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Valuing the landscape benefits of rural policies actions in Veneto (Italy)

This study addresses, with reference to the landscape, a precise request of the EU to quantify the benefits of public expenditure in agriculture. It analyses the implications on rural landscape of some measures of the Common Agricultural Policy at a regional level, taking the Rural Development Programme (RDP) 2007-2013 of the Veneto Region, in north-eastern Italy, as case study. A choice experiment (CE) is applied to value four measures of the RDP that directly affect the landscape characteristics.
The CE results point out that the landscape benefits of the measures in the Veneto RDP are higher than the subsidies paid to farmers for the provision of services that improve landscape quality. The CE results suggest the opportunity to rethink the distribution of the subsidies.

1. Introduction

As stated by the European Landscape Convention signed in Florence in 2000 "landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors". Landscape policy must allow "specific measures aimed at the protection, management and planning of landscapes" to be adopted in order to satisfy the "aspirations of the public with regard to the landscape features of their surroundings". From an economic point of view the rural landscape can be considered a pure public good and an externality (positive or negative) of farming and other business activities that exploit and modify the land (Vanslembrouck & Van Huylenbroeck, 2005). As known, the market is unable to determine an efficient allocation of resources in the presence of externalities and public goods. In such circumstances only government intervention can correct the so-called "market failures" (Randall, 1987; Tisdell, 1993).

With this aim the European Common Agricultural Policy (CAP) has broadened its scope in the last decades, moving from a productive view of agriculture to the consideration of its benefits within a multifunctional framework. The preservation and improvement of the rural landscape has long been one of the objectives of the CAP.

In 1985 EEC Regulation No.797 authorized Member States to introduce special national schemes in environmentally sensitive areas, namely "*areas of recognized importance from an ecological and landscape point of view*" (art. 19). The subsequent

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EEC No 2078/92 introduced an aid scheme part-financed by the Guarantee Section of the European Agricultural Guidance and Guarantee Fund (EAGGF) aimed at promoting "*ways of using agricultural land which are compatible with protection and improvement of the environment, the countryside, the landscape, natural resources, the soil and genetic diversity*" (Art.1).

Finally EC Regulation No 1698/2005 introduced the possibility of supporting "*studies and investments associated with maintenance, restoration and upgrading of the cultural heritage such as the cultural features of villages and the rural landscape.*" (Art. 57).

This objective has been confirmed by the "European Union strategic guidelines for rural development" (Council Decision 2006/144/EC) which stated that "*To protect and enhance the EU's natural resources and landscapes in rural areas, the resources devoted to axis 2 should contribute to three EU-level priority areas: biodiversity and the preservation and development of high nature value farming and forestry systems and traditional agricultural landscapes; water; and climate change*".

With this aim the Regions, following the suggestions in the "Handbook on common monitoring and evaluation framework. Guidance document – Guidance note B" on how to evaluate the results achieved by the Rural Development Programmes (RDP), should answer the question: "To what extent have agri-environmental measures contributed to maintaining and improving the landscape and its features?"

The RDP is the planning instrument that EU Member States and their Regions should use to put the measures of Reg. (EC) No 1698/2005 into practice.

Looking at Italy, the Veneto Region adopted its RDP in May 2006. Despite not including specific measures for rural landscape preservation, the Veneto RDP includes several measures that directly affect the rural landscape (e.g.: measures 211 and 214 – pastures preservation on the mountains, hills and plain; measure 214 A – preservation of ecological corridors, buffer zones, hedges and small woods; measure 214 G – conversion of arable land into meadows; measures 221 and 222 – creation of woods on agricultural land).

There are several methods for evaluating the landscape effects of the CAP (monetary and non-monetary), but stated preference approaches can be considered particularly suitable.

While other monetary methods (travel cost and hedonic pricing) are particularly indicated to investigate use-values, stated preference methods like contingent valuation (Bateman & Great Britain. Dept. for Transport., 2002) and choice experiments (CE) (Hensher, Rose, & Greene, 2005; Hoyos, 2010) have the advantage of eliciting both use and non-use values. A further advantage of stated preference methods over revealed preferences is their suitability for the valuation of the benefits of future scenarios, namely the effects of policies that have not yet been put into practice. Both CV and CE approaches were applied for landscape valuation in the past and it is not possible to state that one is better than the other. What makes CE appealing in landscape valuation compared to CV is the possibility of evaluating different landscape settings simultaneously and the ability of this method to derive part-worth utilities and willingness to pay (WTP) for different characteristics (attribute levels) of the considered landscape scenarios. Stated pref-

erence methods also accomplish the implicit request of the European Landscape Convention that people should judge the quality of the landscape where they live and the outcomes of the landscape policies.

Several studies have applied choice experiments for evaluating the benefits of landscape policies in Scotland (Bullock, Elston, & Chalmers, 1998; Hanley et al., 1998), England (Colombo, Hanley, & Louviere, 2009; Hanley, Colombo, & Mason, 2007), Ireland (Campbell, 2007; Campbell, Hutchinson, & Scarpa, 2009; Hynes & Campbell, 2011; Scarpa, Campbell, & Hutchinson, 2007), Germany (Schmitz, Schmitz, & Wronka, 2003), Switzerland (Huber, Hunziker, & Lehmann, 2011; Hunziker et al., 2008), France (Rambonilaza & Dachary-Bernard, 2007; V. Westerberg, Jacobsen, & Lifran, 2013; V. H. Westerberg, Lifran, & Olsen, 2010) and Denmark (Broch, Strange, Jacobsen, & Wilson). Only a few studies applied this methodology in Italy for landscape policies valuation and they focused on specific aspects like the preservation of the traditional landscape (Bottazzi & Mondini, 2006; Madau & Pulina, 2013), the realisation of an afforestation programme in a peri-urban area (Vecchiato & Tempesta, 2013) and the protection of a riverscape (Tempesta & Vecchiato, 2013). Moreover the Italian CE studies did not usually deal explicitly with agri-environment measures and the CAP application.

