



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Serial non-participation and ecosystem services providers' preferences towards incentive-based schemes

Villanueva, A.J.^{1,*}; Glenk, K.²; Rodríguez-Entrena, M.¹

¹ *Institute of Agricultural and Fisheries Research and Training (IFAPA), Dpt. of Agricultural Economics, Córdoba (Spain).*

² *Scotland's Rural College (SRUC), Land Economy, Environment & Society Group, King's Buildings, Edinburgh, UK.*

Contributed Paper prepared for presentation at the 90th Annual Conference of the Agricultural Economics Society, University of Warwick, England

4 - 6 April 2016

Copyright 2016 by [author(s)]. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

*Corresponding author (IFAPA, Centre Alameda del Obispo, Av. Menéndez Pidal PO. 3092, E-14080, Córdoba (Spain) anastasioj.villanueva@juntadeandalucia.es)

Acknowledgements

This research is co-financed by the Spanish Ministry of Economics and Competitiveness (MINECO), the National Institute for Agricultural and Food Research and Technology (INIA) and the European Regional Development Fund (ERDF) through the projects SUSTANOLEA (P10-AGR-5892) and MERCAOLI (RTA2013-00032-00-00). The first and the last author acknowledge the support provided by Andalusian Institute of Agricultural Research and Training (IFAPA) and the European Social Fund (ESF) within the Operative Program of Andalusia 2007-2013 through postdoctoral training programs. Klaus Glenk acknowledges support by the Scottish Government Rural Affairs and the Environment Portfolio Strategic Research Programme 2011–2016, Theme 3 (Land Use).

Abstract

The incidence of serial non-participation and protest responses has largely been ignored in willingness to accept (WTA) applications. This paper analyses serial non-participation with a focus on choice experiment applications using a WTA format to investigate preferences of ecosystem services providers towards incentive-based schemes. The paper addresses two main objectives. First, a review of the literature on WTA for participation in incentive-based schemes is used to identify and discuss a range of possible motives for protest responses that emerge in a WTA context. Second, drawing on choice experiment data on olive farmers' preferences for agri-environmental scheme participation in Southern Spain, we analyse the impact on WTA estimates of censoring serial non-participation resulting from protest or high compensation requirements (very high takers) from further analysis. Using a random parameter logit model in WTA space, we find that the inclusion or exclusion of serial non-participants in the analysis can have a significant impact on marginal and total WTA estimates. Based on the findings, the paper makes recommendations on how to minimise the incidence of protest responses through survey design, regarding the identification of protesters as opposed to very high takers, and regarding the treatment of both for WTA estimation.

Keywords Protest response; Willingness to accept; Payments for ecosystem services; Agri-environmental schemes; Choice experiment

JEL code Q18, Q58

1. Introduction

It is well-known that some respondents to stated preference surveys do not engage in the hypothetical market to reveal their preferences (Halstead et al., 1992). Commonly, such respondents are considered to be ‘protesters’ since they reject (protest against) aspects of the constructed market scenario (Meyerhoff et al., 2014). However, it is challenging to clearly distinguish between responses that reflect protest motives and responses that actually reflect respondents’ preferences (Meyerhoff and Liebe, 2006; Meyerhoff et al., 2012). In willingness to pay (WTP) formats, the issue of differentiating protest responses from true or ‘genuine’ zero responses exemplifies this (Meyerhoff and Liebe, 2008; Barrio and Loureiro, 2013). Identification of protest responses matters, because their inclusion or omission in the analysis can affect welfare estimates (Halstead et al., 1992; Strazzera et al., 2003).

The identification and subsequent treatment of protest responses in the analysis has received much attention in the stated preference literature (Strazzera et al., 2003; Dziegielewska and Mendelsohn, 2007; Meyerhoff and Liebe, 2010; Barrio and Loureiro, 2013; Söderberg and Barton, 2014). All of these studies use a WTP format to value changes in the provision of environmental goods and services. However, the issue of protest responses has, to the best of our knowledge, not yet been systematically investigated in the context of willingness to accept (WTA). This includes an increasing number of studies that analyse preferences of ecosystem service (ES) providers towards incentive-based schemes (Horne, 2006; Layton and Siikamäki, 2009; Ruto and Garrod, 2009; Espinosa-Goded et al., 2010; Christensen et al., 2011; Rabotyagov and Lin, 2013; Peterson et al., 2015). These studies usually estimate WTA to enrol in incentive-based schemes. Choice experiments (CEs), and to a lesser extent contingent valuation (CV), have been applied in the context of agri-environmental schemes (AES) in Europe (Ruto and Garrod, 2009; Espinosa-Goded et al., 2010; Christensen et al., 2011; Broch and Vedel, 2012; Beharry-Borg et al., 2013), and payments for ecosystem services schemes (PES) in the United States (Cooper, 1997; Sullivan et al., 2005; Rabotyagov and Lin, 2013; Peterson et al., 2015), and other parts of the World (Layton and Siikamäki, 2009; Mulatu et al., 2014; Greiner, 2015).

A few WTA studies investigating incentive-based schemes consider protest responses. However, what may constitute a protest response is frequently not or only vaguely described. Additionally, amongst the studies that comment on protest responses, different criteria for identifying protest patterns have been applied. Currently, therefore, the literature does not provide any coherent guidance on identifying protest responses in WTA formats. To our

knowledge, there is also no empirical evidence of the impact of protest responses on ES providers' WTA for contract attributes of incentive-based schemes. This paper aims to provide first insights into both the identification and analysis of protest responses in WTA assessments.

Towards this end, this study investigates possible reasons for protest behaviour to propose effective means of identifying them in WTA studies related to incentive-based scheme design. Additionally, this paper uses data from a case study on olive growers' preferences towards AES design in Andalusia (Southern Spain) (Villanueva et al., 2015) to analyse the impact of inclusion or omission of protest responses on WTA. For the analysis, a random parameter logit model in WTA space is used. To the authors' knowledge, models in WTA space have not been used previously to analyse CE data in WTA contexts.

The following section reviews and discusses the issue of protest responses in WTA formats, with a focus on preferences for participation in incentive-based schemes. A brief state-of-art summary on protest responses in WTP contexts serves as a reference. The third section describes the method and the data used for the empirical analysis of the impact of protest inclusion on WTA. The main results are presented in the fourth section. This is followed by a discussion of the main findings and recommendations for future research regarding the identification and treatment of protest responses in WTA formats. The sixth section concludes.

2. Protesters and “very high takers” in willingness to accept formats

Protest responses have long been studied in demand-side analysis of environmental goods and services using both CV (Jorgensen et al., 1999; Strazzera et al., 2003; Dziegielewska and Mendelsohn, 2007; Meyerhoff et al., 2012) and CE (Barrio and Loureiro, 2013; Söderberg and Barton, 2014). The two fundamental concerns regarding protest responses in environmental valuation are their identification and treatment in analysis (Meyerhoff et al., 2012; Barrio and Loureiro, 2013). The identification of protest responses in WTP formats typically consists of studying protest beliefs of respondents who stated zero WTP (CV), or who have always chosen the status quo (SQ) or opt-out alternative (CE) in order to distinguish protesters from zero bidders (Atkinson et al., 2012; Barrio and Loureiro, 2013; Söderberg and Barton, 2014). Information on protest beliefs is typically collected through debriefing questions following the valuation task (Arrow et al., 1993; Bateman et al., 2002; Dziegielewska and Mendelsohn, 2007; Meyerhoff and Liebe, 2008). For selected studies that

focus on the role of protest responses, Table 1 shows the main protest-related beliefs identified, and if they are considered to reflect protest or true zero responses. Three groups of beliefs and responses that were classified as protests emerge: i) respondents' attitudes towards the environmental good at hand (e.g., disinterest, information inquiry); ii) the non-acceptance of the valuation approach (mainly critique of the method, and fairness and ethical concerns); and iii) no reason/no response. However, Table 1 also indicates that there is no clear definition of protest response in the literature, a fact that has been highlighted by Brouwer and Martín-Ortega (2012) and Meyerhoff et al. (2014).

Protest responses are most commonly omitted from the data set used for analysis (Mitchell and Carson, 1989; Atkinson et al., 2012). This may affect the representativeness of the sample if not corrected for (Bateman et al., 2002; Strazzeria et al., 2003; Brouwer and Martín-Ortega, 2012). Less often, authors opt to treat protest responses as zero bids or assign mean WTP values based on socio-economic characteristics (Barrio and Loureiro, 2013). Also, some authors recommend to restrain from removing protest responses and rather to try to minimise protest *ex-ante* (Jorgensen et al., 1999; Meyerhoff and Liebe, 2008).

The issue of protest responses is considerably different for supply-side analyses of ES providers' WTA, where respondents, typically land managers, are characterised rather as producers than as consumers. Assuming rational behaviour, a land manager chooses to participate in a scheme if the expected benefits of doing so outweigh the cost. Actual costs and benefits of the farmer remain unobserved, and typically profit maximizing behaviour is assumed. With respect to benefits, this may for example include expectations regarding a scheme's short term or long term impact on production efficiency. Potential aspects that affect expectations on costs include transaction costs associated with participation, or operating costs, for example associated with access to machinery (REF). Further, farmers' risk attitude may affect how costs and benefits are perceived and therefore affect their decision to participate (REF). Under the assumption that land managers are rational profit maximizers, *all* land managers would be expected to participate in the scheme (i.e. to make trade-offs between attributes of scheme participation and compensation requirements) if the compensation amount is sufficiently high. However, not all land managers may be entirely driven by profit maximization and non-profit-based motives (which can reflect self-interest or not) can have an important impact on a land manager's decision making (e.g., Gasson 1973; Burton 2004; Paniagua Mazorra 2001; Greiner et al. 2009; Barnes et al. 2011). Social interest and stewardship motives can affect the evaluation of a scheme's benefits (Chouinard et al. 2008).

If a proposed scheme's benefits and its institutional design is in conflict with beliefs and values, land managers may not participate regardless of the compensation amount offered. For example, land managers who value independent decision making may oppose to being constrained to a narrowly defined set of management prescriptions even if these would provide efficiency gains in production.

