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The value of time in biological conservation and supplied ecosystem services: A willingness to give up time exercise

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ABSTRACT

This study was motivated by the necessity to develop social but not necessarily monetary techniques to characterize the connections between ecological processes and society. Given this goal, we analyzed social support for biodiversity conservation and ecosystem service delivery in semi-arid environments in Spain, based on the willingness to give up time. We took into consideration different types of conservation activities and different ecosystem service categories. In addition, we explored the effect of the respondent's place of residence and gender. Overall, the satisfaction of conserving species continues to be the prominent driving force in engaging public support for conservation programs over ecosystem services. However, we found significant differences by place of residence and gender, with implications for the promotion of social engagement. Urban respondents were particularly interested in allocating time to activities associated with protected-area programs, while rural inhabitants were willing to engage in activities related to cultural services. With respect to gender, women were highly motivated to support activities that enhance rural areas. The results show that the willingness to give up time reflects socio-cultural factors behind consumer preferences. In addition, its application could promote collaborative work and strengthen community values and beliefs.

1. Introduction

The importance of ecosystems and their biodiversity in supporting human well-being through the supply of multiple ecosystem services (ES) on which society depends is now widely recognized (Cardinale et al. 2012). The necessity of measuring these contributions by developing ES assessments is also well established (MA, 2005). Integrated assessments are used to address both sides of the process (Martín-López et al. 2014): ES providers (defined as components of biodiversity or landscape units that deliver a given ES; Harrington et al. 2010) and ES beneficiaries (defined as those who perceive, demand, use, enjoy, or value these types of ES; adapted from Harrington et al. 2010). ES should then be characterized from the demand side, by analyzing the motivations and factors underlying the associated socio-cultural and economic values (Cowling et al. 2008). However, the study of the demand side is usually polarized toward the economic values of ES (Seppelt et al. 2011), masking the socio-cultural values beyond the markets or the willingness to preserve ES (Martín-López et al. 2012). The simplification of social demand in economic metrics could be partially associated with the occidental culture that leads to viewing well-being in terms of economic status (Aguado et al. 2012). Further, it

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might be related by the urgent demand of decision makers to asses ES in monetary terms so that they can make more informed decisions on the basis of cost–benefit analyses.

Non-monetary techniques lend visibility to the intangible and incommensurable contributions provided by nature to society, bringing to the table the multiple (i.e. cultural, educational, moral, historical, spiritual or therapeutic) values of ES (Chan et al. 2012; Daniel et al. 2012). Therefore, non-monetary approaches may help in addressing the limitations of traditional economic exercises. For hypothetical markets in contingent valuation (i.e. willingness to pay, WTP), these limitations concern the ability (or inability) to pay and the income constrains, resulting in WTP not being a realistic vehicle of payment. In this sense, it has been stated that willingness to give up time (WTT) should be considered a useful non-monetary technique, particularly in rural areas with economic limitations (Kenter et al. 2011; Higuera et al. 2012). Further, García-Llorente et al. (2011) found that using time allocation as vehicle payment is one of the preferred alternatives to express public support for ES preservation.

The research presented here analyzes social support for biodiversity conservation and ES delivery in semi-arid environments in Spain using stated preference techniques, with the payment vehicle being expressed in working hours rather than monetary units.

Rural areas and its agrarian character are the source of most essential ES demanded by both urban and rural populations, such as provisioning services (e.g. food from crops, genetic materials), regulating services (e.g. mass stabilization and control of erosion rates), and cultural services (e.g. cultural heritage, aesthetic experiences). In the Mediterranean, and, in particular in the semi-arid region, the traditional agriculture carried out by rural inhabitants based on terraces and *acequias* (traditional irrigation ditches) have facilitated the preservation of soils and water flows, respectively. In doing so, they also contribute to the supply of related ES (García-Llorente et al. 2012). However, the semi-arid region has faced significant land cover changes and socio-economic transformations, with rural and farmland abandonment becoming an important driver of biodiversity and ES decline. When abandonment takes place, the scarce and irregular precipitation limits seed germination and plant colonization; with the unique success of some colonizing species creating landscape homogenization and the development of sedimentary crust in soils (Pugnaire et al. 2006; García-Ruiz and Lana Renault, 2011). The depopulation processes, the decline of extensive agriculture, together with the fragility of semi-arid ecosystems jeopardize the capacity of these areas to conserve biodiversity and provide ES (Quintas-Soriano et al. 2014; Otero et al. 2015). Previous studies on this subject have demonstrated the necessity of maintaining both cultural and biological diversity to ensure a wide flow of ES on semi-arid environments (García-Llorente et al. 2012).