The aim of this paper is to value by means of a CE if the social benefits coming from the implementation of the Veneto RDP, regarding the measures that directly affect the landscape characteristics, are greater than the subsidies granted for this purpose by the RDP.

Compared to previous approaches our study presents the following innovative aspects. Firstly it explicitly addresses a request of the EU to quantify the benefits of public expenditure in agriculture. It therefore also aims at shaping the CE methodology to meet the precise normative requirements imposed by the EU. Secondly, the geographical context, given that no other studies have used a comprehensive approach to try to assess the landscape impacts of CAP at a regional level in Italy.

The paper is organised as follows. Section two analyses the results of previous studies on rural landscape, section three focuses on the presentation of the CE methodology, experiment design, questionnaire design, data collection and model specifications. The results are presented in section four. Section five discusses the results and presents conclusions.

2. Previous applications of choice experiments for the valuation of rural landscape policies

According to the review written by Ciaian, Kancs, and Gomez y Paloma (2011) only 14 studies out of 35 reviewed by the authors applied CE to evaluate the landscape, of which 7 were conducted in Europe. Analysing the recent literature we found two other studies in Europe (Hynes & Campbell, 2011; Yadav, van Rensburg, & Kelley, 2013) while four have been undertaken in Italy since 2006 (Bottazzi & Mondini, 2006; Madau & Pulina, 2013; Tempesta & Vecchiato, 2013; Vecchiato &

Tempesta, 2013). Given the aim of this paper, international CE will be only briefly described while all the Italian landscape evaluations (both CV and CE) will be reviewed.

2.1 European studies

Hanley et al. (1998) applied choice experiments, along with CV, to estimate the wildlife and landscape benefits of the ESAs (Environmental Sensitive Areas) scheme in Scotland. The ESAs programme involves payments to farmers to ensure the provision of wildlife and landscape quality. The attributes considered in the study were the presence of broadleaved woods, heather moors, wet grasslands, dry stone walls and archaeological sites and an increase in taxes. All attributes, apart from the tax increase, had two levels, representing a "more" or "less" change in each characteristic. Respondents (256) were mostly concerned with the provision of woods (50.46 £/household per year), heather moors (22.95 £/household), wet grasslands (20.85 £/household), dry stone walls (11.30 £/household) and archaeological sites (6.65 £/household[1]).

Hanley et al. (2007) analysed the effect of the CAP reform in the UK moving from a payment scheme to farmers linked to production levels to one linked to the provision of public goods (landscape features and habitats). The CAP reform effects analysed covered the 2007-2013 period as in our study. A choice experiment was applied in four severely disadvantaged areas and one in the southeast to measure non-residents' values. Six attributes were considered: heather moorland and bog, rough grassland, mixed and broadleaved woodland, field boundaries, cultural heritage and tax increase (per household/year). The authors found a high variability of the marginal WTP among the different areas considered, an issue that led them to suggest calibrating the payment schemes on a regional basis. The authors therefore concluded that according to their results the benefits calculated exceed the budget for implementing the policy but pointed out that stated preference methods seem susceptible to hypothetical bias and therefore to overestimating the real benefits stated by the respondent.

Rambonilaza and Dachary-Bernard (2007) studied landscape preferences of two groups, residents and visitors, with regard to the expected outcomes of a local programme targeting the rural landscape of the Monts d'Arrée site in Brittany (France) overlapping with the Armorique Regional Nature Park. The attributes considered were the condition of scrubland, hedgerows and farm buildings, and the cost was differentiated in the visitors' and residents' questionnaires. All attributes had qualitative levels (low/medium/high or absent/slightly present/present), apart from the cost attribute that was expressed with monetary values. The authors analysed the differences in preferences for landscape policies between

[1] The WTP estimates reported in brackets refer to the quadratic model results, i.e. the model where the cost attribute was treated as squared.

residents and visitors. The visitors group was differentiated on the basis of their origin from rural or urban areas to test the effect of a deeper knowledge/culture about rural landscape. All groups had a positive WTP for the presence of hedgerows and for a good integration of farm buildings into the rural landscape, but while residents and tourists of urban origin preferred a mixture of forestland and scrubland, tourists of rural origin showed a clear preference for a forest landscape.

Campbell et al. (2009) extended the analysis of the CE presented by Campbell (2007), looking at the spatial distribution of the benefits of the Rural Environmental Protection (REP) Scheme in Ireland. The authors considered four landscape attributes affected by REP: mountain land (reduction of overgrazing and soil erosion), stonewalls, farmyard tidiness and cultural heritage. Each attribute had three levels: a lot of action, some action and no action. Respondents showed the highest WTP for a lot of action on mountain land, and the lowest for cultural heritage improvements. The authors found a great spatial variability of WTP that increased from eastern to western Ireland where the attributes analysed are more present in the rural landscape. In this respect it seems that the use value of landscape plays an important role and that policy should therefore try to increase the access to rural landscape resources for recreational use in order to improve their value.

Hynes and Campbell (2011) estimated the welfare effect on people of landscape changes as a consequence of the changing policy actions of the CAP in Ireland after 2013. Five attributes were considered: cattle and sheep, biofuel crops, field boundaries, flora and fauna, and cost. The levels of the considered attributes involved consideration about an increase/decrease of the attribute or a no-change level. The authors found a negative WTP for a diffusion of intensive productions (cattle and sheep, biofuel crops) and a positive one for an increase in the remaining attributes. The WTP per person/year was 20.39 € for a flora and fauna improvement and 8.57 € for the preservation of field boundaries in good condition.

Yadav et al. (2013) analysed the benefits deriving from the conservation of two traditional landscapes in the Burren Region (Ireland), where the abandonment of traditional agricultural practices was threatening the visibility of rocky limestone pavements and orchid-rich grasslands. The study used a choice experiment submitted to 292 people in six counties. The attributes considered were rocky limestone pavements, orchid-rich grasslands and the cost of the policy. Both non-monetary attributes had two levels: with and without management. To avoid the social desirability bias respondents were approached with both direct and indirect questioning. The WTP estimated with the direct questioning approach was 41.6 € per household/year for the preservation of rocky limestone pavements and 38.5 € for orchid-rich grassland. The WTP obtained with the indirect questioning was much lower: 13 € for rocky limestone pavements and 6.8 € for orchid-rich grassland.