Serial non-participation (choosing the SQ alternative in all choice tasks of a CE study) may reflect either an aversion to making trade-offs in general or very high compensation requirements, or at least requiring an amount that is higher than those offered in the survey. The first may be considered a protest response. Respondents who are willing to trade-off at high levels of compensation may be denoted as 'very high takers' (VHT). To the author's knowledge, only Vedel et al. (2015) briefly mention the possibility of VHT in WTA formats. In practice, the boundaries between protesters and VHTs will be blurred. However, it is still possible to distinguish between motives for non-participation that are more likely to be either related to protest behaviour or to being a VHT. This would then offer a possibility to deal with both types of serial non-participation in the analysis.

Protesters should be considered to be out of the market and should thus be omitted from the analysis used to derive WTA estimates. The treatment of VHT respondents prior to analysis is less clear. Such respondents are not willing to make trade-offs within the constraints of the proposed schemes, hence nothing is known on the compensation thresholds for participation. Inclusion of such respondents may, however, bias WTA estimates. It may thus be best to omit them from analysis and report the incidence of VHTs separately.

Table A1 (see Appendix A) provides a detailed and comprehensive overview of WTA studies in the context of incentive-based schemes focused on ES provision. Most studies not only fail to report on protest responses, but also on serial non-participation in general. Only 12 out of 51 studies report any information on protest responses, and only five of these provide more detailed information on the identification, incidence and treatment of protest responses and serial non-participation.

There is no consensus regarding the identification of protest responses amongst those studies who report on it. The focus lies on discriminating protest responses from VHT, but the criteria for allocation to each group vary considerably between studies. They include, for example, dissent with the proposed scheme (e.g. "it has nothing to do with real farming") (Christensen et al., 2011; Greiner, 2015), lack of trust in institutions (Lienhoop and Brouwer,

2015), and misunderstanding or lack of information (Broch and Vedel, 2012). Barr and Mourato (2014) consider ‘irrational choice’ to be indicative of a protest response, but do not detail what constitutes an irrational choice. Other criteria for identifying protesters used by the reviewed literature may equally reflect responses of VHT. Such criteria include, for example, whether respondents find all the hypothesised alternatives unattractive at the level of monetary compensation offered (Layton and Siikamäki, 2009), or whether respondents state that they do not want to be constrained in their choice of farming practices irrespective of the level of payment (Kuhfuss et al., 2015)¹. In Table 1, where possible we attempt to relate the above reasons to their equivalents for WTP formats. All the WTA studies that report information on protest responses exclude them from further analysis (Table A1). All of them except Kuhfuss et al. (2015) use open-ended questions to inquire on the reasons for serial non-participation, which is a common way of identifying protest responses in WTP approaches (Arrow et al., 1993; Bateman et al., 2002). Overall, the literature review suggests that the issue of protest responses, especially concerning supply side valuation studies using WTA formats, deserves further attention.

¹ We argue that these respondents should be considered to be VHT since they do not find the payment (offered) sufficient to make them enter the market. However, this definition can be ambiguous, because respondents may interpret it as “irrespective of the payment (offered in the CE)”, which would reflect VHT, or as “irrespective of the payment (in general)”, reflecting a protest response.

Table 1. Main protest beliefs in environmental valuation (WTP) and ES-providers' WTA studies.

<i>Beliefs</i>	<i>Demand-side approach (WTP)</i>			<i>Supply-side approach (WTA)</i>		
	<i>Studies that consider belief to be related to</i>		<i>Dominant consideration^a</i>	<i>Beliefs</i>	<i>Literature</i>	<i>Protest or VHT^a</i>
	<i>Protest</i>	<i>True zero</i>				
<i>Attitudes</i>						
I can't afford to pay anything	Jorgensen et al. (1999)	Jakobsson and Dragun (2001), Strazzer et al. (2003), Dziegielewska and Mendelsohn (2007), Brouwer and Martín-Ortega (2012), Barrio and Loureiro (2013), Söderberg and Barton (2014)	0	Difficult to adopt environmental-friendly practices and/or uptake the scheme		VHT
It isn't worth anything to me	Halstead et al. (1992)	Jakobsson and Dragun (2001), Strazzer et al. (2003)	0	I find the alternatives too unattractive/ I don't want to be constrained in my practices	Layton and Siikamäki (2009), Kuhfuss et al. (2015) ^d	VHT
The current situation is good enough		Söderberg and Barton (2014)	0	Current practices are good enough to conserve/provide ES		VHT/PR ^c
I don't believe my contribution will lead to any improvement	Dziegielewska and Mendelsohn (2007), Söderberg and Barton (2014)		PR	I don't believe my contribution will lead to any improvement		PR
It's not my problem	Jorgensen et al. (1999)		PR	My activity (e.g. farming) isn't related to this	Christensen et al. (2011)	PR
There are other, more important problems		Jakobsson and Dragun (2001), Dziegielewska and Mendelsohn (2007), Brouwer and Martín-Ortega (2012), Söderberg and Barton (2014)	0			
Unfair to ask me to pay anything	Jorgensen et al. (1999), Dziegielewska and Mendelsohn (2007)		PR	Unfair to ask me to provide ES		PR
Not enough information	Jorgensen et al. (1999), Jakobsson and Dragun (2001), Meyerhoff and Liebe (2008)		PR	Not enough information		PR

Beliefs	Demand-side approach (WTP)		Supply-side approach (WTA)			
	Studies that consider belief to be related to		Dominant consideration ^a	Beliefs	Literature	Protest or VHT ^a
	Protest	True zero				
<i>Non-acceptance of the valuation approach</i>					Greiner (2015): dissent with the valuation context	
Should use existing funds	Jorgensen et al. (1999), Jakobsson and Dragun (2001), Dziegielewska and Mendelsohn (2007), Meyerhoff and Liebe (2008)	Brouwer and Martín-Ortega (2012)	PR/0 ^b			
I already pay enough taxes	Jorgensen et al. (1999), Meyerhoff and Liebe (2008)	Brouwer and Martín-Ortega (2012), Söderberg and Barton (2014)	PR/0 ^b			
Those who benefit (most) should pay for it	Jorgensen et al. (1999), Meyerhoff and Liebe (2008)	Söderberg and Barton (2014)	PR			
Ethical reasons (e.g. polluter pays)	Jorgensen et al. (1999), Brouwer and Martín-Ortega (2012)		PR			
It's my right to expect this (e.g. good water quality)	Jorgensen et al. (1999), Meyerhoff and Liebe (2008), Barrio and Loureiro (2013)		PR	It's my right to receive payments (or to pollute)		PR
Don't want to place a value on it (e.g. water)	Halstead et al. (1992), Jorgensen et al. (1999), Jakobsson and Dragun (2001), Meyerhoff and Liebe (2008)		PR	Don't want subsidies (but higher prices of products that I produce)		PR
Not a good way to deal with the problem	Jorgensen et al. (1999), Jakobsson and Dragun (2001), Strazzera et al. (2003)		PR	I don't agree with the implementation of this type of measures		PR
Lack of trust in institutions	Brouwer and Martín-Ortega (2012)		PR	Lack of trust in institutions	Lienhoop and Brouwer (2015)	PR
<i>No reason/no response</i>			PR	No reason/no response	Barr and Mourato (2014)	PR

^a PR=Protest; 0=True zero. For WTA, VHT=Very high takers.

^b We argue that in these cases more information is needed to decide if it is 'PR' or '0'. For example, for the case of "Should use existing funds", the prompt "Do you prefer budget reallocation [to enhance ES provision]?" could be asked.

^c We argue that in these cases more information is needed to decide if it is 'PR' or 'VHT'. For example, for the case of "Current practices that I use are good enough to conserve/provide ES", the prompt "But would you be willing to provide more ES at some monetary compensation?" could be asked.

^d While both studies consider these answers indicative of a protest response, we consider them to be rather an indication of VHT.

3. Method

3.1. Choice experiment design and data collection

Table 2 describes the six attributes used in the CE. Three attributes were linked to agricultural management, two attributes to policy design and an additional attribute specifies the level of compensation payments. Two attributes relate to soil conservation practices and focus on the use of cover crops (CC): *Cover crop area* (CCAR), with two levels of 25% and 50% of the olive grove area (CCAR-25% and CCAR-50%), and *Cover crop management* (CCMA), with two levels of unconstrained (CCMA-Free) and constrained management (CCMA-Constr) with respect to tillage and herbicide in cover crops management. For the attribute *Ecological focus areas* (EFA), levels were set at zero and 2% of the olive grove area (EFA-0% and EFA-2%). The policy design attributes included in the CE were *Collective participation* (COLLE) in the scheme and *Monitoring intensity* (MONI). *Compensation payments* (PAYM) offered ranged from €100/ha to €400/ha. For a detailed description of the policy context, the attributes and the experimental design see Villanueva et al. (2015).

Table 2. Attributes and levels used in the choice set design.













<i>Attribute</i> [Acronym]	<i>Explanation</i>	<i>Levels</i>
<i>Cover crops area</i> [CCAR]	Percentage of the olive grove area covered by cover crops	25% and 50%
<i>Cover crops management</i> [CCMA]	Management of cover crops	Unconstrained and constrained management
<i>Ecological focus areas</i> [EFA]	Percentage of the olive grove area covered by ecological focus areas	0% and 2%
<i>Collective participation</i> [COLLE]	Participation of a group of farmers (at least 5) from the same municipality	Individual and collective participation
<i>Monitoring</i> [MONI]	Percentage of farms monitored each year	5% and 20%
<i>Payment</i> [PAYM]	Annual payment per ha for a 5-year AES contract	€100, 200, 300 and 400/ha per year

Note: The SQ alternative represents non-participation, which means that the attributes remain at the current levels.

3.2. Experimental design and data collection

A fractional factorial design that is optimal in the differences (Street and Burgess, 2007) was used to create a manageable number of choice sets, reducing from all possible combinations (1924) to 192 profiles² (D-efficiency=91.3%). The 192 choice sets were divided into 24 blocks of eight choice sets each. Each farmer answered one block. In each choice set, farmers were asked to choose between two alternatives of AES and a status quo alternative (SQ), representing non-participation. Figure 1 shows an example of a typical choice set.

Figure 1. Example of a typical choice set.