This study was motivated by the necessity of developing social but not necessarily monetary techniques for exploring the underlying motivations behind biodiversity conservation and ES delivery, with the latter being understood as a way to revitalize rural areas in semi-arid environments. To deal with this challenge, we specifically addressed the following four objectives: (1) to explore the influence of socio-cultural factors (e.g. visiting protected areas, respondents' available time, education level) on individual decisions in the WTT with respect to contributing to biodiversity conservation (hereafter, WTTB) and the delivery of ES (hereafter, WTTES), (2) to analyze the most important biodiversity conservation and ES activities for which stakeholders are willing to give up time, (3) to examine the effects of the place of residence (i.e. rural vs. urban municipalities) and gender on the WTTB and WTTES, and finally (4) to compare the labor hours stakeholders were willing to allocate to WTTB and WTTES, to distinguish between non-use values (i.e. the existence value, which is defined as the moral satisfaction obtained from biodiversity conservation; Kahneman and Knetsch, 1992) and use values (i.e. the instrumental value related to ES that is derived from the conscious and unconscious use and enjoyment of ES by individuals; Turner et al. 2008).

2. Material and methods

2.1. Study area

The study area comprises the semi-arid ecosystems of the southeastern Iberian Peninsula and covers 1 220 711 ha (Fig. 1). This region is considered the most arid region of continental Europe, with a predominantly Mediterranean warm and dry climate, average annual temperatures between 12 and 15 °C, and average annual rainfall less than 350 mm in most of the region (Armas et al. 2011). This territory is characterized by substantial topographic heterogeneity and an intense altitudinal gradient, ranging from 0 masl at the coastline to a maximum of 2040 masl.

On the socio-economic side, the area includes a total population of 919 405 inhabitants in 2012, distributed between urban areas (areas with a population density >100 inhabitants/km^2 and/or population >30 000 inhabitants), rural areas (areas with a population density <100 inhabitants/km^2 and population <30 000 inhabitants), and rural areas to be revitalized (those municipalities declared by Spanish Law, Law 45/2007 on Rural Development, as high priorities for implementation of actions and plans) located in the Almeria and Granada provinces (Fig. 1). In particular 62% of the total population lives in urban areas, 18% in rural areas, and 20% in rural areas to be revitalized (Fig. 1).

Traditional agriculture (i.e. olive and almond growing), and extensive livestock production are the predominant economic activities in the rural areas in this region, while the urban municipalities located on the coast are mainly associated with intensive agriculture and beach tourism (García-Llorente et al. 2012).

2.2. Survey design and sampling strategy

We structured the questionnaires to address the six following topics: (1) the respondent's relationship with the study area, (2) the respondent's perception of the importance of ES for society in the area, (3) WTT exercises—including WTTB and WTTES, (4) the respondent's allocation of time in a normal day, (5) the respondent's general environmental interest, and (6) socio-demographic information (a detailed description of these variables is presented in Appendix A).

The two valuation questions presented in the third section (WTT exercises) were as follows: *"Recognizing that the current situation in the study area reflects rural abandonment, a decrease in traditional agricultural activities, and erosion of biodiversity, (i) would you be willing to contribute some of your time to a local environmental and cultural organization to promote biodiversity conservation?" (WTTB) and "(ii) considering that some semi-arid areas are characterized by low population densities, a decline in agricultural activity, low levels of income, and geographical isolation, would you be willing to contribute time to a local environmental and cultural organization to support ES delivery as a way to revitalize rural areas?"* (WTTES).

After each WTT question, if a respondent answered "no" to either of the two parts, to differentiate protest answers (i.e. when the elicitation method used provokes a rejection answer) from real zero answers (i.e. when welfare is totally unaffected by the proposal) the respondent was asked for the reasons for not being willing to contribute. If the participant answered "yes," we asked them to state the maximum amount of time that they would be willing to dedicate (hours/week). With respect to the WTTB option,

