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Handling protest responses when estimating willingness to accept: Farmers' preferences towards agri-environmental schemes

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ABSTRACT

The identification and treatment of protest responses in stated preference surveys has long been subject to debate in the literature. The most common treatment is to omit protest responses identified through debriefing questions from the analysis. All major studies investigated the role of protest responses in willingness to pay (WTP) contexts. This paper analyses protest responses in stated preference surveys using a willingness to accept (WTA) format, drawing on choice experiment data on preferences of providers of ecosystem services towards incentive-based environmental schemes. The paper addresses two main objectives. First, we identify a range of possible reasons for protest responses to emerge in a WTA context through a review of literature on WTA for participation in land-based incentive schemes and a discussion on how protest responses in WTA contexts differ from those in WTP formats. Second, the paper analyses the impact of omitting protest responses in a WTA context on welfare estimates based on a random parameter logit model in willingness to accept (WTA) space. We find that the inclusion/exclusion of protesters and/or serial non-participants in the analysis strongly impacts on welfare estimates. We also find that there is a wide variety of reasons for non-participation that may indicate protest depending on a study's context. Based on the findings, the paper makes recommendations aimed at preventing and identifying protest responses in future applications of stated preference surveys using a WTA format.

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

JEL codes: Q18, Q58.

1. Introduction

Some respondents to stated preference surveys do not engage in the hypothetical market to reveal their true preferences when answering stated preference questions (Halstead et al., 1992). This issue is well reported in the literature, and commonly such respondents are considered to be 'protesters' since they reject (protest against) some aspect of the constructed market scenario (Meyerhoff et al., 2014). However, the identification of protest responses is challenging when using stated preference methods, because it is often difficult to distinguish protest responses from responses that actually reflect respondents' preferences (Meyerhoff and Liebe, 2006; Meyerhoff et al., 2012). In willingness to pay (WTP) formats, it is often difficult to differentiate protest responses from true or 'genuine' zero responses (Meyerhoff and Liebe, 2008; Barrio and Loureiro, 2013). As a result, the inclusion or omission of protest responses in the analysis can bias welfare estimates (Halstead et al., 1992; Strazzera et al., 2003).

There is a large body of literature that analyses the impact of treating protest responses in the valuation of environmental goods and services (Strazzera et al., 2003; Barrio and Loureiro, 2013; Söderberg and Barton, 2014), and develops pathways to identifying them (Meyerhoff and Liebe, 2010; García-Llorente et al., 2011; Meyerhoff et al., 2014). All of these stated preference studies use a WTP format for valuing changes in environmental goods and services. However, the issue of protest responses has received very limited and non-systematic attention from the academia with regards to other applications of stated preference methods to environmental economics and policy. This is particularly the case for the analysis of preferences of the providers' of ecosystem goods and services towards environmental policy, especially incentive-based mechanisms. Studies in this context have become increasingly abundant and typically estimate willingness to accept (WTA), mostly using choice experiments (CE) (Ruto and Garrod, 2009; Espinosa-Goded et al., 2010; Christensen et al., 2011; Broch and Vedel, 2012; Schulz et al., 2014; Greiner, 2015). These studies usually consist of estimating the marginal value of the attributes of policy instruments (Ruto and Garrod, 2009), with the underlying assumption that providers' (mostly farmers) choices among alternative incentive-based schemes depend on the attributes of these schemes (Christensen et al., 2011). Such choice experiments have been applied in the context of the European Union's agri-environmental schemes (AES) (Ruto and

Garrod, 2009; Espinosa-Goded et al., 2010; Christensen et al., 2011; Broch and Vedel, 2012; Beharry-Borg et al., 2013), similar schemes in other countries (Greiner, 2015), as well as payments for ecosystem services schemes (PES) (Balderas Torres et al., 2013; Mulatu et al., 2014).

Protest responses are also found when analysing the preferences of the providers of environmental services towards incentive-based schemes using a WTA format. Yet, information about protest responses is frequently omitted or, in the best case, very briefly –and vaguely– commented on in the literature. Additionally, among those studies that comment on protest responses, there is no consensus about what constitutes a protest response. Different reasons for protest responses are applied, for example, dissent with specific aspects of the study (e.g. practices included in the programme) (Christensen et al., 2011), and/or the conceptual context of the valuation scenario (Greiner, 2015), misunderstanding or lack of information (Broch and Vedel, 2012), and lack of trust in institutions (Lienhoop and Brouwer, 2015). Therefore, the literature does not provide clear guidelines regarding the reason/s that justify considering an individual as a protester and, ultimately, serve to identifying them. Coupled with the fact that there is, to the best of our knowledge, no work on the analysis of the impacts of protest responses on providers' WTA for environmental policy attributes, this appoints to a clear need for generating deeper insights in this issue.