	Alternative A	Alternative B	Alternative C
Yearly payment	€200/ha 	€300/ha 	Neither Alternative A, nor Alternative B. I would maintain my current farm management
Cover crops area	50% of olive tree area 	50% of olive tree area 	
Cover crops management	Constrained mgmt. 	Free mgmt. 	
Ecological focus areas	0% of EFA in olive tree area 	2% of EFA in olive tree area 	
Participation	Individual 	Collective 	
Monitoring	Monitoring at 20% 	Monitoring at 5% 	
	I choose A <input type="checkbox"/>	I choose B <input type="checkbox"/>	

After thorough pre-testing, the questionnaire included four sets of questions: i) farm characteristics, ii) farmer characteristics, iii) choice tasks, and iv) farmers' knowledge on and attitudes towards the implementation of AES in olive growing. An explanation of the attributes and the choice task was provided to farmers prior to completing the choice tasks.

² This design allowed analysing main and second-order effects. Second-order effects were analysed but not found to be significant. Therefore, the analysis focuses on main effects only.

An open-ended question format was used to collect information on reasons for serial non-participation to identify protest beliefs.

A multi-stage sampling procedure was employed. In the first stage, five agricultural districts³ in Andalusia were selected as primary sampling units from a total of 52. The sampled districts cover 453,682 ha and account for 31.0% of Andalusian olive groves. In the next stage, 10 villages/towns located in each of the sampled districts were selected as secondary sampling units using a random route procedure. Finally, in each village 6-8 face-to-face interviews were conducted intercepting farmers in various locations (namely public places such as agricultural cooperatives and private olive mills, agricultural public offices, fertilizer shops, etc.) and various times of the day⁴. The interviews were carried out between October 2013 and January 2014. Of a total of 330 interviews, 327 complete responses were obtained. In terms of key farm characteristics such as average yield and farmers' age, level of education and farm-labour time, the sample mirrors farm characteristics obtained in a previous benchmarking survey of Gómez-Limón and Arriaza (2011), who used the same farm conceptualisation⁵. With respect to size, large farms seem to be slightly overrepresented relative to the benchmarking survey, although this may be explained by the on-going structural change in the region. Amongst the 327 respondents, those who chose the SQ alternative in all choice situations were carefully scrutinised in order to distinguish protesters from VHT. We analysed the reasons for serial non-participation collected using the open-ended question, considering VHT to be respondents who expressed opposition or concern regarding the attributes of the CE (comprising the first three beliefs listed in Table 1). In cases where two or more reasons were given, the respondent was classified as a protester if one of the reasons was related to what we considered to be protest behaviour.

3.3. Models specification and welfare estimates

For analysing the choices between alternative AES schemes, random parameter logit models (RPL) with an additional error component in WTA space were used. The modelling approach is based on random utility theory, with a utility function U for farmer n and alternative i in choice task t :

³ Campiña Norte and La Loma (province of Jaen), La Sierra and Campiña Alta (province of Cordoba), and Norte (province of Malaga).

⁴ There is no register of farmers that would have allowed random sampling since the conceptualisation of "olive grove farm" is different in our study compared to the official statistics (e.g. CAP, 2008), as we consider farm as a single decision-making entity regardless of its legal personality.

⁵ We ran t-tests (χ^2 for dichotomous variables) to compare our sample characteristics to those of that survey.

$$U_{nit} = \alpha_n' p_{nit} + \beta_n' x_{nit} + \vartheta_{nit} + \varepsilon_{nit} \quad [1]$$

where p and x are monetary and non-monetary attributes of the experimental design, α and β are parameters to be estimated, and ε is the random error term, which is assumed to be identically and independently distributed (*iid*) and related to the choice probability with a Gumbel distributed error term. To account for the fact that respondents may treat the hypothetical AES alternatives (A, B) systematically different to the SQ (Scarpa et al., 2005), the additional error component ϑ_{nit} (distributed with $N(0, \sigma^2)$) was included in the utility function, capturing the error variance shared by both A and B.

In RPL models, heterogeneity across respondents is introduced by allowing α_n and β_n to deviate from the population means following a random distribution. The unconditional choice probability of respondent n 's sequence of choices (y_n over T_n choice tasks) is:

$$\Pr(y_n | \alpha_n, \beta_n, \vartheta) = \iint \prod_{t=1}^{T_n} \frac{\exp(\alpha_n' p_{nit} + \beta_n' x_{nit})}{\sum_{j=1}^J \exp(\alpha_n' p_{njt} + \beta_n' x_{njt})} f(\eta_{ni} | \Omega) \phi(\vartheta | 0, \sigma^2) d\eta_{ni} d\vartheta \quad [2]$$

where $f(\eta_{ni} | \Omega)$ is the joint density of parameter vector for monetary and K non-monetary attributes $[\alpha_n, \beta_{n1}, \beta_{n2}, \dots, \beta_{nK}]$, η_{ni} is the vector comprised of the random parameters and Ω denotes the parameters (namely the mean and variance) of these distributions. $\phi(\cdot)$ the normal density function for the error component. This integral does not have a closed form and thus requires approximation through simulation (Train, 2003). Simulations were based on 1,000 draws using Modified Latin Hypercube Sampling.

All choice models are estimated in WTA space (Train and Weeks, 2005), which allows the distributions of WTA to be estimated directly and hence avoids issues with calculating WTA as the ratio of two random distributions. The parameters of monetary and non-monetary attributes are assumed to follow lognormal and normal distributions, respectively. An alternative specific constant specified for the SQ-alternative (ASC_{SQ} , assumed to follow a normal distribution) was included in the model, representing observed utility not captured by the attributes.

To analyse the effects of protest responses on WTA estimates, we compare the results for three different samples: the whole sample (*Total*); the sample excluding protesters (*No_protest*); and the sample excluding protesters and VHT (*Participants*). To test for

differences in WTA estimates between samples, the complete combinatorial test suggested by Poe et al. (2005) was used⁶.

Total WTA for participation in the proposed AES was estimated following Hanemann (1984). Inclusion of the ASC_{SQ} is necessary to capture the utility difference between not participating in the scheme and entering a contract at baseline attribute levels for dummy coded categorical attributes and status quo levels for continuously coded attributes. Importantly, the constant also captures the utility difference between zero compensation in case of non-participation and the lowest compensation level offered in the contract alternatives. The sign of the ASC_{SQ} therefore also depends on whether or not the expected cost of scheme participation is – on average across the sample – outweighed by the benefits associated with the lowest level of compensation offered in the experiment. Compared to non-participation, farmers can either expect to be worse off by scheme participation at the lowest compensation amount (positive effect on ASC_{SQ}) or already expect to benefit from participation even at the lowest amount on offer (negative effect on ASC_{SQ}). Additionally, the ASC may capture effects that can related to a behavioural interpretation (Adamowicz et al., 1998). In the context of this study, this may be factors affecting the farmers' decision to participate in AES over and above the scheme attributes. Such factors may reflect barriers to uptake (Falconer, 2000), including transaction costs (Pannell, 2008), but also positive attitudes towards participating in AES, for example because farmers perceive AES as financially rewarding, as highlighted by Hynes and Garvey (2009).

⁶ Note that in this context the applicability of the widely used test of Poe et al. (2005) is limited, because the sample distributions are not independent. Non-parametric alternatives as described in Poe et al. (1997) are not practical, since they would require a large number of model runs from bootstrapped samples. However, even in the case of dependent sample, the Poe et al. test can be of use for investigating whether different treatment of protest and serial non-participation impacts on welfare estimates. As Glenk and Colombo (2013) argue, 'the variance of the difference between two random variables X and Y is given by $var(X)+var(Y)-2cov(X,Y)$. If there is a positive correlation between X and Y , then the variance of the difference will be less than it would have been if X and Y were independent. Since we would expect a positive rather than a negative correlation between WTA distributions calculated from the same data set, the Poe test will tend to over-estimate the true variance of the difference. This means that there is a risk that the null hypothesis of equality will be accepted when it should in fact be rejected, but we can be confident that it should be rejected in cases where it has been'.

4. Results

4.1. Identification of protest responses

Of the total of 327 complete responses used for analysis, 67 were serial non-participants; that is, they chose the SQ alternative in all eight choice situations. This represents 20.5% of the total sample. Table 3 summarises the reasons given by serial non-participants for not enrolling in the AES. The majority of the respondents stated a single reason (59 out of 67). 32 respondents who gave a single reason related to opposition to the attributes were classified as VHT (Table 3). These respondents stated reasons such as rejecting to adopt cover crops (attribute CCAR), non-attractiveness of the monetary incentive offered (attribute PAYM), and not wanting to be monitored (attribute MONI). Because all of the proposed AES alternatives included the use of cover crops (at 25% or at 50%), cover crops adoption represents a hurdle for AES participation. The choices of the farmers who generally rejected the use of cover crops therefore clearly reflect lexicographic preferences. Seven respondents (out of the 32) stated protest reasons for serial non-participation in addition to reasons related to attributes. Following the above guideline, they were considered to be protesters.

The protest-related reasons mainly indicated *non-acceptance of the valuation context* and general protest against AES from respondents with small farms (*attitude*). Those farmers who gave *no reason/no response* were classified as protesters, which are also reported by Amigues et al. (2002) and Barr and Mourato (2014) as signs of protest responses. Concerning non-acceptance of the valuation context, many respondents generally rejected the idea of a multi-annual payment conditional on implementing additional management measures (N=17). The specific reasons included considering AES to be unnecessary and a nuisance, mostly related to simply opposing to the objective of the scheme of provision of environmental goods (as underscored by Christensen et al., 2011), but also complaints about the level of bureaucracy involved (N=3), and lack of trust in the public institutions administering AES (N=1) (mirroring the protest explanation of Lienhoop and Brouwer, 2015). Twelve respondents did not consider participation in AES to be an option for small farms like theirs (consistent with Amigues et al., 2002). Of these, seven respondents stated more than one protest reason. Eight respondents were not willing to provide reasons for serial non-participation, or declined a response. All of the above responses are arguably of protest nature, because the interviewee is justifying his/her choices not on the basis of their preferences with regards to alternatives, attributes and levels presented in the choice tasks.

