age, hunting habits and experiences, and wild life attitudes. A particular interest was to investigate whether WTP for wild boar is lower for hunters that are also farmer because of the damage created by the animal. The main study was distributed to approximately 2000 hunters, and the response rate was 32%.

The responses on the questionnaire with respect to wild life attitudes did not show much difference between different categories of hunters with respect to farmer occupation, hunting habits or experiences. Common to all categories is that moose and roe deer are regarded as more important than wild boar and small game. This supports previous studies that rank moose hunting as the most important due to the economic value (Mattson 1990; Storaas et al. 2001) and social function (Heberlein, 2000). A small difference between hunters that are farmers or hunt on own land and other hunters is that the former are less positive to wild boar populations, which was expected.

The mixed logit model was applied to the choice experiment data, and the estimated mean annual WTP for wild boar is SEK 327/animal or SEK 346/animal depending on treatment of uncertainty in responses on the attributes. Unfortunately, we can not compare our estimated WTP of wild boar with that of other studies, since we are not aware of any such studies. On the other hand, hunting value of moose in Sweden has been subject to estimation in some studies (Boman et al., 2011; Boman and Mattson, 2012; Mensah and Elofsson, 2015). Our results give an annual average WTP of SEK 1737/animal or SEK 1878/animal for the two models with different treatment of stochastic coefficients. Boman et al. (2011) and Boman and Mattson (2012) apply the contingent valuation method and find a WTP for moose of SEK 7780/hunter in 2006 (in 2014 prices). Their estimate can not be compared with ours since it is measured per hunter and not per animal. Per animal estimate was provided by Mensah and Elofsson (2015) who used a hedonic method based on prices for leasing hunting land. They obtained an implicit value of SEK 12145/moose, which is considerably higher than our estimates. However, when considering that the lease contracts in Sweden run for several years, the annual implicit value of moose will be lower. It will be in the same order of magnitude as our estimate if the average contract runs for at least 6 years and the discount rate is 2%. Unfortunately, the Mensah and Elofsson (2015) study did not contain any information on the length of the included lease contracts.

With respect to ranking of game, the results from the regression analysis of the choice experiment data supported the results indicated by the responses on the attitude questions. The estimated mean WTP for wild boar is considerably lower than that for moose, and can correspond to approximately 1/5 of the WTP for a moose. One reason is the difference in weight where the average weight of wild boar is approximately 35% of a moose. This can not explain the higher WTP for roe deer, the average weight of which is 1/10 of that of a wild boar, but the calculated WTP is about 50-100% higher. Mensah and Elofsson (2015) did also calculate values of different game, but found significant results only for moose and fallow dear. Their estimated ratio in implicit prices of moose and fallow deer is approximately five, i.e. the implicit price of moose is five times higher than that of a fallow deer. The ratio between moose and roe deer in our study is approximately four, which can be regarded as relatively high since the weight of a fallow dear is approximately 2.5 times that of a roe deer.

Unlike the results from the questionnaire, the regression results of the choice experiment data showed considerable differences in WTP for wild boar among hunter categories; the calculated annual average WTP ranges between 113 SEK/animal and SEK 529/animal. The lowest and highest WTP are found for hunters with low and very high annual hunting activity, respectively. Wild boars are relatively difficult to hunt. They are active in night, are capable of quick movements, and have excellent hearing and smell. Stand hunting, which is most common, requires patience and efforts by the hunter. Very active hunters showed a higher WTP for wild boar than for roe deer. Similar results were obtained by Delibes-Mateos et al. (2014), who found that more active hunters are willing to pay more to hunt wild than farm-reared red-legged partridge in Spain.

It was also found in our study that the calculated annual WTP for wild boar is relatively low, SEK 134/animal, for hunters that are farmers. However, significant results for famers were obtained only by the model in WTP space Famers face the damages on crops created by the wild boar. The average WTP of hunters that are not farmers is more than three times higher than that for famers. Our results thus supports the hypothesis raised in the introduction of a lower WTP for farmers compared with hunters that are not farmers.

Acknowledgement

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Appendix: Tables A1-A9

Table A1: Results from the multinomial and conditional logit specification for all respondents

	Multinomial model		**Conditional logit model**	
	Mean	**Stand. Error**	**Mean**	**Stand. error**
Main effects:				
Moose	1.4373***	0.0550	1.4183***	0.055881
Roe-deer	0.2894***	0.0335	0.3529***	0.032708
Wild boar	0.2552***	0.0321	0.2708***	0.030209
Small game	0.0052***	0.0009	0.0054***	0.000857
Cost	-0.0008***	0.00004	-0.00072***	0.000035
SQ			0.3902***	0.081058
Model summary:				
Observations	8254		12381	
Log-likelihood	-4710.82		-3992.40	
AIC			7996.81	
BIC			8041.35	
Pseudo-R2	0.110		0.1194	

Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

Table A2: Results from mixed logit model in the preference space for all respondents, farmers and non-farmers