This paper analyses protest responses in choice experiments aimed at studying the preferences of providers of environmental services towards environmental incentive-based schemes. As case study, we analyse farmers' preferences towards AES in southern Spain. The objective of the paper is twofold. First, to investigate the reasoning behind protest responses and propose effective ways to identify such responses for the case of providers' preferences towards environmental incentive-based schemes. Second, to analyse the impact of protest responses on welfare estimates. For the analysis of the choice data, we apply a random parameter logit model in WTA space which, to the authors' knowledge, has not been used previously in WTA contexts.

The paper is structured as follows. The following section is dedicated to the issue of protest responses on this type of WTA approaches. The third section describes the method and the data used for the empirical analysis. The main results are presented in the fourth

section followed by a discussion, which outlines the main analytic implications and recommendations for future studies regarding the identification and treatment of protest responses in WTA formats.

2. Protesters and "very high takers'" in willingness to accept (WTA)

In WTP approaches to the valuation of ecosystem goods and services, protest responses are often related to a discontent with the public institutions, especially regarding tax policy and the delivery of public services (Meyerhoff and Liebe, 2008). As a result of his/her discontent, the interviewee typically does not take the choice situations and their different alternatives into consideration, but always chooses the status quo (SQ) or opt-out alternative. However, there is another type of interviewee who also always chooses the SQ alternative but for a different reason. These so-called "true-zero" or "genuine-zero' responses reflect that the interviewee has taken the choice situations into consideration, but that none of the (policy) alternatives is closer to their preferences than the SQ alternative. Thus, providing that the design of the experiment is correct, this type of responses reflects that the interviewee's WTP for the goods or services analysed is very low or almost zero, which means either that s/he would not be willing to pay (at least at the lowest level considered in the design) for maintaining or improving the provision of the goods and services on offer or that s/he cannot afford it (due to his/her very low disposable income).

In WTA approaches with regards to the valuation of changes of the welfare of the provider of environmental goods and services, things are considerably different. Although there in part protest responses can be in line with reasoning behind protest in WTP formats (i.e. lack of trust on the institutions), it is very difficult to distinguish protest respondents from those who simply preferred the SQ alternative in every choice situation (*serial non-participants* or SQ-individuals) because it better reflects their preferences at the payment levels offered. It is worth clarifying that, unlike in WTP approaches, serial non-participation cannot reflect zero welfare change for the policy scheme alternatives. Actually, serial non-participation in WTA approaches might represent a higher WTA than offered by the policy schemes on offer (i.e. neither of the level of payments offered for the hypothetical alternatives are sufficient to make the interviewee choose them instead of the SQ alternative). Thus, we prefer to call such respondents "very high takers" since they would

probably require a very high payment to choose any alternative but the SQ. The inclusion of these interviewees in the analysis can have a big impact on the estimates (probably higher than for the case of WTP approaches, which are lower bounded at zero). Therefore, it is very relevant to discriminate them from actual protest respondents. As mentioned above, how to distinguish protest individuals from those whose serial choice of the SQ reflects true preferences is a challenging task, because there is a wide variety of reasons for serial non-participation that cannot be easily used to classify respondents.

3. Method

3.1. Choice experiment design and data collection

Choice experiments (CE) are a stated preference valuation technique based on Lancasterian Consumer Theory of utility maximization which postulates that consumption decisions are determined by the utility or value derived from the attributes of the good being consumed (Lancaster, 1966). The econometric basis of the approach lies in the Random Utility Theory (McFadden, 1974). Hensher et al. (2005) provide an extensive explanation of the choice experiment theory and practice. The use of CE to analyse the preferences of the providers of ecosystem services towards environmental policy has sharply increased in the last six years, especially regarding incentive-based mechanisms such as agri-environmental schemes (Ruto and Garrod, 2009; Espinosa-Goded et al., 2010; Christensen et al., 2011; Broch and Vedel, 2012; Beharry-Borg et al., 2013) or their equivalent in other countries (Greiner, 2015) and payments for ecosystem services (PES) schemes (Balderas Torres et al., 2013; Mulatu et al., 2014). All these studies support the use of CE as a valid approach to analyse landowners' WTA for attributes of incentive-based measures.