Therefore, the reasons reflect that they were not willing to make trade-offs (Lusk et al., 2006) and hence state their true preferences towards the AES offered.

Table 3. Reasons for serial non-participation.

<i>Reasons</i>	<i>Protesters</i>	<i>Very high takers</i>	<i>Serial non-participants</i>
<i>Non-protest reasons</i>			
Opposition to attributes	7	32	39
<i>Protest reasons</i>			
Rejecting the idea of a complementary environmental subsidy	17	0	17
Too much bureaucracy	3	0	3
Opposition to any kind of subsidy	2	0	2
Lack of trust in public institutions	1	0	1
AES not an option (small farms)	12	0	12
No reason given	1	0	1
Response declined	8	0	8
One reason given	27	32	59
Two or more reasons given	8	0	8
Total	35	32	67

A summary of the characteristics of the three resulting groups of farmers (*Protesters*, *Very high takers*, and *Participants*) is provided in Appendix B. *Protesters* and *Very high takers* clearly differ from *Participants* in that they show characteristics that have previously been found to negatively affect AES uptake (Siebert et al., 2006; Uthes and Matzdorf, 2013). For example, this includes smaller farm size, more frequent use of conventional techniques, greater additional effort implied by participation based on farmers' status quo, greater share of family labour, older farmers with a lower level of education, professional training and knowledge on AES and cross-compliance, and a less positive perception of the environmental benefits of the proposed practices. *Protesters* and *Very high takers* differ regarding the use and perception of agri-environmental management practices. *Very high takers* apply less cover crops, and perceive both less economic benefits from the use of cover crops and less environmental benefits from EFA. This finding is in line with concerns about cover crops and EFA attributes raised by *Very high takers* when stating reasons for serial non-participation, as opposed to *Protesters*, who objected to AES participation for reasons unrelated to the scheme specification.

4.2. WTA space model results

Table 4 shows the results of the RPL models in WTA space for the three samples: *Total*, *No_protest*, and *Participants*. The three models are highly significant with and goodness-of-fit indicators are favourable (pseudo- $R^2 > 0.43$). All attribute parameters are highly significant (0.1% level or lower) and have the expected sign. The parameter of the constant (ASC_{SQ}) is negative and significantly different from zero. If a behavioural interpretation was applied, farmers would waive some of the compensation associated with AES participation for reasons that are unconnected to the scheme's specific attributes. However, the negative sign may simply imply that on average expected benefits of scheme participation at the lowest compensation level (€100/ha) outweigh expected cost of participation. The 'error component' is significant in each sample and decreases in magnitude when removing serial non-participants. This indicates that the error component is efficient in capturing the 'status quo effect' (Scarpa et al., 2005) induced by serial non-participation. Results of models without the error component not reported here confirm this finding⁷.

⁷ As expected, RPL models without the error component showed positive estimates of the ASC for *Total* and *No_protest*, and a less negative one for *Participants*, with estimates being statistically significant *Total* and *Participants*. In all cases likelihood ratio tests indicated that the models including the error component should be preferred. Results are available from the authors upon request.

Table 4. Random Parameter Logit model in WTA-space^a.

	<i>Total</i>		<i>No_Protest</i>		<i>Participants</i>	
	<i>Coef.</i>	<i>S.E.</i>	<i>Coef.</i>	<i>S.E.</i>	<i>Coef.</i>	<i>S.E.</i>
<i>Mean</i>						
CCAR	0.078	0.002	0.067	0.002	0.073	0.004
CCMA	1.800	0.050	1.770	0.077	1.830	0.107
EFA	0.760	0.020	0.871	0.041	0.838	0.048
COLLE	1.230	0.050	1.150	0.075	1.440	0.100
MONI	0.014	0.002	0.013	0.003	0.018	0.005
PAYM	1.120	0.120	1.440	0.174	0.975	0.154
ASC _{SQ}	-0.693	0.085	-0.800	0.104	-1.240	0.169
<i>Standard deviation of random parameters</i>						
CCAR	0.112	0.003	0.110	0.004	0.094	0.006
CCMA	2.040	0.044	2.150	0.081	2.000	0.098
EFA	0.785	0.014	0.931	0.029	0.944	0.062
COLLE	1.910	0.062	1.640	0.064	1.710	0.190
MONI	0.025	0.003	0.010	0.003	0.016	0.005
PAYM	1.610	0.126	1.560	0.185	1.190	0.157
ASC _{SQ}	0.891	0.057	0.704	0.028	1.050	0.070
Error component	6.490	0.905	3.480	0.450	1.780	0.374
Log-likelihood (LL)	-1460.3		-1382.0		-1307.8	
McFadden Pseudo-R ²	0.492		0.462		0.428	
Observations	327		292		260	

^a All the parameters and std. dev. are different from zero at 0.1% significance level.

Note: the monetary attribute has been scaled (100:1) and the sign has been changed to directly yield positive values that reflect farmers' WTA for a change in the attributes.

The resulting mean marginal WTA estimates can be better observed in Table 5, which also highlights significant differences between the samples. The exclusion of protesters and VHT affects marginal WTA estimates for three out of the five attributes: CCAR, EFA and COLLE. However, there is no clear directional trend in differences between the three samples. Although not meaningful on its own, we also report WTA equivalents related to the ASC_{SQ} estimates. *Total* and *No_protest* samples show significantly higher values (€69.3/ha and €80.0/ha, respectively) than the *Participants* sample (€124.0/ha), suggesting that consideration of serial non-participation may have a large effect on total WTA estimates.

Table 5. Mean marginal willingness to accept (WTA) in €/ha.

<i>Attributes</i>	<i>Total</i>	<i>No_Protest</i>	<i>Participants</i>
Cover crops area [CCAR]	7.8 ^b	6.7 ^a	7.3 ^{ab}
Cover crops management [CCMA]	180.0 ^a	177.0 ^a	183.0 ^a
Ecological focus areas [EFA]	76.0 ^a	87.1 ^b	83.8 ^{ab}
Collective participation [COLLE]	123.0 ^a	115.0 ^a	144.0 ^b
Monitoring [MONI]	1.4 ^a	1.3 ^a	1.8 ^a
ASC _{SQ}	-69.3 ^b	-80.0 ^b	-124.0 ^a

Note: In the case of EFA, MONI and CCAR, estimates referred to a 1% increase relative to current levels. All WTA estimates are different from zero at the 0.1% significance level. The superscripts (^a and ^b) reflect the results of Poe et al. (2005) test; sharing superscripts indicates no indication of significant differences at the 5% level.

This is confirmed by the results on total WTA estimates for all possible combinations of attributes into AES alternatives reported in Table 6. Total WTA varies remarkably depending on whether protesters and VHT are included in the sample or not. In particular, 31 out of the total of 32 AES alternatives show significant differences between the three samples (at 10% level)⁸. The highest estimate is always found for the *Total* sample, while the lowest estimate is always found for the *Participants* sample. In 24 and 17 out of the cases, removing those respondents identified as protesters (*No_protest*) results in significantly higher estimates compared to *Total* and significantly lower estimates compared to *Participants*, respectively. On average across all 32 AES alternatives, total WTA is €280.3/ha for *Total*, €250.0/ha for *No_protest*, and €22.3/ha for *Participants*.

⁸ If the ASC_{SQ} is excluded from the estimation of total WTA, significant differences between samples are found for twelve of the AES alternatives. The results are available from the authors upon request.

Table 6. Total WTA for all the possible scenarios of AES.

<i>Scenario</i>	<i>COLLE</i> (1=collect. particip.)	<i>CCAR</i> (%)	<i>MONI</i> (%)	<i>CCMA</i> (1=CCMA- Constr)	<i>EFA</i> (%)	<i>Total</i>	<i>No_Protest</i>	<i>Participants</i>
SC1	0	25	5	0	0	13.2 ^c	-12.4 ^b	-56.4 ^a
SC2	0	25	5	1	0	193.3 ^c	165.1 ^b	126.9 ^a
SC3	0	25	5	0	2	140.7 ^b	132.6 ^b	81.0 ^a
SC4	0	25	5	1	2	320.7 ^b	310.2 ^b	264.4 ^a
SC5	0	25	20	0	0	34.3 ^c	7.7 ^b	-28.6 ^a
SC6	0	25	20	1	0	214.3 ^b	185.2 ^a	154.7 ^a
SC7	0	25	20	0	2	161.7 ^b	152.8 ^b	108.8 ^a
SC8	0	25	20	1	2	341.7 ^b	330.3 ^b	292.1 ^a
SC9	0	50	5	0	0	95.6 ^c	54.1 ^b	8.8 ^a
SC10	0	50	5	1	0	275.6 ^c	231.7 ^b	192.2 ^a
SC11	0	50	5	0	2	223.0 ^c	199.2 ^b	146.2 ^a
SC12	0	50	5	1	2	403.0 ^c	376.7 ^b	329.6 ^a
SC13	0	50	20	0	0	116.6 ^c	74.3 ^b	36.6 ^a
SC14	0	50	20	1	0	296.7 ^c	251.8 ^b	219.9 ^a
SC15	0	50	20	0	2	244.1 ^c	219.3 ^b	174.0 ^a
SC16	0	50	20	1	2	424.1 ^c	396.8 ^b	357.3 ^a
SC17	1	25	5	0	0	136.5 ^b	103.2 ^a	87.4 ^a
SC18	1	25	5	1	0	316.5 ^b	280.7 ^a	270.7 ^a
SC19	1	25	5	0	2	263.9 ^b	248.2 ^b	224.8 ^a
SC20	1	25	5	1	2	444.0 ^b	425.8 ^{ab}	408.1 ^a
SC21	1	25	20	0	0	157.6 ^b	123.3 ^a	115.1 ^a
SC22	1	25	20	1	0	337.6 ^b	300.8 ^a	298.5 ^a
SC23	1	25	20	0	2	285.0 ^b	268.4 ^{ab}	252.5 ^a
SC24	1	25	20	1	2	465.0 ^a	445.9 ^a	435.9 ^a
SC25	1	50	5	0	0	218.9 ^b	169.7 ^a	152.6 ^a
SC26	1	50	5	1	0	398.9 ^b	347.3 ^a	335.9 ^a
SC27	1	50	5	0	2	346.3 ^c	314.8 ^b	290.0 ^a
SC28	1	50	5	1	2	526.3 ^b	492.3 ^a	473.3 ^a
SC29	1	50	20	0	0	239.9 ^b	189.9 ^a	180.3 ^a
SC30	1	50	20	1	0	419.9 ^b	367.4 ^a	363.7 ^a
SC31	1	50	20	0	2	367.3 ^b	334.9 ^a	317.7 ^a
SC32	1	50	20	1	2	547.4 ^b	512.5 ^a	501.1 ^a
Mean						280.3	250.0	222.3

Note: Superscripts ^a, ^b, and ^c indicate the significant statistical differences at the 10% level, using Poe et al. (2005) test. Same superscript letter indicates no significant differences.