	All respondents		Farmers		Non-farmers	
	Mean	Standard error	Mean	Standard error	Mean	Standard error
Main effects:						
Moose	3.0357***	0.179180	2.5961***	0.305290	3.1393***	0.206054
Roe-deer	0.8013***	0.072277	0.6104***	0.130881	0.8795***	0.090361
Wild boar	0.5296***	0.075869	0.1182	0.128597	0.6052***	0.096848
Small game	0.0096***	0.002238	0.0040	0.004144	0.0078***	0.002456
Cost	-0.0016***	0.000104	-0.0018***	0.000198	-0.0019***	0.000153
SQ	0.2684**	0.131042	-0.3817*	0.221669	0.5433***	0.161769
Standard deviation of random parameters						
Moose	2.5570***	0.157630	-3.1633***	0.299010	-1.9999***	0.189523
Roe-deer	0.7530***	0.071604	0.9613***	0.133668	0.7404***	0.076553
Wild boar	1.0224***	0.079687	1.1028***	0.149869	-0.9706***	0.094380
Small game	-0.0311***	0.002166	0.0410***	0.004343	-0.0257***	0.002554
Cost	0.0016***	0.000096	-0.0015***	0.000154	-0.0015***	0.000130
Model summary:						
Observations	12381		4.491		7.845	
Log-likelihood	-3003.76		-1067.7		-1908.8	
AIC						
BIC						
Pseudo-R2	0.27597224		0.266978		0.286217	

Table A3: Results from mixed logit model in preference space for hunter categories with different annual activity

	Group 1 (1-15 days)		Group 2 (15-30 days)		Group 3 (>30 days)	
Main effects:						
Moose	4.0272***	0.368854	2.8072***	0.275656	2.3287***	0.271964
Roe-deer	0.9205***	0.130740	0.7259***	0.132803	0.5627***	0.116105
Wild boar	0.1958	0.139487	0.5347***	0.125721	0.6967***	0.118978
Small game	0.0077*	0.004048	0.0131***	0.003754	0.0059	0.004132
Cost	-0.0022***	0.000214	-0.0017***	0.000186	-0.0016***	0.000176
SQ	0.0717	0.246307	0.5929**	0.219735	-0.0084	0.218007
Standard deviation of random parameters						
Moose	3.2379***	0.324682	-1.9697***	0.248302	2.2495***	0.241410
Roe-deer	0.6395***	0.136699	0.9273***	0.136693	-0.7393***	0.129388
Wild boar	-0.9435***	0.127001	0.8292***	0.142651	0.8859***	0.122312
Small game	0.0373***	0.004594	0.0278***	0.003449	0.0349***	0.004122
Cost	0.0017***	0.000224	0.0015***	0.000169	0.0012***	0.000181
Model summary:						
Observations	4.134		4.101		4.146	
Log-likelihood	-925.724		-1010.14		-1053.9964	
AIC						
BIC						
Pseudo-R2	0.321660527		0.271587		0.245264	

Table A4: Results from mixed logit model in the preference space for hunters with different hunting experience

	Group 1 (1-15 years)		Group 2 (15-35 years)		Group 3 (>35 years)	
Main effects:						
Moose	2.9797***	0.296668	3.2459***	0.338664	2.4781***	0.283326
Roe-deer	1.1899***	0.138897	0.6756***	0.116807	0.3329**	0.121702
Wild boar	0.7485***	0.135008	0.5379***	0.137311	0.2758	0.117411
Small game	0.0125***	0.003522	0.0107**	0.003981	0.0035	0.003940
Cost	-0.0020***	0.000196	-0.0019***	0.000201	-0.0016***	0.000203
SQ	0.8339***	0.234521	-0.0238	0.234165	-0.0423	0.207011
Standard deviation of random parameters						
Moose	-2.4557***	0.25455	-2.6313***	0.270465	-2.3793***	0.266044
Roe-deer	-0.9443***	0.139878	0.4991***	0.112165	-0.7370***	0.109557
Wild boar	-0.9899***	0.125644	0.9171***	0.108555	0.9056***	0.182145
Small game	0.0251***	0.003286	0.0441***	0.005006	-0.0300***	0.003696
Cost	0.0015***	0.000176	-0.0015***	0.000157	0.0012***	0.000146
Model summary:						
Observations	4.158		4.104		4.119	
Log-likelihood	-986.692		-952.694		-1048.9474	
AIC						
BIC						
Pseudo-R2	0.309270961		0.2883		0.2394	

Table A5: WTP-estimates of the mixed logit model and 95% confidence intervals for the whole sample

	Total		Non-farmers		Farmers	
Moose	1878,17***		1695,87***		1596,19***	
CI (95%)	(2149,34	1607,00)	(1393,97	1997,78)	(1071,93	2120,45)
Roe deer	495,78***		475,21***		317,64***	
CI (95%)	(595,26	396,31)	(366,25	584,18)	(185,53	449,75)
Wild boar	327,69***		327,02***		29,99	
CI (95%)	(420,80	234,59)	(214,42	439,62)	(-113,76	173,74)
Small game	5,94***		4,21***		2,59	
CI (95%)	(8,67	3,21)	(1,51	6,92)	(-1,94	7,11)