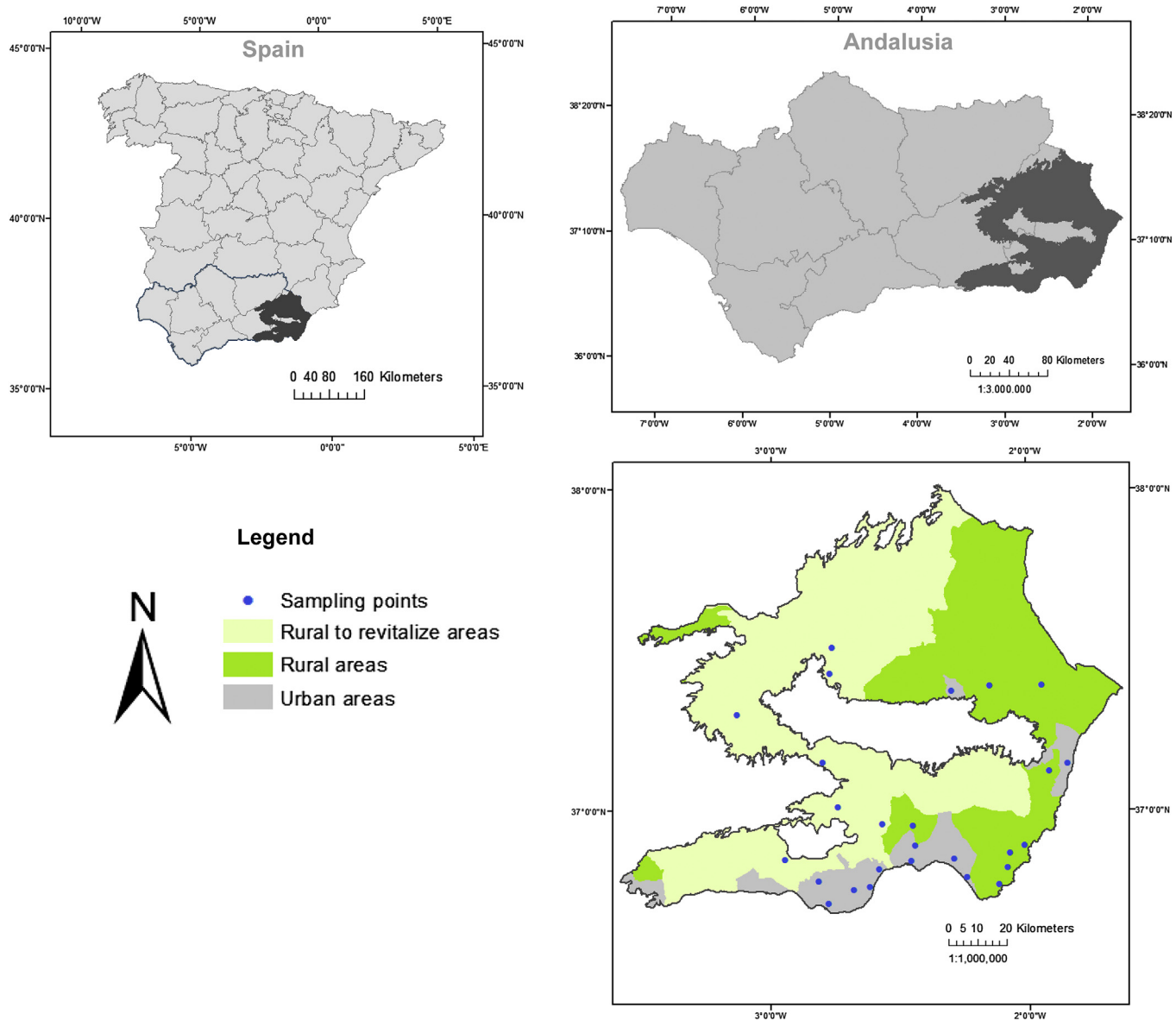

Fig. 1. Study area and sampling points. Blank areas correspond to the main mountain ranges, which were not included in the study area as they don't fulfill semi-arid conditions due to the higher rate of precipitation on these areas.

the participants were asked to select one activity from a list of four, the options being: (1) to promote environmental awareness, (2) to collaborate with conservation plans associated with protected area programs, (3) to collaborate in activities of eradication and control of invasive alien species, (4) and to collaborate in threatened species conservation strategies (Table 1).

On the other hand, with respect to the WTTES option, they were asked to select three activities from a list of twelve to which they would like to distribute a hypothetical amount of time in hours. These twelve activities were grouped according to particular ES (Table 1). Previously, all respondents were informed of independence between questions, so that the amount of time dedicated in each regime started at zero and the amounts of time the respondents were willing to contribute in each scenario were not cumulative.

Fieldwork took place from February to April 2012 through face-to-face questionnaires, covering 26 sample points, including city halls, protected area offices, agrarian offices, recreational areas, natural pathways, libraries, etc. These sample points were selected to cover a similar sampling effort among urban, rural, and rural to revitalize areas (Fig. 1). Overall, of the 500 total questionnaires conducted, 427 questionnaires were used in the data analysis, once incomplete and inaccurate questionnaires (e.g. outliers and those of respondents with minimal understanding of the questionnaire or an unreceptive attitude) were removed. In total, 172 questionnaires were completed by urban respondents, 130 by rural respondents, and 125 by rural respondents living in areas to be revitalized.

The sampled population was randomly selected and covered a wide range of beneficiaries' backgrounds, involving residents working in the primary sector, such as farmers or shepherds, workers in the building industry, housewives, and workers in the tertiary sector such as local government staff (mainly environmental and local development professionals). To avoid unrealistic situations concerning people expressing a willingness to donate time to work in a place that they were just visiting for a few days, tourist respondents were excluded. The respondents were

Table 1
Activities to which time could be allocated, as presented in the questionnaire for biodiversity conservation and the promotion of particular ecosystems services (ES) in the area. The ES nomenclature follows the CICES classification system (see http://cices.eu/).