5. Discussion

The literature review on studies investigating ecosystem services providers' preferences towards incentive-based schemes shows that the vast majority of studies have been silent on the issue of protest responses, and that only few studies briefly comment on protest responses

but use different criteria to identify these responses and justify their exclusion from further analysis. This can partly be explained due to the lack of studies that address protest responses in stated preference surveys using WTA formats in general (exceptions include Bateman et al., 2002, and Lusk et al., 2006). Beyond providing evidence on the lack of knowledge about protest responses in stated preference studies using WTA formats, this paper finds that protest responses can impact on WTA estimates. Below, we discuss this finding in greater detail, and make some recommendations regarding the identification and treatment of protest responses.

5.1. *Impact of protest responses on WTA estimates*

The results suggest that the inclusion/exclusion of serial non-participants (protesters and very high takers) in the analysis strongly impacts WTA estimates. Three out of five attributes show significant differences in WTA. Estimates of total WTA are lower when not only protesters but also very high takers are excluded. The results suggest that it is strongly recommended to identify protest responses since their inclusion in the analysis may bias the estimates obtained. This is in line with similar inquiries in a WTP context (Meyerhoff and Liebe, 2008; Barrio and Loureiro, 2013). It is also important to identify very high takers and retain their responses in the sample used for analysis. Such individuals stated their true preferences for the alternatives proposed, and we find that excluding very high takers results in significantly lower WTA estimates.

5.2. *Handling protest responses when analysing environmental providers' preferences towards incentive-based schemes*

Because the impact of serial non-participation (either related to protesters or very high takers) can be remarkable, researchers should ideally attempt to avoid its occurrence in the first place (*ex ante*). After the data has been collected (*ex post*), the analyst is limited in her/his options. Protesters can be identified and excluded (provided this does not strongly affect sample representativeness). Regarding the remaining serial non-participants that are very high takers, the analyst has no means to identify the compensation threshold that would make them participate in the proposed scheme and hence trade-off the scheme attributes and compensation requirements. Lacking alternatives, we recommend including them in the analysis, because their preferences can at least be reflected in the ASC_{SQ} . This emphasises the need to address the issue *ex ante* in the research design. Therefore, we discuss some relevant points here proposing especially some *ex ante* and also *ex post* measures.

Regarding *ex ante* measures, the design of the non-monetary attribute can affect the share of protest response and very high takers. Particular scheme attributes and their levels

may be perceived as too restrictive or too demanding for ecosystem services providers to enter the scheme irrespective of the other attributes and the level of compensation offered. As a consequence, the frequency of status quo choices may increase. For example, many farmers in our analysis perceived constraints in how to manage cover crops to be very restrictive. While this is reflected by a high magnitude of WTA for schemes that include such attribute levels, it can also increase the incidence of protest responses. This is the case if farmers are generally opposed to the idea that governments conceive incentive-based schemes that contain unacceptable elements. Of course, what is perceived to be too restrictive or unacceptable by some farmers will depend on the study context. It is therefore important to understand the status quo regarding the proposed changes across farmers. If deviations of proposed changes from the status quo are substantial for some farmers, they may protest based on the fact that the proposed scheme is unrealistic. To avoid such hurdle effects, we therefore recommend setting the 'lowest' attribute levels to represent small to moderate changes relative to the status quo.

As in WTP formats, the design of the monetary attribute is particularly important. Although to our knowledge the sensitivity of WTA estimates to the design of the payment vector has not yet been systematically investigated in a similar fashion as in WTP formats (e.g. Hanley et al., 2005; Carlsson and Martinsson, 2008; Mørkbak et al., 2010), there are reasons to conjecture that the choice of compensation amounts in the monetary attribute will affect WTA estimates and serial-non-participation. In this respect, we consider the choice of lowest and highest amounts of compensation offered to be critical. The lowest and highest compensation amounts must be set such that they capture the greatest part of the supply in response to the incentive-based schemes. If the lowest compensation amount offered is not rejected by (almost) all of the respondents, the utility associated with accepting less than the lowest amount offered will be captured by the ASC, and the coefficient of the monetary attribute and thus WTA estimates may be biased. The choice of the lowest compensation amount offered may also be related to range bias (Bateman et al., 2002), which would occur if providers' WTA is lower than the lowest compensation amount offered and imply that their stated WTA is greater than their true minimum WTA. With regards to the highest compensation amount offered, it should be sufficiently high to allow providers which require a lot of compensation to participate in the scheme. This would reduce the incidence of serial-non-participation by very high takers. However, because the upper boundary of WTA is not constrained and little is known about the thresholds levels of compensation required by very

high takers, there are trade-offs between increasing the magnitude of the highest level of the monetary attribute and associated undesirable effects. For example, very high compensation amounts offered may induce strategic response behaviour: high amounts may signal to ES providers that the budget available for the scheme is substantial and thus be inclined to 'overbid'. In addition, very high compensation amounts offered may also cast doubt on the credibility of the proposed schemes.

The discussion regarding the design of the monetary attribute in WTA studies concerning incentive-based schemes for ES provision suggests three avenues for further research. First, more knowledge on the impact of the design of the monetary attribute on WTA estimates and serial non-participation is needed, for example using split-sample approaches as in the demand-side valuation literature. Second, it may be worthwhile to investigate the incidence of and the thresholds for compensation required by very high takers in relation to the choice of the highest compensation level. Third, the role of entreaties (Atkinson et al., 2012) and cheap talk (Ladenburg and Olsen, 2014) should be tested, particularly in relation to protest responses and strategic behaviour.

Regarding *ex post* treatment of serial non-participants, two main aspects are worth highlighting. First, the guiding principle applied in this study to discriminate protest responses from very high takers has been found useful; and our results confirm that it is recommended to exclude protest responses from the analysis. These general guidelines can be helpful not only in studies investigating ES-providers' preferences towards incentive-based schemes, but also in other WTA contexts (e.g. farm decision-making Hudson and Lusk, 2004; Windle and Rolfe, 2005). Second, we strongly suggest the inclusion of follow-up questions to elicit the reasons behind serial non-participation to allow *ex post* identification of protests respondents. In terms of the format of the debriefing questions, the use of closed-ended questions can assist in a more standardised, systematic identification. However, it can also suggest protest beliefs to respondents that they would not have considered themselves. Because of that, we are inclined to support the use of open-ended debriefing questions, followed by a clarification through the interviewer (in face-to-face surveys) using a pre-defined list of reasons for serial non-participation. In mail or online surveys, a single-response closed-ended question could ask the respondent to choose the option that best represents his/her beliefs from a list of very

high takers and protest beliefs⁹. While the ample suggestions for items to be included in such a list made in this paper can serve as a benchmark, it is ultimately context dependent. Yet, a more systematic analysis of protest attitudes and motives, for example along the line of e.g. in Meyerhoff and Liebe (2006) in the context of WTP, would be clearly desirable.

6. Conclusions

The problem of protest responses in stated preference surveys remains contested in the literature on environmental valuation, both regarding the demand side (mainly WTP formats) and especially concerning the supply side (mainly WTA formats). To our knowledge, this is the first study that provides a comprehensive survey and analysis concerning the identification and treatment of protest responses in supply side assessments with a focus on choice experiment applications. Similar to findings in the context of demand side valuation and WTP formats, the study confirms that the consideration of protest responses can affect value estimates. We therefore recommend routinely identifying protest responses and subsequently excluding them from analysis in studies investigating landowners' preferences for incentive-based schemes. Protest responses must be distinguished from serial non-participation by very high takers who require high amounts in compensation for participation in a scheme. In contrast to protest respondents, very high takers reveal their true preferences through serial non-participation.

Failing to identify protest responses, and consequently to include them in the analysis, results in biased estimates of providers' minimum compensation requirements for the provision of ecosystem services. This can result in inefficient budget allocation for the implementation of the related incentive-based schemes. The exclusion of very high takers in addition to protest respondents can also affect WTA estimates. The lower estimates expected in this case may also provide erroneous signals to policy makers, because implementation budgets may not encourage scheme participation at levels required to achieve ecosystem services provision targets.

⁹ Although a multiple-response question would be interesting, further research is needed to provide clear guidance in cases where both protest and VHT beliefs are stated.