Hasund, Kataria, and Lagerkvist (2011) conducted a CE in order to estimate the WTP for different landscape elements in Sweden. They considered arable land and grassland separately. The arable land elements were linear (wood fence, stone wall, headland, ditch, field road), points (field islet, cultivation cairn, pond, field barn, pollard, cultural heritage, biodiversity and visibility) and environmental quality attributes (cultural heritage, biodiversity and visibility). The grassland

attributes were: type of grassland, own consumption, presence of red listed species, size, overgrowth by brushwood or thickets, cultivation management. With reference to the arable land landscape the most valued linear attribute was "stone walls" (about 25 € per year) followed by "traditional wooden fences" (about 15 €per year). The point element most valued was "cultivation (stone) cairn" (about 18 € per year). However in general the WTP was higher in the case of the environmental quality attributes "more biodiversity" (39 € per year) and "more visibility" (31 € per year). In the case of grassland in general people seemed to prefer a more natural management (e.g. semi-natural pastures) that can ensure more biodiversity. In the case of the field elements, people familiar with the elements considered were more willing to pay to preserve them. On the contrary, in the case of the grassland familiarity tended to reduce the WTP for some elements. From the agricultural policy point of view the study found that the benefits of the grants paid to the farmers are lower than the social benefits that these measures can produce.

2.2 Italian studies

In Italy only a few studies have estimated the value of landscape using CE. Bottazzi and Mondini (2006) analysed the WTP of tourists to preserve the traditional landscape of the "Cinque Terre" National Park (Liguria) and for other tourist goods and services (traditional food, transport). The results obtained by the authors were, to a certain extent, contradictory. In fact it was found that the WTP for conserving the traditional landscape was negative because foreign tourists tended to prefer a more natural arrangement. This was probably due to the way in which the choice experiment was set up.

Madau and Pulina (2013) examined tourists' preferences for the preservation of some features of the rural landscape in Gallura (Sardinia). The most appreciated landscape element were forests (WTP = 49.5 € per person), followed by vineyards (16.5 € per person) and grazing (6.65 € per person). Also in this case tourists seemed to prefer a more natural landscape than traditional (grazing) or agricultural ones (vineyards).

Tempesta and Vecchiato (2013) analysed the impact of alternative water management scenarios on a riverscape. The authors found that the WTP of residents to guarantee a minimum in-stream flow of 10% was 40.9 € per family/year while the WTP to increase the presence of forests and hedgerows by 10% along the river Serio (Lombardy) was 61.3 € per family/year. The research, by means of a latent class approach, also highlighted that there was a not negligible degree of preference heterogeneity among interviewees. About one third did not consider the increase of forests and hedgerows important while the others, on the contrary, considered the greening of the river banks more important than a guarantee of minimum in-stream flow.

Vecchiato and Tempesta (2013) analysed the landscape benefits from a peri-urban afforestation programme. The objectives of the study were to estimate the

WTP for different surface allocations of the future Wood of Mestre (Venice). The research found that people preferred a mixed solution in terms of surface allocation: the wood–meadow mix (75% woodland, 25% meadow) was at the top of the sample preferences. The research highlighted that WTP had an inverse correlation with age. Nonetheless the WTP of older people was not negligible and this appears to support the hypothesis that the woodland will also have a bequest value. The WTP also tended to decline with the distance of the district where the interviewees lived.

2.3 Other Italian landscape valuations

Given the aim of this paper it is of interest to also consider the results of other Italian studies that valuated the landscape by means of the contingent valuation method (CV). Tempesta (2014) reviewed 8 studies where the value of 11 landscapes was estimated (Table 1).

The CV studies in Italy mainly concerned preservation of the existing rural landscape against possible sources of degradation caused by the intensification or abandonment of farming activities. As can be seen in Table 1, the estimated WTP is very diverse, ranging from 2.8 to 74.3 € per household/year and from 10.2 to 3,079.9 € per ha/year. This probably depends on the different characteristics of the landscapes under investigation but also partly on different hypothetical market design used. However it is interesting to observe that the benefits of landscape preservation were in general higher than the per hectare subsidies paid to farmers in Italy through the CAP accompanying measures (Antonelli et al., 2006; Tempesta, 1998; Tempesta & Thiene, 2004; Torquati & Musotti, 2007).

3. Material and methods

3.1 Case study area

The Veneto Region is located in north-eastern Italy and covers an area of 18,390 km^2, 56.4% of which is flat, 29.1% mountainous and 14.5% hilly. The regional land structure underwent some intense landscape changes starting from the Second World War.

Meadows were gradually abandoned in mountain and hill areas and this was followed by an extensive reforestation process. According to the agricultural census data, between 1970 and 2010, meadows reduced by 39.9% in the mountains and 49.4% in hilly areas. Woods re-colonised the abandoned meadows covering a total surface of 395,000 ha. Today 58% of the land in the mountains is covered by woods and 29% in hilly areas.

On the plain, there has been a progressive expansion of crops with the consequent disappearance of permanent meadows, hedges and woods. Between 1970 and 2010, permanent meadows were reduced by 40% to just 2.8% of the territo-

Table 1. Italian landscape estimation by means of the contingent valuation method. Source: Tempesta 2014.