Activities related to biodiversity conservation		
To promote environmental awareness through information, education, and social participation		
To collaborate with conservation plans associated with protected-area programs		
To collaborate in invasive alien species management		
To collaborate in threatened species conservation strategies		
Activities related to ESs	**Improved ES (predominantly)**	**ES category**
To promote local food products	Cultivated crops	Provisioning
To promote organic agriculture production	Cultivated crops	Provisioning
To recover native seeds	Genetic materials	Provisioning
To collaborate in recovering native cattle breeds	Genetic materials	Provisioning
To collaborate in developing an inventory of medicinal plants	Genetic materials	Provisioning
To promote or collaborate in mushroom workshops	Wild plants	Provisioning
To recover handicrafts	Cultural heritage	Cultural
To collaborate in restoring paths related to cultural itineraries	Physical use of landscapes	Cultural
To promote nature and rural tourism activities	Entertainment	Cultural
To collaborate in restoring terraces	Mass stabilization and control of erosion rates	Regulating
To recover traditional freshwater channels	Hydrological cycle and water flow maintenance	Regulating
To collaborate in cleaning and restoring riverbanks	Freshwater conditions	Regulating

restricted to be citizens 18 years of age or older, and the questionnaires were pre-tested through pre-sampling to improve the wording of the survey and adapt it to the case study context.

2.3. Data analysis

We analyzed the data using a Heckman model, which is considered an appropriate model for open-ended elicitation formats (Heckman, 1979). This model uses two different equations: the first equation explains the respondent's decision to give up time or not through a probit regression, and the second equation clarifies the positive value of the WTT through ordinary least squares regression (Sigelman and Zeng, 1999) (objective 1). At the same time, the assumption of dependence between the two decisions was maintained by analyzing the covariance between the error terms. Furthermore, Heckman's model assumes that there is a distribution for the second-stage variable (the amount of WTT) that exists but that is not observed when the dependent variable is beyond some threshold (e.g. when WTT <0). The model can be considered a response to sample selection bias, which arises when data are available only for cases in which a variable reflecting "pay," z*, exceeds zero (for more details about Heckman's model, see García-Llorente et al. 2008). We selected the best model from among all possible combinations of the variables, guided by Akaike information criterion (AIC) statistics.

After checking the non-normality of the WTT estimations, we performed a nonparametric Friedman test to assess the significance of differences between the WTTB for various conservation activities (environmental awareness, protected area programs, invasive alien species and threatened species) and the WTTES for various service categories (provisioning, regulating, and cultural) (objective 2).

We also used the nonparametric Kruskal–Wallis test and the Mann–Whiney U-test to compare WTT estimations (both WTTES and WTTB) with respect to the respondent's place of residence and gender, respectively (objective 3). Meanwhile, using a nonparametric Wilcoxon test, we analyzed the differences between the estimations for both WTT options and determined the relationship between the two by means of Spearman correlation (objective 4).

3. Results

3.1. Socio-cultural factors influencing WTTB and WTTES

With respect to biodiversity conservation, we found that approximately 3 of 5 respondents (66.5%) were willing to give up time to conserve biodiversity, approximately 1 of 4 (26.2%) gave real zero responses, and a minority were protesters (7.3%). Similar results were obtained for ES: 64.8% were willing to give up time to ES promotion, 29.7% gave zero responses and 5.5% were protesters. Overall, the main motivations for zero respondents were the following: lack of time because of work or other responsibilities such as family care, inability to work, and other priorities. The motivations for protesters' answers included distrust of volunteer activities, blaming the government, and unwillingness to give up time without receiving any monetary compensation.

The probability of WTT for activities related to biodiversity conservation was positively affected by visiting protected areas, the number of ES recognized as important and the respondent's available time. Meanwhile, the respondent's age had a significant negative effect, with the results showing more availability of younger people to contribute their time to conserve biodiversity (first column, Table 2). Lastly, the amount of time a respondent was willing to invest was significantly influenced by the same variables (second column, Table 2).

Similarly, the probability of willingness to allocate time to activities related to promoting ES was positively influenced by factors such as visiting protected areas, the number of ES recognized as important, and respondents' available time, as well as (but to a lesser degree) the presence of protected areas in the respondent's place of residence. Age and education level negatively influenced WTTES (third column, Table 2). The data show that the greatest WTT (in hours per week) was associated with the same characteristics described above, with the exception of the influence of protected areas (in terms of both visiting protected areas and living in communities with designated protected areas) (fourth column, Table 2). That is, the respondents more willing to allocate time were those who were young, those who had less formal education, those who recognized the importance of ES, and those who had time available, independent of whether they lived in or visited protected areas.

3.2. The most important activities for timing allocation

In analyzing the four biodiversity conservation actions proposed, we found the following two significant differences (Table 3): the activities for which respondents were willing to give up the most time were activities related to environmental awareness (0.858 h/week for this activity) and the activities focused on

Table 2
Heckman model results showing the factors influencing willingness to give up time for biodiversity conservation (WTTB) and willingness to give up time for ecosystem services delivery (WTTES). Probit regression results for the first stage of the Heckman model and sample selection for the two-stage least squares regression (OLS) results for the second stage of the Heckman model. Standard coefficients (in parentheses) were calculated using robust (Huber/White) standard errors. The dependent variable in the Probit regression is 0 when WTP = 0 and 1 when WTP > 0. The dependent variable in the OLS is ln (WTT). Statistical significance at the **** = 0.1%, *** = 1%, ** = 5%, and * = 10% levels. We defined significance as $p \leq 0.1$ since our results were focused on conservation management decisions (Field et al. 2004, 2005). PA: Protected area. ES: Ecosystem service.