The case study selected for the analysis is olive farming in Andalusia (southern Spain), given that this is the main crop grown in this region (over 1.5 million hectares, 48% of Andalusian farmland) and that it has great potential for improvement in the production of environmental public goods. According to Villanueva et al. (2014), soil fertility, visual quality of the landscape, biodiversity and mitigation of climate change are the four public goods presenting the highest enhancement potential from a supply point of view. Moreover, all of these public goods are in high demand by European (EC 2010) and Andalusian (Rodríguez-Entrena et al., 2014) societies. Thus, it is reasonable that an AES for olive growing in

Andalusia should focus on agronomic practices aimed at increasing the provision of these public goods.

Six attributes were used in the CE, three of them linked with agricultural management (two of them related to soil conservation practices and one to ecological focus areas –EFA), two policy design attributes and the payment (see Table 1). The two attributes related to soil conservation practices focus on the use of cover crops (CC) since it possibly represents the most useful agricultural practice in olive growing in terms of enhancing the production of environmental public goods (Villanueva et al., 2014). Thus, the area covered by CC and their management are two attributes included in the CE. For the attribute *Cover crops area* (CCAR), two levels were set: 25% and 50% of the olive grove area (CCAR-25% and CCAR-50%, respectively) (see Table 1). As regards the attribute *Cover crops management* (CCMA), two levels were also set: free (CCMA-Free) and restrictive management (CCMA-Restr). The latter corresponds to the management established in the current AES specifically related to olive growing (*Sub-measure 7* or SM7[1]), that basically restricts the use of both tillage and herbicide in CC management, while the former implies no additional restrictions to those that are part of cross-compliance. A more detailed description of the attributes and the experimental design can be found in Villanueva et al. (2015).

For the attribute *Ecological focus areas* (EFA), levels were set at zero and 2% of the olive grove plots covered by EFA (EFA-0% and EFA-2%, respectively). The first level is equivalent to the requirement included in green payment for permanent crops. The second is below the 5% of EFA finally established for arable lands in the new CAP and was decided upon after taking into account both the current lack of these kinds of areas in Andalusian olive groves and the difficulties of increasing the share of EFA in permanent crops (Gómez-Limón and Arriaza, 2011).

[1] SM7 was an AES implemented for olive growing in the Andalusian Rural Development Program 2007-2013, targeted at integrated farming in olive groves located in Natura 2000 areas or watersheds of reservoirs for urban water supply. Participation in this scheme involved the use of CC from November (when the rainy season begins) to mid-March (when the CC start to compete with olive trees for soil water). SM7 payments were linked to the strip width of the CC, €204/ha and €286/ha per year for strips 1.8 and 3.6m wide, respectively. As regards its management, soil tillage was not allowed (except for sowing cultivated CC) and the use of herbicides was restricted to twice every five years (but never twice in a single year).

Table 1. Attributes and levels used in the choice set design[μ].

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

[μ] The SQ level considered is the farmer's initial condition for CCAR, CCMA, and EFA, COLLE=Individual, MONI=5%, and zero PAYM.

Source: Own elaboration.

Collective participation and level of monitoring are the two design attributes included in the CE. For *Collective participation* (COLLE), the two established levels are collective and individual participation. For participation to be considered collective, a group of at least five farmers whose farms were located in the same municipality had to sign the same AES contract. Regarding the attribute *Monitoring* (MONI), two levels were also set: 5 and 20% (MONI-5% and MONI-20%, respectively). The lower level was set equal to the typical monitoring level of the CAP measures, while the higher level was set to reflect an increase in monitoring effort that is clearly visible to farmers.

Regarding the attribute *payment* (PAYM), four levels were set according to payments in SM7 (€204-286/ha per year). Two levels (€200/ha and €300/ha) were set in line with these payments, while two further levels (€100/ha and €400/ha) were set as minimum and maximum payments.

3.2. Experimental design and data collection

A fractional factorial design that is optimal and orthogonal in the differences proposed by Street and Burgess (2007) was used to create a more manageable number of choice options, reducing the possible combinations (1924) to 192 profiles (D-efficiency=91.3%). The 192 choice sets were divided into 24 blocks of eight choice sets each, with one farmer answering one block. In each choice set, farmers were asked to choose between two alternatives, in

addition to a possible no-choice (i.e. SQ, representing the "business as usual" option). Appendix A shows an example of a choice set.