Table A6: WTP-estimates for hunters who hunt on different grounds

Ground	Own		Lease		Team	
Moose	1202,08***		1791,53***		1887,32***	
CI (95%)	(760,21	1643,95)	(1331,04	2252,02)	(1529,90	2244,75)
Roedeer	216,83**		561,04***		510,12***	
CI (95%)	(47,92	385,74)	(366,52	755,57)	(382,25	637,99)
Wild boar	47,51		312,55***		314,62***	
CI (95%)	(-99,63	194,65)	(157,67	467,43)	(189,66	439,58)
Small game	-0,061		5,22**		3,79**	
CI (95%)	(-5,89	5,76)	(0,72	9,72)	(0,82	6,77)

Table A7: Results from mixed logit model in the WTP space for all respondents, farmers and non-farmers

	All respondents		Farmers		Non-farmers	
	Mean	Standard error	Mean	Standard error	Mean	Standard error
Main effects:						
Moose	1737.99***	104.89	1585.04***	124.66	2247.13***	125.91
Roe-deer	470.02***	56.43	380.63***	60.38	623.04***	77.87
Wild boar	346.74***	57.43	134.88***	49.77	439.58***	60.80
Small game	7.42***	1.93	2.76	2.24	7.85***	1.89
Cost	-6.41***	0.07	-6.16***	0.12	-6.45***	0.08
SQ	344.62***	86.07	-68.79	111.29	530.00***	112.81
Standard deviation of random parameters						
Moose	1610.43***	113.05	1825.79***	131.49	1155.31***	103.60
Roe-deer	-638.77***	48.48	-438.70***	42.95	587.74***	67.67
Wild boar	701.56***	65.47	565.73***	59.64	704.90***	76.37
Small game	23.09***	1.50	31.20***	2.32	18.41***	1.38
Cost	0.67***	0.07	0.86***	0.11	0.75***	0.08
Model summary:						
Observations	12381		4491		7845	
Log-likelihood	-3140.73		-1104.16		-1991.37	
AIC						
BIC						
Pseudo-R2	0.20798		0.20939		0.221419	

Table A8: Results from mixed logit model in WTP space for hunter categories with different annual activity

	Group 1 (1-15 days)		Group 2 (15-30 days)		Group 3 (>30 days)	
	Mean	Standard error	Mean	Standard error	Mean	Standard error
Main effects:						
Moose	2156.50***	167.27	1960.78***	137.07	1207.23***	135.67
Roe-deer	556.99***	66.58	495.52***	56.51	395.52***	62.96
Wild boar	113.41*	63.68	342.85***	47.46	529.01***	75.39
Small game	4.26**	2.06	9.35***	1.47	1.28	2.19
Cost	-6.25***	0.12	-6.25***	0.11	-6.36***	.11
SQ	307.33**	121.16	546.57***	125.12	99.66	127.13
Standard deviation of random parameters						
Moose	1905.27***	256.27	-1430.34***	140.37	-1395.83***	123.51
Roe-deer	502.79***	69.77	-637.44***	44.79	-601.72***	70.32
Wild boar	673.68***	85.95	620.00***	58.17	-498.38***	69.90
Small game	21.16***	2.36	24.47***	2.20	26.62***	2.33
Cost	.84***	.14	-.97***	.12	.84***	.16
Model summary:						
Observations	4134		4101		4146	
Log-likelihood	-968.99		-1049.57		-1089.54	
AIC						
BIC						
Pseudo-R2	0.260178		0.206433		0.183478	

Table A9: Results from mixed logit model in the WTP space for hunters with different hunting experience

	Group 1 (1-15 years)		Group 2 (15-35 years)		Group 3 (>35 years)	
	Mean	Standard error	Mean	Standard error	Mean	Standard error
Main effects:						
Moose	1968.75***	137.85	2005.16***	126.54	1534.32***	292.55
Roe-deer	848.75***	95.78	514.33***	74.63	285.07***	81.74
Wild boar	352.216***	71.11	253.23***	81.36	286.06***	85.30
Small game	10.40***	1.82	4.82**	1.96	3.19	3.08
Cost	-6.32***	0.10	-6.30***	0.12	-6.42***	0.19
SQ	531.01***	146.51	271.48**	126.31	52.19	126.77
Standard deviation of random parameters						
Moose	1738.58***	155.77	1366.05***	125.68	1511.00***	176.57
Roe-deer	-727.29***	106.27	463.27***	76.85	516.41**	97.73
Wild boar	-605.86***	74.11	668.17***	69.90	584.79***	82.30
Small game	16.10***	1.83	27.917***	2.18	21.00***	2.41
Cost	0.66***	0.10	0.98***	0.14	0.862***	0.20
Model summary:						
Observations	4158		4104		4119	
Log-likelihood	-1030.98		-990.785		-1083.02	
Pseudo-R2	0.237454		0.233327		0.1776193	

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