Variables	WTTB		WTTES	
	Probit	OLS	Probit	OLS
	Coefficient (standard error)	Coefficient (standard error)	Coefficient (standard error)	Coefficient (standard error)
Constant	1.105 (0.758)	1.245*** (0.469)	1.984** (0.852)	2.121*** (0.444)
Municipalities with PA	–	–	0.217* (0.132)	–
Age (years)	−0.426** (0.195)	−0.215* (0.120)	−0.550*** (0.199)	−0.294* (0.156)
Education	–	–	−0.383* (0.201)	−0.290*** (0.091)
Visiting PA	0.294* (0.159)	0.195* (0.103)	0.329* (0.171)	–
Important ES	0.529*** (0.156)	0.229** (0.098)	0.550*** (0.160)	0.244** (0.104)
Time available	0.208** (0.094)	0.134** (0.060)	0.210** (0.094)	0.134* (0.079)
Λ		0.873*** (0.029)		0.875*** (0.072)
N	427	427		427
Log likelihood	−272.25	−206.85	−261.75	−212.93
AIC	1.24	−1.84	1.26	−1.81
Chi-squared	25.28***		30.08***	
Pseudo-R^2	0.10		0.12	
Percent correct predictions	67%		68%	
Adjusted R^2		0.74		0.74

invasive alien species management received the least support (0.361 h/week).

Differences were also found for the WTTES estimations with respect to the three ES categories, with respondents being most willing to give up time for activities related to cultural services (Table 3). Respondents were willing to dedicate an estimated 0.837 h/week to activities related to cultural services, 0.589 h/week to activities related to regulating services, and 0.572 h/week to activities related to provisioning services.

3.3. The effects of the place of residence and gender on WTT estimations

Significant differences were found in the analysis of the influence of the place of residence on WTTB for developing activities as part of protected-area programs, being urban dwellers those who were more willing to dedicate time (0.970 h/week per this activity) (Table 3). Willingness to engage in this type of activity was also affected by gender, males being more willing to dedicate their time (0.878 h/week for this activity) than women on the same activity (0.665 h/week for this activity).

Similarly, we also found significant differences with respect to the WTTES in activities related to cultural services (Table 3). People living in locations classified as "rural to revitalize" were those most willing to contribute time to cultural services (0.996 h/week per cultural service activity). Furthermore, the time respondents were willing to contribute to the three categories of ES promotion was significantly affected by gender: men were more willing to give up time to work on activities related to the improvement of regulating services, while women were more interested in activities related to provisioning and cultural services.

3.4. Comparisons between WTT estimations

Although WTTB and WTTES were positively correlated (Rho = 0.480; p-value < 0.001), we found significant differences between the two, the WTTB being higher (Wilcoxon test, $W = 41\,144$, p-value <0.1) (Fig. 2). Moreover, we found significant differences in the total estimation of WTTES by type of municipality (Kruskal–Wallis test, $\chi^2 = 7.458$, p-value <0.05) and gender (Mann–Whitney U-test, $U = 25\,676.5$, *p-value* <0.05). Hence, people who live in rural areas, and in particular, those who live in rural communities targeted for revitalization, were more willing to give up time to work on ES (8.334 h/week) than urban respondents

Table 3
Mean scores for willingness to give up time for biodiversity conservation (WTTB; hours/week per activity in conservation) and activities related to willingness to give up time for ecosystem services delivery (WTTES; hours/week per activity in a service category). The results are shown for the total sample (Friedman test), between different types of municipalities (Kruskal–Wallis test) and by gender (Mann–Whitney test). Statistical significance at the **** = 0.1%, *** = 1%, ** = 5%, and * = 10% levels. We defined significance as $p \leq 0.1$ since our results were focused on conservation management decisions (Field et al. 2004, 2005). Standard deviations are in parentheses.

Activities related to:	Total	Type of municipality				Gender		
	Mean	Urban ($N = 172$)	Rural ($N = 130$)	Rural to revitalize ($N = 125$)	X^2	Female ($N = 195$)	Male ($N = 232$)	U
Biodiversity conservation								
Environmental awareness	0.858 (1.106)	0.784 (1.066)	0.865 (1.114)	0.952 (1.150)	2.626	0.947 (1.164)	0.783 (1.050)	23380.5
Protected area programs	0.781 (1.052)	0.970 (1.144)	0.680 (0.981)	0.626 (0.956)	7.893**	0.665 (0.986)	0.878 (1.098)	19231.5***
Invasive alien species	0.361 (0.628)	0.300 (0.512)	0.394 (0.668)	0.411 (0.722)	1.403	0.320 (0.583)	0.394 (0.664)	20673.0*
Threatened species	0.686 (0.995)	0.575 (0.905)	0.816 (1.079)	0.703 (1.014)	3.737	0.784 (1.080)	0.603 (0.912)	23398.5
Friedman test	27.635***							
ESs promotion								
Provisioning	0.572 (0.523)	0.576 (0.525)	0.626 (0.601)	0.510 (0.422)	1.475	0.629 (0.540)	0.524 (0.505)	25788.0**
Regulating	0.589 (0.819)	0.579 (0.708)	0.572 (0.886)	0.622 (0.891)	0.046	0.484 (0.672)	0.678 (0.917)	19757.0**
Cultural	0.837 (0.920)	0.751 (0.856)	0.799 0.871)	0.996 (1.035)	6.932**	0.978 (1.012)	0.719 (0.818)	26178.5***
Friedman test	48.183***							