References

- Adamowicz, W., Boxall, P., Williams, M., Louviere, J. (1998). Stated preference approaches for measuring passive use values: Choice experiments and contingent valuation. *American Journal of Agricultural Economics* **80**(1): 64-75.
- Amigues, J.P., Boulatoff, C., Desaignes, B., Gauthier, C., Keith, J.E. (2002). The benefits and costs of riparian analysis habitat preservation: A willingness to accept/willingness to pay contingent valuation approach. *Ecological Economics* **43**(1): 17-31.
- Arrow, K.J., Solow, R., Portney, P.R., Leamer, E.E., Radner, R., Schuman, H. (1993). Report of the NOAA Panel on Contigent Valuation. Federal Register. 58: 4601-4614.
- Atkinson, G., Morse-Jones, S., Mourato, S., Provins, A. (2012). 'When to take "No" for an answer'? Using entreaties to reduce protests in contingent valuation studies. *Environmental and Resource Economics* **51**(4): 497-523.
- Barnes , A.P., Willock, J., Toma, L., Hall, C. (2011). Utilising a farmer typology to understand farmer behaviour towards water quality management: Nitrate Vulnerable Zones in Scotland. *Journal of Environmental Planning and Management* **54**(4): 477-494.
- Barr, R.F., Mourato, S. (2014). Investigating fishers' preferences for the design of marine Payments for Environmental Services schemes. *Ecological Economics* **108**: 91-103.
- Barrio, M., Loureiro, M. (2013). The impact of protest responses in choice experiments: an application to a Biosphere Reserve Management Program. *Forest Systems* **22**(1): 94-105.
- Bateman, I.J., Carson, R.T., Day, B., Hanemann, M., Hanley, N., Hett, T., Jones-Lee, M., Loomes, G., Mourato, S., Ozdemiroglu, E., Pearce, D.W., Sugden, R., Swanson, J. (2002). *Economic valuation with stated preference surveys: A manual*. Edward Elgar Publishing, Cheltenham.
- Beharry-Borg, N., Smart, J.C.R., Termansen, M., Hubacek, K. (2013). Evaluating farmers' likely participation in a payment programme for water quality protection in the UK uplands. *Regional Environmental Change* **13**(3): 633.
- Broch, S.W., Vedel, S.E. (2012). Using choice experiments to investigate the policy relevance of heterogeneity in farmer agri-environmental contract preferences. *Environmental and Resource Economics* **51**(4): 561.
- Brouwer, R., Martín-Ortega, J. (2012). Modeling self-censoring of polluter pays protest votes in stated preference research to support resource damage estimations in environmental liability. *Resource and Energy Economics* **34**(1): 151-166.
- Burton, R.B. (2004). Reconceptualising the 'behavioural approach' in agricultural studies: a socio-psychological perspective. *Journal of Rural Studies* **20**: 359-371.
- CAP (Consejería de Agricultura y Pesca). (2008). *El sector del aceite de oliva y de la aceituna de mesa en Andalucía*. Junta de Andalucía, Seville.
- Carlsson, F., Martinsson, P. (2008). How much is too much? *Environmental and Resource Economics* **40**(2): 165-176.
- Chouinard, H., Paterson, T., Wandschneider, P., Ohler, A. (2008). Will farmers trade profits for stewardship? Heterogeneous motivations for farm practice selection. *Land Economics* **84**: 66-82.
- Cooper, J.C. (1997). Combining actual and contingent behavior data to model farmer adoption of water quality protection practices. *Journal of Agricultural and Resource Economics* **22**(1): 30-43.
- Christensen, T., Pedersen, A.B., Nielsen, H.O., Mørkbak, M.R., Hasler, B., Denver, S. (2011). Determinants of farmers' willingness to participate in subsidy schemes for pesticide-free buffer zones-A choice experiment study. *Ecological Economics* **70**(8): 1558-1564.
- Dziegielewska, D., Mendelsohn, R. (2007). Does "No" mean "No"? A protest methodology. *Environmental and Resource Economics* **38**(1): 71-87.

- Espinosa-Goded, M., Barreiro-Hurlé, J., Ruto, E. (2010). What do farmers want from agri-environmental scheme design? A choice experiment approach. *Journal of Agricultural Economics* **61**(2): 259-273.
- Falconer, K. (2000). Farm-level constraints on agri-environmental scheme participation: A transactional perspective. *Journal of Rural Studies* **16**(3): 379-394.
- Gasson, R. (1973). Goals and values of farmers. *Journal of Agricultural Economics* **24**: 521–542.
- Glenk, K., Colombo, S. (2013). Modelling outcome-related risk in choice experiments. *Australian Journal of Agricultural and Resource Economics* **57**(4): 559-578.
- Gómez-Limón, J.A., Arriaza, M. (2011). *Evaluación de la sostenibilidad de las explotaciones de olivar en Andalucía*. Analistas Económicos de Andalucía, Málaga.
- Greiner, R., Patterson, L., and Miller, O., 2009. Motivations, risk perceptions and adoption of conservation practices by farmers. *Agricultural Systems* **99**: 86–104.
- Greiner, R. (2015). Factors influencing farmers' participation in contractual biodiversity conservation: A choice experiment with northern Australian pastoralists. *Australian Journal of Agricultural and Resource Economics*: In press.
- Halstead, J.M., Luloff, A., Stevens, T.H. (1992). Protest bidders in contingent valuation. *Northeastern Journal of Agricultural and Resource Economics* **21**(2): 160-169.
- Hanemann, W.M. (1984). Welfare evaluations in contingent valuation experiments with discrete responses. *American Journal of Agricultural Economics* **66**(3): 332-341.
- Hanley, N., Adamowicz, W., Wright, R.E. (2005). Price vector effects in choice experiments: an empirical test. *Resource and Energy Economics* **27**(3): 227-234.
- Horne, P. (2006). Forest owners' acceptance of incentive based policy instruments in forest biodiversity conservation - A choice experiment based approach. *Silva Fennica* **40**(1): 169-178.
- Hudson, D., Lusk, J. (2004). Risk and transactions cost in contracting: Results from a choice-based experiment. *Journal of Agricultural & Food Industrial Organization* **2**(1): Article 2.
- Hynes, S., Garvey, E. (2009). Modelling farmers' participation in an agri-environmental scheme using panel data: An application to the Rural Environment Protection Scheme in Ireland. *Journal of Agricultural Economics* **60**(3): 546-562.
- Jakobsson, K.M., Dragun, A.K. (2001). The worth of a possum: Valuing species with the contingent valuation method. *Environmental and Resource Economics* **19**(3): 211-227.
- Jorgensen, B.S., Syme, G.J., Bishop, B.J., Nancarrow, B.E. (1999). Protest responses in contingent valuation. *Environmental and Resource Economics* **14**(1): 131-150.
- Kuhfuss, L., Préget, R., Thoyer, S., Hanley, N. (2015). Nudging farmers to sign agri-environmental contracts: The effects of a collective bonus. Discussion papers in Environmental Economics. University of St. Andrews.
- Ladenburg, J., Olsen, S.B. (2014). Augmenting short cheap talk scripts with a repeated opt-out reminder in choice experiment surveys. *Resource and Energy Economics* **37**(0): 39-63.
- Layton, D., Siikamäki, J. (2009). Payments for Ecosystem Services programs: Predicting landowner enrollment and opportunity cost using a beta-binomial model. *Environmental and Resource Economics* **44**(3): 415-439.
- Lienhoop, N., Brouwer, R. (2015). Agri-environmental policy valuation: Farmers' contract design preferences for afforestation schemes. *Land Use Policy* **42**: 568-577.
- Lusk, J.L., Bruce Traill, W., House, L.O., Valli, C., Jaeger, S.R., Moore, M., Morrow, B. (2006). Comparative advantage in demand: Experimental evidence of preferences for genetically modified food in the United States and European Union. *Journal of Agricultural Economics* **57**(1): 1-21.
- Meyerhoff, J., Liebe, U. (2006). Protest beliefs in contingent valuation: Explaining their motivation. *Ecological Economics* **57**(4): 583-594.

- Meyerhoff, J., Liebe, U. (2008). Do protest responses to a contingent valuation question and a choice experiment differ? *Environmental and Resource Economics* **39**(4): 433-446.
- Meyerhoff, J., Liebe, U. (2010). Determinants of protest responses in environmental valuation: A meta-study. *Ecological Economics* **70**(2): 366-374.
- Meyerhoff, J., Bartczak, A., Liebe, U. (2012). Protester or non-protester: A binary state? On the use (and non-use) of latent class models to analyse protesting in economic valuation. *Australian Journal of Agricultural and Resource Economics* **56**(3): 438-454.
- Meyerhoff, J., Mørkbak, M.R., Olsen, S.B. (2014). A meta-study investigating the sources of protest behaviour in stated preference surveys. *Environmental and Resource Economics* **58**(1): 35-57.
- Mitchell, R.C., Carson, R.T. (1989). *Using surveys to value public goods: The contingent valuation method*. Johns Hopkins University Press, Baltimore.
- Mørkbak, M.R., Christensen, T., Gyrd-Hansen, D. (2010). Choke price bias in choice experiments. *Environmental and Resource Economics* **45**(4): 537-551.
- Mulatu, D.W., van der Veen, A., van Oel, P.R. (2014). Farm households' preferences for collective and individual actions to improve water-related ecosystem services: The Lake Naivasha basin, Kenya. *Ecosystem Services* **7**: 22-33.
- Pannell, D.J. (2008). Public benefits, private benefits, and policy mechanism choice for land-use change for environmental benefits. *Land Economics* **84**(2): 225-240.
- Paniagua Mazon, A. (2001). Agri-environmental policy in Spain. The agenda of socio-political developments at the national, regional and local levels. *Journal of Rural Studies* **17**: 81-97.
- Peterson, J.M., Smith, C.M., Leatherman, J.C., Hendricks, N.P., Fox, J.A. (2015). Transaction costs in payment for environmental service contracts. *American Journal of Agricultural Economics* **97**(1): 219-238.
- Poe, G.L., Welsh, M.P., Champ, P.A. (1997). Measuring the difference in mean willingness to pay when dichotomous choice contingent valuation responses are not independent. *Land Economics* **73**(2): 255-267.
- Poe, G.L., Giraud, K.L., Loomis, J.B. (2005). Computational methods for measuring the difference of empirical distributions. *American Journal of Agricultural Economics* **87**(2): 353-365.
- Rabotyagov, S.S., Lin, S. (2013). Small forest landowner preferences for working forest conservation contract attributes: A case of Washington State, USA. *Journal of Forest Economics* **19**(3): 307-330.
- Ruto, E., Garrod, G. (2009). Investigating farmers' preferences for the design of agri-environment schemes: A choice experiment approach. *Journal of Environmental Planning and Management* **52**(5): 631-647.
- Scarpa, R., Ferrini, S., Willis, K.G. (2005). Performance of error component models for status-quo effects in choice experiments. In: R. Scarpa, Alberini, A. (Ed.) *Applications of Simulation Methods in Environmental and Resource Economics*. Springer, Dordrecht, The Netherlands: 247-274.
- Siebert, R., Toogood, M., Knierim, A. (2006). Factors affecting European farmers' participation in biodiversity policies. *Sociologia Ruralis* **46**(4): 318-340.
- Söderberg, M., Barton, D.N. (2014). Marginal WTP and distance decay: The role of 'protest' and 'true zero' responses in the economic valuation of recreational water quality. *Environmental and Resource Economics* **59**(3): 389-405.
- Strazzer, E., Genius, M., Scarpa, R., Hutchinson, G. (2003). The effect of protest votes on the estimates of WTP for use values of recreational sites. *Environmental and Resource Economics* **25**(4): 461-476.