Authors and year	Area	Interviewee characteristics	Landscape	Benefits estimation (current prices)	Average yearly benefits (constant prices 2005)	
					per household/ year	Total per ha
Tempesta (1998)	Plain between Isonzo and Tagliamento rivers (Udine)	Residents	Plain natural meadows	WTP average =2.17€ per household/year	2.9	473.8
Tempesta (1998)	Plain between Isonzo and Tagliamento rivers (Udine)	Residents	Plain meadows and hedgerows	WTP average =4.21€ per household/year	5.6	3,079.9
Tempesta (1998)	Plain between Isonzo and Tagliamento rivers (Udine)	Residents	Plain wood	WTP average =3.72€ per household/year	4.9	1,494.2
Cicia and Scarpa (1999)	Cilento National Park	Tourists	Natural	WTP average = 18€ per person/year	51.3	270.4
Tempesta and Thiene (2004)	Cortina d'Ampezzo Valley - Dolomites (Belluno)	Tourists	Mountain meadows	WTP average = 27.4€ per household more years	4.4	759.0
Signorello, Pappalardo, and Pulvirenti (2001)	Etna Volcano area (Catania)	Residents	Traditional pistachio cultivation	WTP average = 51.6€ one shot per household	2.8	273.9
Tempesta (2006)	Plain of the Venice Municipality	Residents	Plain wood	WTP median = 20.1€ per person/year	50.2	1,709.6
Torquati and Musotti (2007)	Umbria Region hills and mountains	Residents	Traditional landscapes (pasture, meadows, olive trees, hedgerows, dry stone walls)	WTP average = 47€ per household/year	47.0	1,692
Idda et al. (2006)	Sardinia - Thiesi hills area (Sassari)	Residents	Traditional pasture and meadows	WTP average = 53.3€ per household/year	53.3	10.2
Idda et al. (2006)	Sardinia	Tourists	Traditional pasture and meadows	WTP median = 15.9€ per person/year	39.8	65.7
Antonelli et al. (2006)	Marche Region - hills and mountains	Residents	Traditional landscapes (pasture, meadows, hedgerows)	WTP median = 74.3€ per person/year	74.3	3,980.6

ry. It should be noted that at the beginning of the 19th century there were nearly 5,000 ha of woods that almost entirely disappeared: at the end of the 20th century only 7 woods were left on a total area of 72 ha. From the beginning of the 21st century, the local authorities tried to limit this trend by creating 350-400 ha of woods (230 of them in the Venice hinterland) with the support of EU funds (Reg. n. 2080/92 and Reg. n.1698/2005).

3.2 *The choice experiment methodology*

CE (Hensher et al., 2005; Hoyos, 2010) are part of stated preference methods in non-market valuation and are grounded on the Lancastrian consumer theory (Lancaster, 1966) and random utility theory (Manski, 1977; McFadden, 1974; Yellott, 1977). The central assumption of CE methodology is the postulate that utility is derived from the properties/characteristics of goods, rather than the goods per se.

Multinomial logit (MNL) (McFadden, 1974) models have been widely applied in CE data analysis and are mostly suitable for exploratory data analysis due to the fact that they often do not satisfy some assumptions[2]. Other models[3] like the Random parameter logit models (RPL) (McFadden & Train, 2000; Train, 2009) and latent class models (LCM) (Swait, 1994) are more flexible and not subject to the Independence from Irrelevant Alternatives (IIA) assumption. Both models are suitable for investigating respondents taste heterogeneity but differ in the way individual characteristics are handled in determining choice probability.

Welfare measures are derived by looking at the marginal rate of substitution between non-monetary attributes and the monetary attribute included in the indirect utility function (IUF). Therefore, the consumer surplus can be calculated within the context of discrete choice models such as the relative Hicksian compensating variation (Hoyos, 2010). When dealing with additive IUFs, the formula for calculating WTP becomes:

$$WTP_j = -\frac{\partial U / \partial X_j}{\partial U / \partial p} = -\frac{\beta_j}{\beta_p} \tag{1}$$

Where j is the j-th attribute, U is the indirect utility function and p is the price attribute.

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[2] In particular the Independence from Irrelevant Alternatives (IIA) assumption, namely that the ratio of the probabilities of choosing one alternative over another (given that both alternatives have a non-zero probability of choice) is unaffected by the presence or absence of any additional alternative in the choice set (Louviere, Hensher, & Swait, 2000).

[3] The interested reader can find more details on the mathematical specifications of the different CE models in Hensher et al. (2005) and Train (2009).

4. Study design and data collection

4.1 Experimental design

Five attributes were considered in the choice experiment: one monetary (the cost of the policy) and four non-monetary. In order to choose the "non-monetary" attributes and levels used in the design, the measures of the Veneto Region RDP 2007-2013 that mainly influence the landscape transformations have been considered. The "non-monetary" attributes and the CAP measures they refer to are:

1) Maintenance of pastures and meadows in mountain areas (measures 211 and 214E);
2) Conversion of arable land to grassland on the plain (measure 214 G);
3) Hedges and forest buffers maintenance on the plain (measure 214 A);
4) First afforestation of agricultural land on the plain (measure 221 and 222).

Each of the four attributes had three levels (Table 2). It is important to underline that while measures 211, 214E and 214A are aimed at preserving the existing landscape features, the target of measures 214G, 221 and 222 is to improve the landscape. So in the case of the conservation of mountain meadows and pastures (measures 211 and 214E), the surface of 800 km^2 corresponds to the high action since it is the optimal result that can be achieved by the RDP considering the current subsidies. Reducing the subsidies (and the cost for the families living in the Veneto Region), a smaller area could be preserved (respectively 500 km^2 - medium action and 300 km^2 - low action). The same applies in the case of hedgerows and forest buffers maintenance, where "high" means preservation of the existing 49,000 km (Table 2). On the contrary, in the case of afforestation measures and the conversion of arable land to meadows, the high level corresponds to the maximum increase of the surface (respectively 1,600 ha and 60 km^2).

The choice of the different area levels was inspired by the real actions foreseen by the Veneto Region RDP 2007-2013 for the landscape.

The vehicle of payment is an increase in the income taxes paid yearly by households. In order to set the levels of the cost attribute we took into consideration previous studies on landscape in Italy (Tempesta, 2014) and the opinions of the participants in our focus groups[4].

In designing the CE we opted for an unlabelled and unblocked design. A fractional factorial orthogonal design was generated with SPSS software. Each respondent was presented with six cards (choice sets) with four options each: A, B, C and the status quo. The status quo alternative provides a scenario at zero cost

[4] There were two rounds of focus groups: the first was technical to choose the attributes and levels for the experimental design and the second to test the questionnaire. The main purpose of the second round of focus groups was to check whether the structure of the questionnaire was clear, identify typing errors, verify the acceptability of the hypothetical market and payment vehicle, and test the choice task comprehension.