(7.879 h/week) (Fig. 2). In terms of gender differences, women displayed higher willingness to allocate time to activities that promote ES (8.445 h/week) than men (7.748 h/week) (Fig. 2).

4. Discussion

4.1. WTT as a useful non-monetary approach of social preferences

Considering the socio-economic crisis in which Spain has been immersed since 2008, we consider this method to be appropriate for studying social preferences toward biodiversity and ES in rural areas or communities with income limitations. The WTT conducted to study the non-monetary value of biodiversity and supplied ES received strong social support, being protest responses substantially lower (7.3% and 5.5% for the WTTB and WTTES exercises, respectively) than the usual percentages (approximately 15–25%) reported for WTP (e.g. Chen and Jim, 2010; García-Llorente et al. 2011; Ressurreição et al. 2012).

Nevertheless, a limitation of the exercise is that WTT is unsuitable for application to cases in which the respondents have little time available. Our results demonstrated that respondent's available time positively influences WTT (Table 2). So, we consider that modeling WTT requires the inclusion of the time available as an explanatory variable in the same way that income is a compulsory variable in WTP models. A second limitation is related with the type of activities to invest time offered in the exercise. The activities might be selected because respondents' preconceived notions, either positive or negative, or because the physical effort required performing them. For example, one could select collaborating in activities framed in a protected area program rather than in a program for control invasive alien species not because the respondent values the former higher, but because the last one might entail physical unpleasant work for eradicating plants or animals. Therefore, it is important to provide a clear description of the activities and a variety of different possibilities that could fit everyone's capacity.

Despite these limitations, we have found that the socio-cultural factors underpinning WTTB and WTTES results are consistent with those factors used in conventional WTP research; such as respondents being younger (García-Llorente et al., 2008) or respondents having less formal education (e.g. Ressurreição et al. 2012). The significant positive relationships found between environmental interest (as indicated by respondents visiting protected areas) and supporting conservation initiatives were also consistent with the results of other studies (e.g. Meyerhoff and Liebe, 2006). The same applies to the explanatory variables affecting WTT and WTP exercises in the case of ES (e.g. Castro et al. 2011). Consequently, our findings are consistent with the results obtained in conventional WTP studies for non-use and use values related to biodiversity conservation and ES, respectively. WTT appears to be able to capture the social factors behind consumer preferences.

4.2. Biodiversity conservation and ES

Awareness of the semi-arid area's importance to supply ES was relevant to the WTTB and WTTES models. In particular, the respondents showed strong support for activities related to cultural services, followed by regulating and provisioning services, with significant differences by place of residence and gender (Fig. 2). Cultural services are among the most complex services; they are usually not considered in the standard assessments of ES and are still under debate (Daniel et al. 2012). Cultural services are associated with multiple ecological, social, cultural, and heritage values (Chan et al. 2012; Daniel et al. 2012). In fact, the assessment of cultural services in the scientific literature has been often performed through economic techniques (Milcu et al. 2013) and, thereby, the plurality of values underpinning their social importance remains overlooked (Chan et al. 2012). This study is an empirical step towards estimating the quantitative value of cultural, provisioning, and regulating services beyond their