- Street, D.J., Burgess, L. (2007). *The construction of optimal stated choice experiments: Theory and methods*. John Wiley & Sons, Hoboken (New Jersey).
- Sullivan, J., Amacher, G.S., Chapman, S. (2005). Forest banking and forest landowners forgoing management rights for guaranteed financial returns. *Forest Policy and Economics* **7**(3): 381-392.
- Train, K. (2003). *Discrete choice methods with simulation*. Cambridge University Press, Cambridge, UK.
- Train, K., Weeks, M. (2005). Discrete choice models in preference space and willingness-to-pay space. In: R. Scarpa, Alberini, A. (Ed.) *Applications of simulation methods in environmental and resource economics*. Springer Netherlands: 1-16.
- Uthes, S., Matzdorf, B. (2013). Studies on agri-environmental measures: A survey of the literature. *Environmental Management* **51**(1): 251-266.
- Vedel, S.E., Jacobsen, J.B., Thorsen, B.J. (2015). Forest owners' willingness to accept contracts for ecosystem service provision is sensitive to additionality. *Ecological Economics* **113**: 15-24.
- Villanueva, A.J., Gómez-Limón, J.A., Arriaza, M., Rodríguez-Entrena, M. (2015). The design of agri-environmental schemes: Farmers' preferences in southern Spain. *Land Use Policy* **46**: 142-154.
- Windle, J., Rolfe, J. (2005). Diversification choices in agriculture: A choice modelling case study of sugarcane growers. *Australian Journal of Agricultural and Resource Economics* **49**(1): 63-74.

Appendix A. Literature review.

Table A1. Review of studies using stated preference method to estimate WTA of the providers of ES^a.

<i>Papers</i>	<i>Case study</i>	<i>Providers</i>	<i>Format</i>	<i>Respon- dents</i>	<i>Does they report any information about protests?</i>	<i>% of SQ- choices</i>	<i>% serial non- participants (total)</i>	<i>% of protests</i>	<i>Serial non- participants included in the analysis</i>	<i>Method to distinguish protest</i>	<i>Definition of protester (or related information)</i>
Adams et al. (2014)	Biodiversity conservation program in Australia	Landowners	Mail	92	No	-	-	-	-	-	-
Alló et al. (2015)	AES to protect steppe birds in Spain	Farmers	Face-to-face	359	No	-	-	-	-	-	-
Amigues et al. (2002) ^b	Riparian habitat preservation in France	Landowners	Mail	95	Yes	51.6	51.6	6.3	Yes	Open-ended question to serial non-participants	Those who returned blank questionnaires or partially completed questionnaires, some with explicit protest statements
Austin et al. (2014)	Collaborative incentives for deer conservation in UK	Landowners	Face-to-face	128	No	-	-	-	-	-	-
Balderas-Torres et al. (2013)	Local PES in Mexico	Farmers	Face-to-face	161	Yes	-	6.2	6.2	No	-	Serial non-participants
Barr and Mourato (2014)	PES to protect marine ecosystems in Tanzania	Fishers	Face-to-face	317	Yes	55.1	30.3	8.8	Yes	Open-ended question to serial non-participants	Serial non-participants who made at least one irrational choice and provided no explanation for choices made
Beharry-Borg et al. (2013)	PES to improve water quality in UK	Farmers	Face-to-face	97	No	22.0	6.0	-	Yes	-	-
Biról et al. (2006)	Agrobiodiversity in small farms in Hungary	Farmers	Face-to-face	277	No	-	-	-	-	-	-
Blazy et al. (2011)	Adoption of agri-environmental practices in Caribbean banana farms	Farmers	Face-to-face	607	No	-	-	-	-	-	-
Broch y Vedel (2012)	AES for afforestation in Denmark	Farmers	Online	1027	No	-	-	-	-	-	-
Buckley et al. (2009) ^b	Scheme for public access for recreational walking in Ireland	Landowners	Face-to-face	274	Yes	40.1	40.1	3.3	Yes	-	-
Buckley et al. (2012) ^b	Adoption of riparian buffer zones in Ireland	Farmers	Face-to-face	247	No	53.0	53.0	-	No (not in the WTA model)	-	-

<i>Papers</i>	<i>Case study</i>	<i>Providers</i>	<i>Format</i>	<i>Respon- dents</i>	<i>Does they report any information about protests?</i>	<i>% of SQ- choices</i>	<i>% serial non- participants (total)</i>	<i>% of protests</i>	<i>Serial non- participants included in the analysis</i>	<i>Method to distinguish protest</i>	<i>Definition of protester (or related information)</i>
Chen et al. (2009)	Afforestation (and grasslands) incentive in China	Heads of the households	Face-to-face	305	No	-	46.1	-	-	-	-
Christensen et al. (2011)	AES in Denmark	Farmers	Online	486	Yes	28.7	22.6	8.6	Yes	Open-ended question to serial non-participants (apparently)	Serial non-participants who stated that subsidy schemes had nothing to do with real farming
Cooper (1997) ^b	Adoption of water quality protection practices in the US	Farmers	Mail	1261	No	-	-	-	Yes	Yes	-
Cooper and Signorello (2008) ^b	Environmental conservation program in Italy	Farmers	Face-to-face	449	No	45.2	45.2	-	Yes	-	-
Dupraz et al. (2003) ^b	AES for protecting endangered bird species in Belgium	Farmers	Face-to-face	248	No	43.1	43.1	-	Yes	-	-
Espinosa-Goded et al. (2010)	AES in two different regions of Spain	Farmers	Face-to-face	300	No	-	-	-	-	-	-
Feng and Xu (2015) ^b	Afforestation (and grasslands) incentive in China	Rural households	Face-to-face	1207	No	-	-	-	No	-	-
Greiner (2015)	Voluntary biodiversity conservation contracts in Australia	Farmers	Face-to-face	104	Yes	-	-	3.8	Yes	Open-ended question to serial non-participants	Serial non-participants who disagreed with the conceptual context of the valuation scenario
Grosjean and Kontoleon (2009) ^b	Follow-up options for an afforestation programme in China	Farmers	Face-to-face	286	No	-	-	-	-	-	-
Hope et al. (2008)	Schemes to switch to organic farming in India	Farmers	Face-to-face	640	No	-	-	-	-	-	-
Horne (2006)	Scheme for forestry biodiversity in Finland	Forest owners	Mail	1240	No	-	33.0	-	Yes	-	-
Kaczan et al. (2013)	PES to reduce deforestation in Tanzania	Heads of the households (farmers)	Face-to-face	220	No	-	-	-	-	-	-

<i>Papers</i>	<i>Case study</i>	<i>Providers</i>	<i>Format</i>	<i>Respon- dents</i>	<i>Does they report any information about protests?</i>	<i>% of SQ- choices</i>	<i>% serial non- participants (total)</i>	<i>% of protests</i>	<i>Serial non- participants included in the analysis</i>	<i>Method to distinguish protest</i>	<i>Definition of protester (or related information)</i>
Kadigi and Mlasi (2013)	PES towards water protection in Tanzania	Households	Face-to-face	63	No	-	-	-	-	-	-
Krishna et al. (2013) ^b	PES for biodiversity in India	Households	Face-to-face	454	No	-	-	-	-	-	-
Kuhfuss et al. (2015)	AES for winegrowers in France	Farmers	Email	317	Yes	46.3	22.4	8.5	Yes	Debriefing close-ended questions (final open-ended) when SQ was chosen	Serial non-participants who do not want to be constrained on their farming practices, irrespective of the level of payment
Lant (1991) ^b	Conservation Reserve Program in Illinois (US)	Farmers	Mail	152	No	17-94	17-94	-	Yes	-	-
Layton and Siikamäki (2009) ^b	PES for habitat preservation in Finland	Forest owners	Mail	1129	Yes	33-42	-	-	-	-	Those who would really enrol at some attribute/level combination but not at any of the offered program configurations
LeVert et al. (2009) ^b	Forest conservation in Vermont and Massachusetts (US)	Forest owners	Mail	1300	No	36.7	-	-	-	-	-
Lienhoop and Brouwer (2015)	AES for afforestation in Germany	Farmers	Face-to-face	217	Yes	-	33.0	4.1	Yes	Open-ended question to serial non-participants (apparently)	Serial non-participants who do not trust on the institutions (do not believe that the AES will be implemented)
Lindhjem and Mitani (2012) ^b	Voluntary conservation program in forestry systems in Norway	Forest owners	Mail	773	No	-	48.0	-	No	-	-
Ma et al. (2012) ^b	PES in Michigan (US)	Farmers	Mail	1688	No	36-43	-	-	-	-	-
Matta et al. (2009)	Forest conservation programs in Florida (US)	Private forest owners	Mail	400	No	-	-	-	-	-	-
Mulatu et al. (2014)	Water-related PES in Kenya	Heads of the households	Face-to-face	205	Yes	19.0	0.0	0.0	-	-	Authors argue that PES was attractive for respondents, so no serial non-participant and protest were reported