Table 2. Attributes and levels of the choice experiment design

Action (RDP measure)	Maintenance of pastures and meadows in mountain areas	Conversion of arable land to grassland on the plain	First afforestation of agricultural land on the plain	Hedges and forest buffers maintenance on the plain
Levels	High 800 km^2 (100%*)	High 60 km^2 (+20%)	High (+1600 ha)	High 49,000 km (100%*)
	Medium 500 km^2 (62%*)	Medium 30 km^2 (+10%)	Medium (+800 ha)	Medium 24,500 km (50%*)
	Low 300 km^2 (37%*)	No increase	No increase	Low 12,000 km (25%*)
Average cost per family	60 € (High) 30 € (Medium) 15 € (Low) 0 €			

* percentage of the highest level of the attribute that corresponds to the present surface or length.

where the proposed policies will not be undertaken. Each respondent had to choose the preferred option for each of the six cards (six choices per respondent).

4.2 Questionnaire structure

Data were collected by means of in person interviews where people had to fill in a questionnaire with the support of a group of specifically trained interviewers. The questionnaire was composed of an introduction and four main sections. The introductory page presented the survey and the institution conducting it and then emphasised the importance of taking part in the survey and the fact that the respondent would remain anonymous.

The first section focused on the collection of opinions about the perceived state of the rural landscape in the Veneto Region both on the plain and in the mountains. A further set of questions was related to the knowledge of the relationship between agricultural policy and landscape preservation and on the factors that contribute to the improvement or degradation of landscape.

The second section contained questions aiming at understanding the recreational habits of the interviewees. The sensitivity to landscape quality is often affected by the relationship that people have with open spaces and this is often reflected by the place of residence and their recreational activities.

The third section introduced the CE itself, explaining the role of agricultural policies in supporting farmers for the provision of services aimed at the conservation and improvement of landscape.

Interviewees were given an overview of the main transformations taking place in the Veneto landscape and their causes. This information was given with the support of photographs illustrating the effect of the abandonment of meadows and pastures on the mountains, the preservation of hedges and forest buffers on the plain and the conversion of arable land to grassland and first afforestation on the plain. After this introduction, the measures foreseen by the RDP for landscape preservation were described.

The six choice cards were then presented asking to indicate the preferred option for each card.

The fourth and final section investigated the respondents' socioeconomic characteristics.

4.3 Data collection

To draw the sample the municipalities of the Veneto Region were first grouped into two main clusters depending on their geographical area (plain or hill and mountain). Some municipalities that can be considered representative of the two main clusters were selected.

We then randomly selected interviewees from the local phonebooks. We contacted the selected sample by phone asking for the availability for an in person interview at home. The majority of people contacted refused to take part in the study. The chosen sampling approach, despite being methodologically correct, has the limit of not guaranteeing respondent anonymity, and we think this is the main reason for the high rate of refusal we encountered. A further limit of this sampling strategy is that it is subject to self-selection phenomena: people with more sensitivity towards the survey topic are more likely to accept to be interviewed.

To overcome this problem we decided to change interview method, following a sampling strategy described by Davis (2004) as an intercept survey. A group of interviewers was specifically trained for handling in person interviews in front of grocery stores, local street markets, and bakeries. In order to ensure randomness of respondents and avoid self-selection, interviewers were told to stop one pedestrian in every five.

We collected 309 usable questionnaires from residents of the Veneto Region, yielding a total of 1854 choice observations, given that each respondent made six choices. Data were collected between summer 2011 and spring 2012.

5. Results

5.1 Interviewee characteristics

50.2% of interviewees are men and 49.8% women (Table 3). 54.1% of people are over 50 and this value is close to that of the Veneto Region 2011 census (56.5%).

Table 3. Socioeconomic characteristics of the sample.

Sex	Sample		Veneto*
	n.	%	%
Male	155	50.2	48.7
Female	154	49.8	51.3
Total	309	100.0	100.0

* data from ISTAT 2011 Census.

Age classes	Sample		Veneto*
	n.	%	%
18 to 30 years	57	18.5	15.5
31 to 40 years	52	16.8	17.8
41 to 50 years	60	19.4	20.2
51 to 65 years	109	35.2	23.2
65 years or over	31	10.3	23.3
Total	309	100.0	100.0

* data from ISTAT 2011 Census (considering people from 18 years).

Educational level	Sample		Veneto*
	n.	%	%
Primary school	21	6.8	20.8
Middle school	105	34.0	31.7
High school	136	44.0	37.2
University degree	47	15.2	10.5
Total	309	100.0	100.0

* data from ISTAT 2011 Census (considering people from 15 years).

Place of residence	At present	
	n.	%
Town centre	49	15.9
Town suburbs	78	25.2
Village	131	42.4
Rural areas	51	16.5
Total	309	100.0

Geographical area of residence	Sample		Veneto*
	n.	%	%
Plain	189	61.2	76.6%
Hill	98	31.7	15.8%
Mountain	22	7.1	7.5%
Total	309	100.0	100.0

*data from ISTAT 2012.

44% have a high school diploma and 15.2% a bachelor's degree: the educational level of the sample is slightly higher than the regional average (high school plus bachelor's degree = 47.7%).

66% of people have a job, and 51.4% of those who work are employed in the tertiary sector, 40% in industry and the rest in agriculture. The relationship of our sample with agriculture is more intense than that emerging from the analysis of occupation: 23.9% of people own a plot of land and 52.2% are related to people who work in agriculture.

These latter data can be better interpreted looking at the place where people live. 36.3% live in urban areas while the majority declared that they live in a rural village. This data is similar to the percentage of the people living in the 50 most important cities and towns of the Region (38.4%). However it should be noted that in the Veneto Region it is often difficult to establish what is strictly "urban" and what "rural" given that, excluding some mountain areas, the territory has a high dispersal of urban settlement and activities. 61.2% of the sample live on the plain. This percentage is lower than the regional one but, as we will see, it is possible to compensate for this difference by putting an interaction term into the CE model that permits the willingness to pay of the people living in the different geographical areas of the region to be estimated.