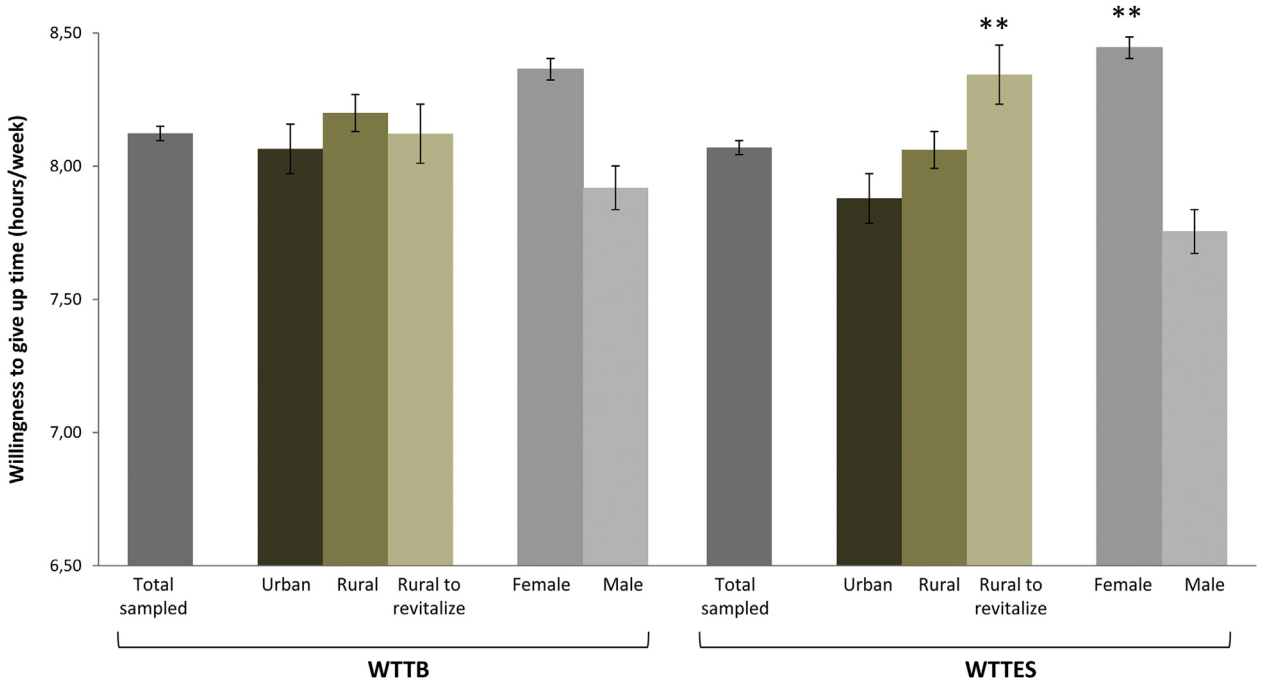

Fig. 2. Mean scores for willingness to give up time for biodiversity conservation (WTTB) and willingness to give up time for ecosystem services delivery (WTTES) expressed in hours/week. The results shown are for the total sample, by type of municipalities and by gender. Asterisks above the bars (**) indicate statistical significance at the ** = 5% level when running non-parametric tests to compare WTT estimations (both WTTES and WTTB) with respect to the type of municipality and gender.

monetization.

It is also notable that the satisfaction of conserving species continues to be the prominent driving force in engaging public support for conservation programs over ES (see Fig. 2). People attach greater importance to the non-use values of biodiversity than to its use values. From a moral perspective, all of us are responsible for conserving species, while not all ES are meaningful for every person. The literature on this subject shows that if conservation is limited to the delivery of services, we could oversimplify the multiple values of biodiversity (e.g. Ridder, 2008). ES delivery and its valuation is one of the most persuasive arguments for supporting conservation initiatives. However, ethical, moral or ecological motivations should not be obscure; in fact, they need to be taken into consideration in decision making. Nowadays, there is an explicit claim in the scientific community for a conservation ethic that embraces multiple values, voices and motivations (Martín-López and Montes, 2015).

4.3. The interdependency of urban and rural areas

Formal education was found to be a significant explanatory variable in the WTTES exercise, but it was not significant in the WTTB exercise. It seems that with respect to conservation per se, all respondents (regardless of their level of formal education) consider the non-use value of biodiversity. Meanwhile, with respect to the WTTES option, more educated respondents do not consider rural areas to be as important as less educated respondents do. Considering that urban respondents hold higher formal education than rural ones (64% had university studies, against 30% in rural areas), we interpret this result to be strongly related to the low investments of time by urban respondents in the WTTES option, compared with the time invested by them in WTTB (see Fig. 2). Urban areas are characterized by the accumulation of different sources of capital, such as human, financial and information capital (Glaeser, 1994). As Grimm et al. (2008) noted, cities play important roles as drivers of change (in pollution, urbanization and overexploitation), but they also aggregate skills, creativity and knowledge. In addition, most decisions concerning conservation policy are made in urban environments (Castells, 1989). In spite of urban areas responsibility and capacity to act on conservation, urban dwellers are generally disconnected from rural and natural environments because of the biological impoverishment in urban areas and the less time they spend in natural spaces (Miller, 2005). This disconnection from nature impacts on the value of biodiversity and ES, and therefore, it could explain a lower willingness to contribute to its preservation (Nisbet et al. 2009).

Over the last four decades, Spain has experienced a substantial increase in its urban population, while rural areas have been depopulated. This suggests a partitioning of knowledge, with formal knowledge being related to urban worldviews and experiential knowledge being associated with rural environments (Martín-López et al. 2012). Consequently, it is important to implement actions intended to promote public participation in environmental activities (Miller, 2005) and specially, to reconnect urban dwellers with rural areas (Folke et al. 2011). Further, a need exists to combine formal knowledge with historically and culturally consolidated experiential knowledge, traditions and practices to address the complexity of ecosystem and biodiversity conservation objectives (Tengö et al. 2014; Martín-López and Montes, 2015).