The questionnaire was tested in an *ad hoc* pilot survey, which included five sets of questions: 1) Farm characteristics (farm size, type of tenancy, slope, olive tree density, subsidies perceived, yield, etc.), 2) Use of production technologies, agricultural practices (soil management, pest management, pruning, irrigation and harvesting) and participation in AES, 3) Farmer characteristics (gender, age, off-farm economic activities, level of education, agricultural professional training, etc.), 4) Choice sets as shown in Appendix A, complemented with debriefing questions asked when respondent only chose the SQ alternative, and 5) Farmer's knowledge and perceptions towards the implementation of AES in olive growing. An explanation of the attributes and choice procedure was provided to ensure that farmers understood correctly before answering the questionnaire.

A multi-stage sampling procedure was employed. In the first stage, five agricultural districts[2] 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 using convenience sampling[3] to select participant olive growers. The interviews were carried out from October 2013 to January 2014. 330 interviews were carried out while 327 useable responses were obtained (the remaining three questionnaires were incomplete and consequently excluded from the analysis). Amongst the 327 respondents, those who chose the SQ alternative in all choice situation were carefully scrutinised in order to distinguish protesters from serial non-participants. For this purpose, the information collected from debriefing questions following the choice tasks were analysed. This is a common way of identifying protest responses in WTP approaches (Strazzera et al., 2003; Meyerhoff and Liebe, 2008), and has also been used in WTA approaches (Greiner, 2015). Since the distinction between protesters and genuine serial

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

[3] The sampling process consisted of looking for olive growers to be interviewed in each village (e.g. in agricultural cooperatives and private olive mills, agricultural public offices, gas stations, fertilizer shops or even at the street).

non-participants is a central part of the paper, this process is explained in-detail in the results section.

3.3. Models specification and welfare estimates

In this paper, we use random parameter logit models (RPL) with an additional error component in WTA space. The modelling approach is based on the random utility theory, with a utility function U for respondent n and alternative i in choice task t :

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

where p and x are monetary and non-monetary attributes of the experimental design, and 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) different to the SQ (Scarpa et al., 2007), the additional error component ϑ_{nit} (distributed with $N(0,\sigma^2)$) was included in the utility function, capturing the error variance common to 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 the integral of the logit formula over all possible values of η_{ni} weighed by the density of η_{ni}:

$$\Pr(y_n|\alpha_n,\beta_n,\vartheta) = \iint \prod_{t_1=1}^{T_n} \frac{\exp(\alpha_n' p_{nit} + \beta_n' x_{nit})}{\sum_{j=1}^{J} \exp(\alpha_n' p_{njt} + \beta_n' x_{njt})} f(\eta_{ni}|\Omega)\phi(\vartheta|0,\sigma^2)d\eta_{ni}d\vartheta \quad [2]$$

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

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. To achieve this, the standard specification of the utility function in equation [1] can be written as follows:

$$U_{nit} = \alpha_n' p_{nit} + (\alpha_n \omega_n)' x_{nit} + \vartheta_{nit} + \varepsilon_{nit} \quad [3]$$

where $\omega_n = \beta_n/\alpha_n$ is the WTA for non-monetary attributes x. If we substitute [3] into [2] $f(\eta_{ni}|\Omega)$ denotes the joint density of parameter vector for monetary and non-monetary (K) WTA parameters [α_n, ω_{n1}, ω_{n2}, … , ω_{nK}]. The parameters of monetary and non-monetary attributes α and ω are assumed to follow lognormal and normal distributions, respectively.

To analyse the effects of protest responses on WTA estimates, we compare the results for three different samples: the total sample (*Total*) of 327 individuals; the sample excluding the 35 protesters identified (*No_protest*) thus resulting in 292 individuals; and the sample excluding all the serial non-participants (*Participants*), i.e. both protesters and serial non-participants, resulting in a sample of 260 individuals. To test the differences between the marginal WTA estimates for the attributes, the complete combinatorial test suggested by Poe et al. (2005) was used[4]. Additionally, farmers' welfare changes related to AES scenarios were estimated. When estimating the welfare changes, the alternate specific constant (ASC_{SQ}) was included following the recommendation of Glenk et al. (2015).

4. Results

4.1. Identification of protest responses

From the 327 valid interviews, 67 respondents chose the SQ in all eight choice situations. This represents 20.5% of the total sample, which is roughly on par with Christensen et al. (2011), who carried out an online survey, and in between percentages reported for other face-to-face surveys (e.g. Beharry-Borg et al., 2013, reported a 6% of full-SQ-choices; while Lienhoop and Brouwer, 2015, reported a 33% of these responses).