<i>Papers</i>	<i>Case study</i>	<i>Providers</i>	<i>Format</i>	<i>Respon- dents</i>	<i>Does they report any information about protests?</i>	<i>% of SQ- choices</i>	<i>% serial non- participants (total)</i>	<i>% of protests</i>	<i>Serial non- participants included in the analysis</i>	<i>Method to distinguish protest</i>	<i>Definition of protester (or related information)</i>
Peterson et al. (2015)	PES for water quality in Kansas (US)	Farmers	Face-to-face	135	No	27.0	-	-	-	-	-
Rabotyagov and Lin (2013)	Forest conservation contracts in the Seattle (US)	Forest owners	Mail	678	No	-	-	-	-	-	-
Ruto y Garrod (2009)	AES in different EU countries	Farmers	Face-to-face	2262	No	-	-	-	-	-	-
Santos et al. (2015)	AES in the agroforestry system Montado in Portugal	Farmers	Face-to-face	111	No	-	18.0	-	Yes	-	-
Schulz et al. (2014)	Green payment implementation in Germany	Farmers	Online	128	No	43.0	14.0	-	Yes	-	-
Shaikh et al. (2007) ^b	Afforestation program in Canada	Farmers	Mail	260	No	-	-	-	No	-	-
Sorice et al. (2011)	Endangered species conservation program in Texas (US)	Landowners	Mail (plus Face-to-face)	266	Yes	-	31.0	-	Yes	-	-
Sullivan et al. (2005) ^b	Payments for enrolment in a Forest Bank in Virginia (US) to protect water quality and imperiled species	Forest landowners	Mail	300	No	-	-	-	-	-	-
Sun et al. (2009) ^b	Ranchers' preferences towards the use of public forage in Nevada (US)	Farmers	Mail	205	No	91.0	91.0	-	Yes	-	-
Tesfaye and Brouwer (2012)	Soil conservation contracts in Kenya	Farmers	Face-to-face	750	Yes	9.0	3.1	0.0	Yes	Open-ended question to serial non-participants (apparently)	Serial non-participants who do not trust on the authorities (though none of them stated that)
van Putten et al. (2011)	Conservation incentive programs in Tasmania (Australia)	Landowners	Mail	132	No	-	67.0	-	No	-	-
Vanslebrouck et al (2002) ^b	Two AES (for scenery and extensification) in Belgium	Farmers	Face-to-face	347	No	11-51	11-51	-	-	-	-

<i>Papers</i>	<i>Case study</i>	<i>Providers</i>	<i>Format</i>	<i>Respon- dents</i>	<i>Does they report any information about protests?</i>	<i>% of SQ- choices</i>	<i>% serial non- participants (total)</i>	<i>% of protests</i>	<i>Serial non- participants included in the analysis</i>	<i>Method to distinguish protest</i>	<i>Definition of protester (or related information)</i>
Vedel et al. (2015)	PES in Natura 2000 areas in Denmark	Forest owners	Online	283	No	-	-	-	Yes	-	-
Wossink and van Wenum (2004) ^b	Biodiversity conservation programs in arable farms the Netherlands	Farmers	Mail	250	No	48.0	48.0	-	Yes	-	-
Yu and Belcher (2011) ^b	Adoption of wetland and riparian conservation management in Canada	Landowners	Mail	212	No	17.9	17.9	-	Yes	-	-
Zhen et al. (2014) ^b	Mandatory PES to restore grassland ecosystems in China	Farmers	Face-to-face	240	No	-	-	-	No	-	-

^a The details of the references are available upon request to the authors.

^b They do not use CE but other stated preference method (especially, contingent valuation).

Source: Own elaboration.

Appendix B. Characteristics of Protesters, Very high takers and Participants

The characteristics of the three resulting groups of farmers, *Protesters*, *Very high takers*, and *Participants* are shown in Tables B1 and B2. As can be observed, the results revealed inter-group differences to a large extent. Especially, the group of *Participants* is clearly different from the other two groups. *Protesters* and *Very high takers* have much smaller farms (14.2ha and 17.3ha for *Protesters* and *Very high takers*, both significantly lower than 33.4ha for *Participants*) and higher share of family labour over total farm labour (78.7%, 76.1%, and 62.6%, respectively). They are more distant from the compliance with the requisites included in the AES (they have less EFA, use less cover crops and manage it using tillage –thus not complying with CCMA-Constr). They use conventional techniques in a higher rate. They are older, show lower level of knowledge with regards to AES and the cross-compliance, and perceive the environmental benefits of cover crops and EFA less positively. A vast majority have not undergone any agricultural professional training and there is a higher share of farmers that have not gone to school than *Participants*. It is also worth highlighting that the three groups of farmers do not show statistically significant differences with regards to the area where the farm is located (i.e. provinces of Córdoba, Jaén, and Málaga), and the type of olive grove sub-system (mountainous, plain rain-fed, irrigated olive groves). Additionally, no significant differences were found for structural variables such as tree density, grove age, and slope, neither for yield.

It is pertinent also to underscore the differences between *Protesters* and *Very high takers*. *Very high takers* seem to use less cover crops than *Protesters* and, as a result, their initial compliance of the levels CCAR-25% and CCMA-Constr are lower (especially for the latter level, as none of the *Very high takers* initially comply with it). Aligned with this result, *Very high takers* seem to perceive the use of cover crops and EFA less positively. They do not perceive cover crops as economically beneficial (scoring 2.0 out of 5 in this variable while *Protesters* show 3.3), and they perceive the use of EFA for providing environmental benefits less positively (scoring 3.2 compared to 3.8 for *Protesters*, although not statistically different in this case). These differences are likely reflecting the guideline followed to identify both.

Table B1. Differences between Protesters, Very high takers, and Participants (Numeric variables).

<i>Variables</i>	<i>Protesters</i>			<i>Very high takers</i>			<i>Participants</i>		
	<i>Mean</i>	<i>St.dv.</i>	<i>N</i>	<i>Mean</i>	<i>St.dv.</i>	<i>N</i>	<i>Mean</i>	<i>St.dv.</i>	<i>N</i>
Olive tree area (ha) ^{***}	14.2 ^a	35.6	35	17.3 ^a	41.2	32	33.4 ^b	60.8	260
Total area (ha) ^{***}	20.2 ^a	49.8	35	18.7 ^a	44.8	32	40.9 ^b	77.8	260
Own olive grove area (% of total olive grove area)	92.9	24.0	35	86.0	30.9	32	83.0	32.0	260
Farmers' labour time (% of total labour time) [*]	37.5 ^a	40.0	35	43.1 ^{ab}	36.6	32	52.4 ^b	40.0	260
Family labour (person-year/ha) ^{**}	78.7 ^b	27.4	35	76.1 ^{ab}	24.4	32	62.6 ^a	31.0	260
Grove age (years)	101.8	78.0	35	68.9	55.7	32	83.7	75.3	260
Tree density (trees/ha)	113.6	48.7	35	137.8	66.8	32	125.7	60.0	260
Slope (%)	6.3	6.1	35	6.6	6.4	32	9.5	9.5	260
Yield (Kg/ha)	4336	1583	35	4917	2938	32	4583	2223	260
cover crops / olive tree area (%) ^{***}	17.8 ^{ab}	20.2	35	8.6 ^a	13.9	32	27.2 ^b	23.5	260
EFA / olive tree area (%) [*]	0.3 ^a	1.0	35	1.2 ^{ab}	3.4	32	1.3 ^b	2.5	260
Perception of cover crops as economically beneficial (adim., 1-5) ^{***}	3.3 ^b	1.5	33	2.0 ^a	1.5	32	3.6 ^b	1.4	254
Perception of cover crops as environmentally beneficial (adim., 1-5) ^{***}	3.8 ^a	1.3	33	3.7 ^a	1.5	32	4.4 ^b	1.0	256
Perception of EFA as environmentally beneficial (adim., 1-5) [*]	3.8 ^{ab}	1.4	33	3.2 ^a	1.6	32	3.9 ^b	1.2	256
Farmer's age (years) ^{***}	57.6 ^b	10.5	35	56.1 ^b	11.6	32	49.6 ^a	11.8	260
Knowledge index (0-1) ^{***}	0.3 ^a	0.19	35	0.23 ^a	0.23	32	0.43 ^b	0.25	260

Note: *, **, and *** reflect significance at 5%, 1%, and 0.1% levels respectively (using the Kruskal-Wallis H-Test). Superscripts ^a, ^b, and ^c indicate the differences among the three groups for each variable; sharing the same letter implies no significant statistical differences.

Source: Own elaboration.

Table B2. Differences between Protesters, Very high takers, and Participants (Dichotomous variables).

<i>Variables</i>	<i>Protesters</i>		<i>Very high takers</i>		<i>Participants</i>	
	%	N	%	N	%	N
Province: Córdoba	31.4	35	43.8	32	41.9	260
Province: Jaén	48.6	35	28.1	32	40.0	260
Province: Málaga	20.0	35	28.1	32	18.1	260
Sub-system: Mountainous olive groves	11.4	35	15.6	32	26.9	260
Sub-system: Plain rain-fed olive groves	51.4	35	53.1	32	38.1	260
Sub-system: Plain irrigated olive groves	37.1	35	31.3	32	35.0	260
Farmer knows current AES implemented ^{**}	8.6 ^a	35	12.5 ^a	32	34.6 ^b	260
Participation in current AES ^{**}	0.0 ^a	35	3.1 ^{ab}	32	18.5 ^b	260
Use of conventional techniques	80.0	35	78.1	32	63.5	260
Farmer complies with EFA-2% [*]	5.7 ^a	35	12.5 ^{ab}	32	25.0 ^b	260
Farmer complies with CCMA-Restr ^{***}	25.7 ^b	35	0.0 ^a	32	36.5 ^b	260
Farmer complies with CCAR-50%	14.3	35	3.1	32	18.8	260
Farmers complies with CCAR-25% ^{***}	25.7 ^{ab}	35	9.4 ^a	32	45.8 ^b	260
Farmer knows the EFA requisite within cross-compliance ^{**}	39.4 ^{ab}	33	25.0 ^a	32	52.6 ^b	251
Farmer knows the cover crops requisite within cross-compliance ^{**}	69.7 ^{ab}	33	56.3 ^a	32	81.7 ^b	251
Farmer pertains to agricultural unions [*]	12.0 ^a	34	41.0 ^b	32	36.1 ^b	254
Farmer asks for advice at least once a month [*]	20.6 ^a	34	28.1 ^{ab}	32	43.6 ^b	257
Farmers did not go to school ^{**}	29.4 ^b	34	21.9 ^{ab}	32	8.9 ^a	258
Not trained ^{**}	76.5 ^b	34	71.0 ^{ab}	31	52.9 ^a	257

Note: *, **, and *** reflect significance at 5%, 1%, and 0.1% levels respectively (using Chi-squared). Superscripts ^a, ^b, and ^c indicate the differences among the three groups for each variable; sharing the same letter implies no significant statistical differences.

Source: Own elaboration.