4.4. Gender roles defining preferences toward ES

We found significant differences between women and men with respect to the time they were willing to allocate to promoting ES and with respect to their views about the best ways to revitalize rural areas. While women supported provisioning and cultural services, men were more focused on regulating services (Table 3). This could be related to the division of labor between men and women, with women in rural areas playing larger roles in the tertiary sector and in activities concerning the promotion of tourism, as well as in traditional activities such as harvesting of edible and medicinal plants (MARM, 2011). Meanwhile, male respondents play larger roles in the primary sector and consider promoting regulating services to be important as a basis for maintaining agriculture and livestock activities (e.g. the mass stabilization and control of erosion rates affect agricultural production). In addition, as mentioned in Subsection 4.1, it could be influenced by the more physically demanding activities offered to maintain regulating services (e.g. to collaborate in restoring terraces to improve or in cleaning and restoring riverbanks).

It is also interesting to note that despite women have less time available because of the time they invest in working and in family care in rural areas (MARM, 2011), men and women were not significantly different with respect to the time that they were willing to allocate to biodiversity conservation. Indeed, women were willing to allocate more time to ES promotion than men (Fig. 2). In this study, women's mean free time was found to be 3.25 h/day, whereas men's mean free time was found to be 3.70 h/day. These findings are consistent with those of previous studies that have shown that women display higher levels of environmental awareness and more support for conservation initiatives than men (Martino, 2008). In fact, increasing the participation of women in conservation has been suggested to be a way to improve progress toward achieving conservation goals (Sodhi et al. 2010). In this sense, it is important to highlight that despite the masculinization phenomenon that takes place in rural areas in Spain (i.e. female migration to cities being strongly promoted and being identified as a source of inequality because of the lack of work opportunities in rural areas) (MARM, 2011), women are highly motivated to support activities that enhance rural areas.

5. Conclusions

WTT for conservation was found in this study to be a suitable indicator of socio-cultural factors behind consumer preferences but also to understand social demands and priorities for conservation in semi-arid environments. In comparison with conventional monetary methods, WTT overcomes income limitations and is in fact highly socially supported. This approach prevails over restrictive arguments related to economic profitability because, in the words of Caballero Bonald (2004), "*we are the time we have left*". Being able to allocate our time implies a renunciation of monetary metrics and can be understood as a holistic indicator of the consumer surplus and the multiple motivations behind conservation.

Time may be a helpful indicator of quality of life in terms of our ability to harmonize our lifestyles (Novo, 2010). As suggested by Miller (2005), time (and in this case WTT) could be interpreted as an indicator of the degree of harmony with the rhythms of nature. In fact, there is a concept of a subjective perception of time that varies with individuals socio-economic characteristics, with implications on how to engage them with environmental policies. In the case of urban respondents, this engagement could be initially address using protected areas as linkers because, as shown here, urban respondents were particularly interested in allocating their time to activities associated with protected-area programs. Meanwhile, rural inhabitants could be engaged through activities related to the promotion of cultural services, thus consolidating their roles as sculptors and keepers of rural landscapes.

In terms of environmental and land-use planning programs, we should recognize that multifunctional landscapes are by definition

built over time, with the failures and successes of traditional practices playing out over centuries. As a consequence, the design of policy instruments should take into consideration these needs and the time required for ecological processes and biogeochemical cycles that take place far outside a productivist model of quick market instrument solutions. Multifunctional landscapes in semi-arid environments have been built from local knowledge, extensive practices and non-formal institutions (Iniesta-Arandia et al. 2015). They are characterized as being reservoirs of biodiversity and by the high capacity of their ecosystems to supply a diverse flow of ES to society (García-Llorente et al. 2012). This implies that conservation is a matter of not only conserving biodiversity and ecosystems but also of empowering the local communities that manage landscapes (Mascia et al. 2003).

As we have found, rural populations are willing to make considerable contributions of available time to conservation and ES, which could be interpreted as a proxy for a consumer surplus. In that regard, market instruments such as payments for ES or agro-environmental schemes designed in the Common Agricultural Policy should be combined with other innovative strategies (Plieninger et al. 2012), such as the promotion of social farming (i.e. understanding agriculture as a way to improve human wellbeing with vulnerable people), the enhance of collaborative work and environmental actions involving local communities. In Spain, the National Rural Development Programme for the period 2014–2020 has three main priorities: (1) the economic viability and competitiveness of agriculture, (2) the efficient use of natural resources preserving agricultural ecosystems and rural heritage and (3) the innovation and collective approaches in the agriculture sector (European Commission, 2015). WTT implementation and participatory approaches could contribute to achieve the second and third priorities through: rural and urban communities' participation on improving agriculture with environmental concern. It could impact on increasing collaboration between stakeholders, social learning and knowledge co-production (Moschitz and Home, 2014). This would promote conservation and changes in human behavior and attitudes, engage local communities and encourage non-formal institutions and organizations to lead the transition toward collective frameworks and social action in rural areas (Fischer et al. 2012).

In summary, promoting time-sharing initiatives could reconnect nature and society in three ways: (1) by giving people enough time to understand the dependence of human well-being on nature, (2) by respecting the rhythms of nature, and (3) as Shiva (1989) stated, by creating an open space to strengthen human capacity for conservation.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jaridenv.2015.07.004.

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