The information collected from debriefing questions raised a wide variety of reasons. The main guideline that we followed to distinguish protesters from serial non-participants

[4] Note that 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 treatments 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'.

was whether or not the individual's answers to these questions (i.e. his/her reasons) were strongly related to any of the attributes used in the CE. Using this guideline, there were some reasons that clearly reflected protest responses. One of these reasons are inconsistent responses such as "I do not want subsidies (and do want a higher price for the [private] good I produce)" while s/he was currently receiving subsidies through agricultural policies. We found other protest-related reasons commonly reported in the literature such as the lack of trust in the institution (Lienhoop and Brouwer, 2015) and the rejection to justify their choices (e.g. Amigues et al., 2002, for contingent valuation). In addition, some farmers stated that they did not want the disturbances that the participation in AES would entail, especially mentioning the higher level of bureaucracy associated with this participation. In this regard, some farmers claimed that it was not worth participating in AES for a small farm like theirs (which is a finding also reported by Amigues et al., 2002). We interpret that this reason is related to the previous one (i.e. the avoidance of disturbances, especially bureaucracy) since small farms have higher per-hectare transactions costs related to AES uptake. All these responses are arguably of protest nature since the interviewee is justifying his/her choices not on the basis of their preferences with regards to the attributes, levels and their different combinations presented in the choice task but on reasons related to other issues, thus not reflecting his/her true preferences towards the AES offered.

It is worth pointing out that we often found farmers that always chose the SQ due to lexicographic preferences, in particular regarding CCAR. This is due to all of the combinations of attributes and levels include the use of CC at a certain level (at least CCAR-25%), in some way representing a hurdle for AES participation. So, farmers who generally rejected the use of CC at the CCAR-25% level always chose the SQ. Following the above guideline, we identified them not to be protesters but serial non-participants.

The characteristics of the three resulting groups of farmers, *Protesters*, *Serial non-participants*, and *Participants* (i.e. respondents that chose the AES alternative, A or B, at least once) are shown in Tables 2 and 3. As can be observed, the results revealed intra-group homogeneity and inter-group differences to a large extent. Especially, the group of Participants is clearly different from the other two groups. Actually, Protesters and have characteristics reported by the specialised literature as barriers to AES uptake (Siebert et al., 2006; Uthes and Matzdorf, 2013). They have much smaller farms (14.2ha and 17.3ha for

Protesters and Serial non-participants, 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 CC and manage it using tillage –thus not complying with CCMA-Restr). 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 CC 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 Serial non-participants. Serial non-participants seem to use less CC than Protesters and, as a result, their initial compliance of the levels CCAR-25% and CCMA-Restr are lower (especially for the latter level, as none of the Serial non-participants initially comply with it). Aligned with this result, Serial non-participants seem to perceive the use of CC and EFA less positively. They do not perceive CC 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 2. Differences between Protesters, Serial non-participants, and Participants (Numeric variables).

Variables	*Protesters*			*Serial non-participants*			*Participants*		
	Mean	*St.dv.*	*N*	*Mean*	*St.dv.*	*N*	*Mean*	*St.dv.*	*N*
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
CC / 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 CC 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 CC 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
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

*, **, 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 3. Differences between Protesters, Serial non-participants, and Participants (Dichotomous variables).

Variables	*Protesters*		*Serial non-participants*		*Participants*	
	%	*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: Mountanous 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	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 CC 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

*, **, 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.

4.2. WTA space models and welfare estimates

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 and fit well, as shown by the main goodness-of-fit statistics (e.g. pseudo-R^2 ranges from 0.428 to 0.492 for Total and Participants, respectively). As can be observed in this table, all the attributes are highly significant determinants of choice; all the coefficients are statistically significant at a 10% level or higher and have the expected sign (note that all the non-monetary attributes have been scaled and their negative coefficient has entered the model to yield positive values that reflect farmers' disutility for a change in the attributes). The coefficient of ASC_{SQ} is significantly different from zero which indicates that, apart from the variables considered in the RPL, there are also other sources of heterogeneity not taken into account in the observed part of utility that explain farmers preferences toward AES. ASC_{SQ} is negative, implying that olive growers are generally more willing to participate than not for reasons not explained by the attributes. We will return to this point in the discussion section.

Table 4. Mixed Multinomial Logit model in WTA-space.