Interviewees declared that they make many recreational day trips. The preferred destinations are the mountains (median = 7 trips/year), the countryside (median=7 trips/year), and hill areas (median = 5 trips/year). Residents on the plain make fewer recreational day trips than people living in hill and mountain areas. Given the number of recreational trips the sample seems to have a good knowledge of rural landscape characteristics.

5.2 Landscape benefits estimates

To analyse the interviewees WTP an RPL model was estimated using NLOGIT software version 4.0 (Table 4). We applied a linear and additive in parameters utility function where the different levels of our attributes where dummy coded.

After testing several RPL model specifications we found that four variables present a significant level of heterogeneity (standard deviation - p-value < 0.1) and can be considered random parameters in the RPL model. The random parameters were assumed to have a normal distribution (Hensher et al., 2005). The four parameters treated as random are the dummy for the conservation of 800 km^2 of meadows in the mountains, the dummy for the creation of 8 km^2 of woods on the plain, the dummy for the creation of 16 km^2 of woods on the plain and the dummy for the conservation of 49,000 km of hedges on the plain.

In order to improve the explanatory capacities of the model, we tried to include both socio-economic variables and those relating to the opinions and recreational habits. Among those tested, the variables that were found to be significant as interaction parameters are: the dummy for residents on the plain, the dummy for those who hold a bachelor's degree and the number of trips made to the mountains. These variables were interacted with the random parameters and resulted as significant with all of them apart from hedges. In particular, the preference for the preservation of 800 km^2 of meadows in the mountains increases with the number of trips to the mountains and diminishes for the people living on the plain. The preference for the creation of 16 km^2 of woods on the plain is higher for those who live on the plain and those who have a degree, while the expected utility from the creation of 8 km^2 of woods on the plain is higher only in the case of plain residents.

According to Hensher et al. (2005), it is possible to state that our RPL model has an acceptable fit (McFadden pseudo-R^2 = 0.28). All coefficients are significant at the 95% confidence level and have the expected sign.

Looking at the estimated benefits, the WTP for the maintenance of 800 km^2 of meadows on the mountains is 67.2 €/household per year (95% confidence interval – CI - from 51.1 to 83.4) (Table 4). This figure is much lower for residents on the plain who have a yearly WTP of 43.6 €/household. It is interesting to observe that the WTP of those who make recreational trips to the mountains increases by 0.5 € per trip (95% C.I. from 0.08 to 0.91). This implies that the use value of the mountain landscape is an important component of the total economic value of this resource. The importance of the use value is confirmed on the plain, where residents have a higher WTP for the creation of permanent meadows on the plain (52.8 €/household per year) rather than for the conservation of pastures and meadows in the mountains.

The WTP for the afforestation of the plain is lower for the residents in mountain and hill areas (17.4 €/household per year for a 16 km^2 improvement) than for those living on the plain (52.4 €/household per year). The WTP for the creation of woods on the plain (16 km^2) is also positively correlated with education: people with a degree have a WTP of 17.2 €/household per year.

The WTP expressed for the conservation of hedges (16.2 €/household per year) is the lowest. As mentioned previously, socio-economic characteristics did not influence the WTP for hedges.

We then calculated the total benefits for the Veneto Region of the different actions. The total WTP was calculated considering that in the Veneto Region, following the 2012 Census, 76.6% of households live on the plain and 10.3% of adults are graduates. No official data exist regarding the number of trips to the mountains so we used the median value declared by the interviewees (9.5, 10 and 5 visits per year respectively for the people living on the mountains, on the hills and on the plain). We preferred to use the median rather than the mean since it is less sensitive to the presence of outliers. More details about the formula used in our computation are provided in Appendix A. Table 5 presents the estimates of the benefits deriving from the different actions of the Veneto RDP and the subsidies currently provided (total and per year). The WTP for all actions per year is 328.8 million €/year (95% CI from 182.3 to 475.3 million €/year) while the subsidies per year are ten times less, i.e. 32.4 million €/year. Note that also considering the lower limit of the WTP 95% confidence interval, the benefits are 5.6 times higher than the RDP subsidies. As can be seen, the discrepancy between the estimated benefits and the subsidies is quite high for all action levels, but it is particularly relevant on the plain for the conversion of crops into both meadows and woods. The benefits per hectare for the creation of woods on the plain are 56,524 €/ha per year (95% CI from 26,118 to 86,930 €/ha per year), while that for meadows is much lower (17,246 €/ha per year; 95% CI from 13,850 to 20,643).

Table 4. The Random Parameter Logit model.

	Coeff.	Std. Error	z	Pr. |z|>Z	WTP	WTP C.I. (95%)	
					Average	Inf.	Sup.
Random parameters (latent heterogeneity)*							
Maintenance of pastures and meadows (mountain): 800 km^2	1.525	0.189	8.074	0	67.2	51.1	83.4
First afforestation of agricultural land (plain): 8 km^2	0.822	0.155	5.288	0	36.2	23.3	49.1
First afforestation of agricultural land (plain): 16 km^2	0.395	0.135	2.923	0.004	17.4	5.8	28.9
Hedges and forest buffers maintenance (plain): 49,000 km	0.367	0.097	3.774	0	16.2	7.5	24.9
Non-Random Parameters							
No-choice	-1.752	0.230	-7.601	0			
COST	-0.023	0.002	-11.092	0			
Maintenance of pastures and meadows (mountain): 500 km^2	1.024	0.093	10.957	0	45.1	37.0	53.2
Conversion of arable land to grassland (plain): 30 km^2	0.747	0.101	7.398	0	32.9	21.6	44.3
Conversion of arable land to grassland (plain): 60 km^2	1.19	0.103	11.517	0	52.4	42.1	62.8
Hedges and forest buffers maintenance (plain): 24,500 km	0.317	0.070	4.54	0	14	7.3	20.6
Heterogeneity in mean parameter: Variable							
800 km^2 pastures maintained x mountain trips	0.0112	0.005	2.376	0.018	0.5	0.1	0.9
800 km^2 pastures maintained x residence plain	-0.5356	0.170	-3.154	0.002	-23.6	-39.1	-8.2
8 km^2 new woods on the plain x residence plain	0.4505	0.172	2.612	0.009	19.8	4.7	35.1
16 km^2 new woods on the plain x degree	0.3906	0.183	2.134	0.033	17.2	1.2	33.3
16 km^2 new woods on the plain x residence plain	0.8031	0.164	4.884	0	35.4	19.9	50.9
Standard deviations of random parameters distributions							
Maintenance of pastures and meadows (mountain):: 800 km^2	0.839	0.116	7.261	0			
First afforestation of agricultural land: 8 km^2	0.487	0.157	3.104	0.002			
First afforestation of agricultural land: 16 km^2	0.375	0.168	2.229	0.026			
Hedges and forest buffers maintenance: 49,000 km	0.408	0.231	1.765	0.078			