	Total		***No_Protest***		***Participants***	
	Coef.	*Std.err.*	*Coef.*	*Std.err.*	*Coef.*	*Std.err.*
WTA-parameters						
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
Parameters						
CCARn	-0.112***	0.003	-0.110***	0.004	-0.094***	0.006
CCMAn	-2.040***	0.044	-2.150***	0.081	-2.000***	0.098
EFAn	-0.785***	0.014	-0.931***	0.029	-0.944***	0.062
COLLEn	-1.910***	0.062	-1.640***	0.064	-1.710***	0.190
MONIn	-0.025***	0.003	-0.010***	0.003	-0.016***	0.005
PAYMn	1.610***	0.126	1.560***	0.185	1.190***	0.157
ASC_{SQ}n	-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
LL	-1460.3		-1382.0		-1307.8	
McFadden Pseudo-R^2	0.492		0.462		0.428	
Observations	327		292		260	

*, **, and *** reflect significance level of 10%, 5%, and 1%, respectively.

Source: Own elaboration.

The WTA estimates can be better observed in Table 5 where the WTA of the attributes and the constant for each sample are shown, highlighting the differences between them. With regards to the attributes, the exclusion/inclusion of protesters and serial non-participants highly impact the WTA estimates although there is no clear trend in the comparison of the three samples. For example, the attribute CCAR shows higher WTA estimates for Total (€7.8/ha for additional 1% of CCAR) than for No_protest (€6.7/ha), with Participants (€7.3/ha) in-between both. For EFA, results for No_protest (€87.1/ha for additional 1% of farmland devoted to EFA) are significantly higher than those obtained for Total (€76.0/ha), again with Participants (€83.8/ha) in-bewteen both. For COLLE, Total and No_protest show significantly lower WTA (€123./ha and €115.0/ha, respectively) than Participants (€144.0/ha). The only two attributes in which the exclusion/inclusion of protesters and serial non-participants did not have an impact are CCMA and MONI, showing no significant differences among the three samples. With regards to the ASC_{SQ} estimates, Total and No_protest show significantly higher WTA (€-69.3/ha and €-80.0/ha, respectively) than Participants (€-124.0/ha). Then, as regards the ASC_{SQ} it seems that the exclusion of full SQ-choosers makes a big difference in WTA estimates.

Table 5. Mean willingness to accept (WTA) of the attributes (€/ha)[1].

Attributes	***Total***	***No_Protest***	***Participants***
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}

[1] In the case of EFA, MONI and CCAR, it is € per additional 1% of the olive groves area devoted to EFA, 1% of increase in farms monitored, and per additional 1% of the olive groves area covered by cover crops, respectively. For the case of ASC_{SQ}, it must be interpreted as the entrance value needed to make farmers interested in joining at least one of the subsidy schemes described in the choice experiment (Christensen et al., 2011).

*, **, and *** reflect significance level of 5%, 1%, and 0.1% respectively. The test proposed by Poe et al. (2005) was used to examine the differences among WTA estimates for the three samples; sharing superscripts (^{a} and ^{b}) indicate no significant statistical differences at 5% level.

Source: Own elaboration.

To provide a broader picture, Table 6 shows the welfare changes estimated for all the possible scenarios of AES. Results show that welfare estimates remarkably vary depending on whether protest and serial non-participants are included in the sample or not. In

particular, 24 out of the 32 possible AES scenarios show significant differences among the three samples (as can be observed in Table 6, only in 8 AES scenarios the estimates for the three samples share the same superscript letter). In these 24 AES scenarios the estimates of welfare changes are generally higher for the Total sample and lower for the Participants sample, with No_protest in between both. Actually, the estimates of welfare changes are on average €280/ha for Total, €250/ha for No_protest, and €222/ha for Participants.

Table 6. Welfare changes estimates for all the possible scenarios of AES[1].

Scenario	***COLLE*** *(1=collect. particip.)*	***CCAR*** *(%)*	***MONI*** *(%)*	***CCMA*** *(1=CCMA-Restr)*	***EFA*** *(%)*	***Total***	***No_Protest***	***Participants***
SC1	0	25	5	0	0	13.2^{b}	-12.4^{ab}	-56.4^{a}
SC2	0	25	5	1	0	193.3^{b}	165.1^{ab}	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^{b}	7.7^{ab}	-28.6^{a}
SC6	0	25	20	1	0	214.3^{b}	185.2^{ab}	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^{ab}	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^{b}	231.7^{a}	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^{b}	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^{b}	251.8^{a}	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^{b}	396.8^{ab}	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^{a}	280.7^{a}	270.7^{a}
SC19	1	25	5	0	2	263.9^{b}	248.2^{ab}	224.8^{a}
SC20	1	25	5	1	2	444.0^{a}	425.8^{a}	408.1^{a}
SC21	1	25	20	0	0	157.6^{a}	123.3^{a}	115.1^{a}
SC22	1	25	20	1	0	337.6^{a}	300.8^{a}	298.5^{a}
SC23	1	25	20	0	2	285.0^{a}	268.4^{a}	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^{b}	314.8^{a}	290.0^{a}
SC28	1	50	5	1	2	526.3^{b}	492.3^{ab}	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^{a}	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^{a}	512.5^{a}	501.1^{a}
Mean						280.3	250.0	222.3

[1] Superscripts ^{a}, ^{b}, and ^{c} indicate statistically significant differences at 5% level, using the confidence intervals (using the Krinsky and Robb, 1986, method). Same superscript letter indicate no significant differences.

Source: Own elaboration.

5. Discussion

5.1. Impact of protest responses on welfare estimates

The results suggest that the inclusion/exclusion of protesters and serial non-participants in the analysis strongly impacts welfare estimates. This is evident from observing how WTA estimates for the attributes and welfare changes related to AES scenarios vary depending on including or not protesters and serial non-participants. With regards to the attributes, three out of five attributes show significant differences in the WTA estimates although the comparison of WTA estimates for the attributes among the samples shows no clear trend. With regards to AES scenarios, the comparison of welfare change estimates suggests that estimates are lower not only when protesters are excluded but also when serial non-participants are excluded. Specifically, there is a downward trend in the estimates of welfare change from the total sample, to the sample excluding protesters, and ultimately to the sample also excluding serial non-participants. It must be pointed out that the differences found as regards the ASC_{SQ} partly explain such a downward trend. Therefore, two main issues are worth highlighting. First, observing these results it is strongly recommended to identify protest responses as their inclusion in the analysis biases the estimates obtained. This has been found in the literature about environmental valuation (Meyerhoff and Liebe, 2008; Barrio and Loureiro, 2013) but, to the authors' knowledge, this is the first work to find this in WTA approaches analysing the preferences of providers of environmental services. Second, it is also very relevant to identify serial non-participants and include them in the analysis, otherwise biased estimates would be likely obtained. These individuals have stated their true preferences for the choice situation proposed, so if the analyst decided to exclude them s/he would obtained lower welfare estimates (as they are "very high takers"). This has been recently suggested by Vedel et al. (2015) who also analyse farmers' preferences towards AES, but again this is the first work to empirically show the effect of excluding this "very high takers" from this type of analysis. In particular, our results show that the inclusion of these respondents is especially reflected in the ASC_{SQ}; as it is included in the data set a group of respondents who always preferred the SQ alternative, the overall coefficient of the ASC_{SQ} increases.

With regards to the ASC_{SQ}, the results suggest a general positive initial attitude towards participating in AES due to a negative ASC_{SQ}. This has been obtained in previous

studies (Beharry-Borg et al., 2013; Mulatu et al., 2014), although it is more frequent to find the opposite, that is positive ASC_{SQ} reflecting a general negative initial attitude towards participating in AES (Espinosa-Goded et al., 2010; Greiner, 2015; Vedel et al., 2015). During the interviews, two main reasons were found to explain this positive attitude towards participating in AES: the fact that a certain number of farmers already comply with most of the requisites of the AES-alternatives or perceive the changes proposed not to be too drastic (which is consistent with Hodge and Reader, 2010, who reported that the initial condition of the farm/farmer was a strong determinant of AES uptake); and the fact that some farmers adopt a "rent seeking" behaviour, so they preferred AES-alternatives because of the related payment (which is also found in other EU regions, as underscored Ingram et al., 2013). In this regard, a potential explanation for the latter behaviour is the concern of farmers regarding future CAP payment reductions for olive growing, an agricultural sector that has typically received high level of CAP payments, but this is a matter that can be dealt with in future research.

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

Since the impact of protest and full-SQ responses can be remarkable, analysts should take special care of reducing the likelihood of finding such responses. In fact, neither protesters nor serial non-participants are desired by the analyst as there are limited options to analyse them. Once data have been collected, the analyst can only identify who are the protesters and exclude them but, since the remaining full-SQ-choosers did not make any trade-off, the analyst cannot know how high serial non-participants' welfare estimates are. We recommend to include them in the analysis because their preferences at least can be reflected in the ASC_{SQ}, but it is better to address this issue from the very beginning, i.e. in the design of the CE. Therefore, we discuss some relevant points here proposing some ex-ante –especially– and ex-post guidance to prevent and handle protest and full-SQ responses in this type of WTA approaches.