N. Observations =1854 Loglikelihood =-1855.05 *random parameters assumed normally distributed
McFadden pseudo R-squared = 0.28 Halton draws = 1000

Table 5. Comparison of RDP expenditures and people's willingness to pay at the regional level.

Measures	Type of intervention	RDP payments (euro)				Benefits estimate per year (euro)			
		RDP Total	per year	area or length	per ha (or km) per year	WTP Total	per ha (or km)	Per household*	WTP/ RDP
Measure 211	Payments to farmers in mountain areas								
Measure 214/e	Maintenance of pastures and meadows in mountain areas	159,367,145	22,766,735	80,000 ha	285	102,950,352	1,286.9	52.2	4.5
Measure 214/a	Hedges and forest buffers maintenance	40,000,000	5,714,286	49,000 km	117	31,955,923	652.2	16.2	5.6
Measure 214/g	Conversion of arable land to grassland	5,280,000	754,286	6,000 ha	126	103,477,795	17,246.3	52.4	137.2
Measure 221	First afforestation of agricultural land	22,354,545	3,193,506	1,600 ha	1,996	90,438,358	56,524	45.8	28.3
Total		227,001,690	32,428,813			328,822,429		166.7	10.1

Measures	Type of intervention	WTP Confidence Interval (95%): benefits per year (euro)							
		Lower Limit				Upper Limit			
		WTP Total	per ha (or km)	per household*	WTP/ RDP	WTP Total	per ha (or km)	per household*	WTP/ RDP
Measure 211	Payments to farmers in mountain areas								
Measure 214/e	Maintenance of pastures and meadows in mountain areas	42,701,113	534	21.6	1.9	163,199,592	2,040	82.7	7.2
Measure 214/a	Hedges and forest buffers maintenance	14,739,468	301	7.5	2.6	49,172,378	1,004	24.9	8.6
Measure 214/g	Conversion of arable land to grassland	83,099,215	13,850	42.1	110.2	123,856,376	20,643	62.8	164.2
Measure 221	First afforestation of agricultural land	41,788,539	26,118	21.2	13.1	139,088,177	86,930	70.5	43.6
Total		182,328,335		92.4	5.6	475,316,523		240.9	14.7

* Total households = 1,973,086.

6. Discussion

Despite the methodological differences it is possible to state that our results are coherent with the findings of other European and Italian studies. Several researches conducted in Europe have highlighted that people are willing to pay in order to protect mountain or hill pastures against abandonment or spontaneous afforestation (Borresch, Maas, Schmitz, & Schmitz, 2009; Campbell, 2007; Willis & Garrod, 1992). Similarly some authors have found that people consider it important to preserve hedgerows, especially on the plain (Campbell, 2007; Vanslembrouck & Van Huylenbroeck, 2005; V. H. Westerberg et al., 2010).

The effect of the place of residence on the WTP for landscape preservation has been highlighted by Garrod, Ruto, Willis, and Powe (2014). In general, people are more willing to pay in order to preserve or improve the landscape in the area where they live or in an area that they can easily reach. According to our results the WTP expressed by the residents on the plain is quite different from that of people living in mountain or hill areas. More specifically, the WTP of the former to preserve mountain pastures is 58% lower than that of the latter. On the contrary, the WTP for the creation of new woods (16 Km^2) on the plain provided by residents on the plain is 200% higher than that of people living in the mountains. This result is also coherent with the results obtained in Ireland by Campbell et al. (2009), where the authors found that the existence of a "remarkable visual decline in WTP for preservation of 'mountain land', 'stonewall', 'farm tidiness', and 'cultural heritage' from the rural west of Ireland – where such features are generally present – to the urbanised and modern farm landscape of east – where they are generally absent" (Campbell et al., 2009, p. 109).

This aspect has an important implication, namely that the use value is a key component of the total social value of landscape. In our study this emerged from the analysis of the correlation between the WTP for maintenance of the mountain landscape and the number of recreational trips of respondents to the mountains. We found that the WTP for maintenance of the mountain landscape increases by 0.5 €/trip, corresponding on average to a WTP of about 76 €/ha per year.

The average WTP per household per year for all the actions considered amounts to 166.7 €/year (95% CI from 92.4 to 240.9 €/year). This figure is higher than all previous estimates made in Italy, which are summarised in Table 1.

Looking at the benefits for the single actions, it should be noted that the discrepancy is particularly high only for some of them, while others, like those for the conservation of mountain meadows and pastures (52.2 €/year per household) are quite similar to those found in Sardinia (53.3 €/year per household) (Idda et al., 2006), Marche (74.3 €/year per household) (Antonelli et al., 2006) and Umbria (47 €/year per household) (Torquati & Musotti, 2007). The WTP for the preservation of mountain meadows and pastures estimated by surface unit (1,286 €/year per hectare) is comparable to that estimated in Umbria (Torquati and Musotti, 2007) and Cortina d'Ampezzo (Tempesta & Thiene, 2004), but very different from that in Sardinia and Marche (Antonelli et al., 2006) (Table 1).