With regards to the design of the CE (ex-ante), there are two key points worth discussing. First, how data are collected. A priori, there is a higher likelihood that the percentage of protest responses is higher in face-to-face than in internet (online/web) surveys (as shown Marta-Pedroso et al., 2007; Meyerhoff and Liebe, 2010; and Meyerhoff et

al., 2014, for WTP approaches). Internet surveys likely have more problems of self-selection, reducing protest responses as respondents are more willing to consent the hypothetical choice scenario and play along in the CE exercise. We argue that this can be broadened to all the full-SQ responses to a certain extent since some of the "very high takers" probably will prefer not to waste their time after being aware of how far the hypothetical scenarios are from their preferences. That is, part of the "very high takers" will not take it seriously and decide not to play along in the CE exercise, for instance, deciding not to complete the questionnaire and drop out of the survey. On the contrary, in face-to-face interviews, after accepting interviewer's request for interview these respondents will more likely complete the questionnaire.

Second, the design of CE attributes and levels is also key to ameliorate protest and full-SQ responses. As in WTP approaches, a particularly critical point is establishing the monetary attribute (payment). Setting payment levels strongly determines the accuracy of welfare change estimates so the analyst needs to carefully think about what levels would be best to model such changes. Of special importance is the setting of the lower and upper level since they establish the interval of welfare changes to be analysed. Regardless of the approach, the lower and upper levels must be set to ensure there is not a significant part of the demand/supply excluded from the analysis. For the case of environmental providers' WTA towards incentive-based schemes, this means that the lower (upper) level must be low (high) enough to include those farmers in the analysis that would be willing to participate in such scheme at low (high) levels of payment. This would ensure that most part of the providers would be included in the analysis, especially those with higher WTAs (thus reducing the number of "very high takers" obtained). However, when setting the upper level, to some extent there is a trade-off between the interval of supply (of environmental services) analysed and the existence of some biases related to unintended effects. That is, the higher the upper level of payment, the larger the interval analysed is but –very likely– the lower the accuracy of the estimates of providers' WTA due to both providers' strategic behaviour and the increasing number of providers that take the choice situation not seriously. The strategic behaviour consists of providers would wait for the card with the upper level and discard choosing options of the lower levels. If the upper/s level/s were much higher than the lower/s level/s, it can be presumed that this strategic behaviour would

consequently be enhanced. With regards to not taking the choice situation seriously, it is likely that if the provider perceives the payments as not realistic (especially, the upper ones), s/he could adopt an sceptical attitude not willing to choose according to the attributes, levels and the combinations of them presented. As Adamowicz et al. (1998) highlighted, to make the choices realistic it is important to simulate a real situation.

Not only the design of the monetary attribute but also the design of the remaining attributes highly determines the share of protest and full-SQ responses. We observe that the level of stringency perceived by the providers strongly influence their choices. So if the attributes and levels established by the analyst are very stringent to the provider of the environmental service (that is, they imply a large change from providers' SQ to the hypothetical situation) SQ choices will likely increase. For instance, in our analysis most of the farmers perceived the level CCMA-Restr as very stringent (that is why there is a very high WTA for this level) so, when this level appeared in both AES alternatives, SQ choice increased. We understand that, apart from an increase in the number of serial non-participants, a high level of stringency shown in the CE attributes and levels also can increase the number of protesters. The reasoning behind this statement is that a higher share of respondents would reject (protest against) the scenarios proposed –typically by the government– since they think these scenarios are not 'comparable' to their situation. Therefore, it is recommendable to propose a range of scenarios starting from a low level of stringency. In this regard, our results suggest to establish lower levels of non-monetary attributes low enough to avoid "hurdle" effects like the one observed for CCAR-25%.

Finally, we find that the inclusion of debriefing questions to elucidate the reasons behind full-SQ responses is strongly recommended. This can make it possible the ex-post identification of protesters. By questioning whether the respondent's justification of his/her full-SQ choice is related to the attributes and levels of the CE or not it is easier to discriminate protest responses and exclude them from the analysis. This general guideline to distinguish protesters from serial non-participants can be useful in research that analyses the preferences of the providers of environmental services towards incentive-based schemes. However, the design of these debriefing questions is still open for further research and, overall, a common framework to identify protest responses in this type of WTA approaches is still required.

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Appendix A. Example of choice set.

Figure A. Example of a 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	Restrictive mgmt. 	Free mgmt. 	
Ecological focus areas	0% of EFA in olive tree area 	2% of EFA in olive tree area 	
Participation	Individual 	Colective 	
Monitoring	Monitoring at 20% 	Monitoring at 5% 	
	I choose A ☐	I choose B ☐	I choose C ☐