Only a few Italian studies tried to value the benefits deriving from the conservation and improvement of landscape on the plain. Tempesta and Vecchiato (2013) applied a CE and did a survey among the residents of the Serio River Regional Park (Lombardy), estimating a WTP of 61.3 €/year household to increase the presence of hedges along the river by 10%. The value is higher than that obtained in our study for the preservation of hedges (16.2 €/year per household).

There have been two studies on the benefits of actions concerning the improvement of landscape with afforestation programmes (Tempesta, 2006; Vecchiato & Tempesta, 2013), both related to the Wood of Mestre project. The first study (Tempesta, 2006) applied CV and found a WTP of about 50 €/year per household for a period of 10 years. The second (Vecchiato & Tempesta, 2013) applied CE and estimated a WTP of 42.7 €/year per household for 10 years. The results of these two studies are quite similar to the finding of the present research (45.8 €/year per household).

7. Conclusions

Despite from the fact that the choice experiment presented in this study has been conducted following the best research practices (Hauber et al., 2016), our results should be considered with caution due to the low number of interviewees (309 people). It should also be considered that the aim of the research was to compare the benefits coming from the landscape preservation and improvement with the magnitude of the subsidies provided by the RDP. In this respect, it is not possible to draw any conclusion about the opportunity to modify the destination of the RDP subsidies among the different measures of the program not considered in this study.

Our study had two main objectives: to verify whether CE can be a useful instrument to value the effects of the agri-environmental measures concerned with landscape as prescribed by the European Union and to compare such benefits with the costs paid by the citizens to subsidise farmers through the taxes.

As concerns the first objective, our research showed that CE seems to be a useful instrument to accomplish the valuation requests made by the EU with reference to the landscape. This methodology permits the different measures implemented by the RDP to be considered simultaneously, giving people the possibility to express their preferences among alternative policy scenarios. Compared to other methodologies (e.g. CV) CE has a further advantage: it makes it possible to consider respondents' individual characteristics directly in the utility function. This is an interesting aspect of CE when, like in our case study, the distribution of the population and that of subsidies in the territory do not coincide. In the Veneto Region 76.6% of households live on the plain while 70% of the total subsidies of the RDP for landscape measures is spent in mountain areas. CE gave the possibility to analyse the effect of the place of residence and recreational habits on the WTP to protect or improve the landscape. Our findings highlight that the social value of the landscape has an important use component: people are willing to pay more

to protect or improve the landscape where they live or that they usually visit for recreational purposes.

Regarding the second objective of our research (to compare the costs and benefits of the subsidies paid to farmers) it emerged that the benefits outweigh the costs for every RDP measure analysed even considering the lower value of the 95% confidence interval. On average this imbalance ranges from a minimum of 4.5 fold for the conservation of mountain pastures (95% CI from 1.9 to 7.2 fold) to a maximum of 137.2 fold for the conversion of arable land into meadows on the plain (95% CI from 110.2 to 164.2 fold). In this respect it is plausible to suppose that the public expenditure aimed at preserving or improving the landscape is lower than the benefits produced and that its increase will improve the social benefits of the people living in the Region.

The CE results suggest the opportunity to rethink the distribution of the subsidies among the four measures considered by the research. A high WTP emerges for interventions on the plain. This is not surprising given that the Veneto plain landscape has been progressively degraded in the last decades by urban sprawl and the elimination of permanent meadows and hedges. On the central plain, urbanised areas nowadays cover about 20% of the territory. In this respect, hedges and woods, besides their direct improvement of the landscape, have another no less important function of masking the view of scattered industrial and residential buildings, which have a strong negative impact on the aesthetic quality of the landscape (Tempesta, 2010). This does not mean that the subsidies aimed at preserving the mountain landscape should be reduced in the future but that if there is an increase in the total amount of the CAP payment for the considered measures it should be devoted to the improvement of the plain landscape.

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Appendix A

The total WTPs for the four attributes considered has been estimated as follows:

Maintenance of pastures and meadows in mountain areas (800 Km^2) (MPM800):

$$WTPtot_{MPM800} = -\frac{\beta_1 \cdot TOTH + \beta_2 \cdot PH + \beta_3 (9.5\ \mathrm{MH} + 10\ \mathrm{HH} + 5\ \mathrm{PH})}{\beta_{cost}}$$

Conversion of arable land to grassland on the plain (CALGP):

$$\mathrm{WTPtot}_{CALGP} = -\frac{\beta_4}{\beta_{cost}} \cdot \mathrm{TOTH}$$

First afforestation of agricultural land on the plain (AALP):

$$\mathrm{WTPtot}_{AALP} = -\frac{\beta_5 \cdot \mathrm{TOTH} + \beta_6 \cdot \mathrm{PH} + \beta_7 \cdot \mathrm{TOTH} \cdot \mathrm{PPHD}}{\beta_{\mathrm{cost}}}$$

Hedges and forest buffers maintenance on the plain (HFBMP):

$$\mathrm{WTPtot}_{HFBMP} = -\frac{\beta_8}{\beta_{cost}} \cdot \mathrm{TOTH}$$

Where:
MH = number of households living on the mountains in 2012 (149,025);
HH = number of households living on the hills in 2012 (313,945);
PH = number of households living on the plain in 2012 (1,510,116);
TOTH = MH+ HH + PH;
PPHD = percentage of people holding a degree = 0.103;
9.5; 10 and 5 = median number of trips in mountain areas made by people living on the mountains, on the hills and on the plain.

With regard to the beta coefficients used in the formulas above, we refer to the coefficient reported in Table 4:
β_{cost} = COST
β_1= Maintenance of pastures and meadows (mountain): 800 km^2
β_2= 800 km^2 pastures maintained x residence plain
β_3= 800 km^2 pastures maintained x mountain trips
β_4= Conversion of arable land to grassland (plain): 60 km^2
β_5= First afforestation of agricultural land (plain): 16 km^2
β_6= 16 km^2 new woods on the plain x residence plain
β_7= 16 km^2 new woods on the plain x degree
β_8= Conversion of arable land to grassland (plain): 60 km^2