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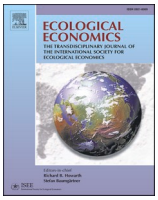

Surveys

Social desirability bias in the environmental economic valuation: An inferred valuation approach

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ABSTRACT

Environmental economic valuation allows to derive values from individuals' behaviour in hypothetical markets, but it is not exempt from certain biases. This work aims to evidence the existence of Social Desirability Bias (SDB) in the use of the stated preference method for environmental valuation. SDB is due to the consideration that, when interviewed, people provide responses to match the interviewer's expectations or to be consistent with social norms. The Inferred Valuation Approach (IVA) was used to identify and quantify the social desirability bias in a choice experiment survey conducted to estimate the benefit of protecting a coastal Natura 2000 site. The results revealed the existence of a SDB that increases by 2.8-fold the benefits of the valued environmental assets. It is also found greater differences between use and non-use values when the IVA is used.

1. Introduction

Environmental economic valuation is an environmental policy tool that offers decision-makers in the public and private sectors a way of assessing environment-related projects or policies from the perspective of the benefits and costs derived (Hanley and Spash, 1995). The goods and services provided by environmental assets, also called ecosystem services, can be classified as provisioning, regulation, and cultural services (European Environment Agency, 2019). Ecosystem services are crucial for human activity and well-being (Irwing et al., 2007; King, Renó, and Novo, 2013). Thus, the gain or loss of well-being experienced by an individual due to variation in the provision levels of ecosystem services offered by an environmental asset can be valued in monetary terms. The assigned monetary measure, called the total economic value (TEV), represents the sum of the economic values that people assign individually to an environmental asset or to the specific ecosystem services variations (Sartori et al., 2015). The TEV of an environmental asset is composed of use and non-use value. Use value refers to the social value that people obtain from using a good now or in the future as well as the benefits used indirectly (Sartori et al., 2015). Likewise, non-use value indicates that individuals could assign values, according not only to the well-being produced by the existence of the resource itself (existence value) but also to the well-being provided to other individuals by the availability of this good, (Sartori et al., 2015).

Revealed preference and stated preference methods allow determination of specific components of the economic value associated with the different ecosystem services flows provided by an environmental asset. Revealed preference methods employ the concepts of use value and use demand of existing or substitute markets to determine the value of an environmental asset, but these methods cannot provide the non-market estimations needed for environmental policy analysis (Baker and Ruting, 2014). On the other hand, stated preference methods allow one to estimate the non-use value, considering the possibility that people value the characteristics or services of environmental assets, independently of any present or future use that they may make of them (Hausman, Leonard, and McFadden, 1995). The main stated preference method is choice modelling (CM). The CM method involves offering people the choice between different alternatives and modelling their preferences regarding a good in terms of its attributes and levels. In CM, the choice made by the people indicates that the utility that an alternative gives to an individual is superior to that of the other alternatives not chosen, on the basis of the McFadden Random Utility Theory (McFadden, 1973), which assumes that an individual chooses, given the values of the attributes, the alternative that gives him/her greater utility. In addition, by including the price, or a monetary compensation, as one of the attributes of the good, it is possible to determine the WTP or WTA for specific attributes (Hanley, Mourato, and Wright, 2001). The conceptual framework of CM is also based on Lancaster (1966), which assumes that

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those benefits that consumers derive from goods can be decomposed into utilities depending on their characteristics (Hanley, Mourato, and Wright, 2001). Thus, the utility provided by a good would be the sum of the utilities of its attributes.

Despite the development and acceptance of the different value elicitation methods for public goods and ecosystem services, they are prone to a number of well-documented biases. Much of the literature has focused on discussing the so-called hypothetical bias and the ways to minimize it. Hypothetical bias consists in the difference observed between a hypothetical payment and a comparable actual payment (Cummings, Brookshire, and Shulze, 1986). According to the literature this difference may be due to, among others, the hypothetical nature of experiment, strategic behaviour of the interviewee, influence of the interviewer, Similarly, there is growing concern that valuations obtained in both hypothetical and non-hypothetical markets may be significantly influenced by the so-called Social Desirability Bias (SDB) (Lusk and Norwood, 2009a). This bias results with participants answering question with socially desirable or to match the interviewer's expectations, rather than truthful answers. In this regard, several approaches have been developed in order to identify the SDB, as discussed below; one of these, the Inferred Valuation Approach (IVA) proposed by Lusk and Norwood (2009a, 2009b,) and Norwood and Lusk (2011), already used for environmental services (Yadav, Thomas, Rensburg, and Kelley, 2013; Drichoutis, Lusk, and Pappa, 2016; Khong, Loch, and Young, 2019; and Vassilopoulos, Avgeraki, and Klonaris, 2019), is a feasible alternative.

Lusk and Norwood (2009b) used IVA in various types of laboratory and non-laboratory experiments intended to identify differences in behaviour. These authors also found that people usually overstated their preferences for relatively familiar goods and understated their preferences for a relatively unfamiliar good with low moral motivations. In addition, these authors claimed *"…a person predicts others' willingness-to-pay by first determining their own valuation. However, because the question is indirect or inferred, there is no motivation or need to 'look good' to the questioner. Thus, one possibility is that inferred WTP corresponds to a person's own WTP (derived in a conventional utility theoretic way) internally adjusted for 'social desirability bias,' which is exactly the statistic needed in a cost benefit analysis,* i.e., *the consumption value of the good, net the utility people get from the act of saying they are willing to pay for it"*.

In this context, the aim of this study is to identify a possible SDB in environmental economic valuation by a comparison between the Conventional Stated Preference Technique (CSP) and the IVA, in a prediction-based choice experiment exercise. This is done by comparing the actual choices of the respondents to their predicted behaviour of other respondents at an individual level. The study is focused on the estimation of the benefits derived from a Natura 2000 site protected by an Integrated Natural Resources Management Plan (NRMP): specifically, the coastal Natura 2000 protected area in the south-east of Spain (*Espacios Protegidos del Mar Menor y la Franja Litoral Mediterránea de la Región de Murcia*). The work tests the hypothesis that CM estimates suffer from SDB. SDB is tested comparing estimates from direct and indirect questioning in a within subject experimental design. It is expected that people estimate their WTP based on their own perception, and this value is higher than their prediction of other people's WTP (i.e., there is an overestimation).

This study makes three contributions. First, it demonstrates the usefulness of the IVA in a choice experiment designed to identify the SDB. Second, it provides empirical evidence about the benefits of avoiding economic, social and environmental impacts in a coastal Natura 2000 network protected area. Finally, it demonstrates a possible overstatement of WTP estimates, attributable, among other aspects, to the utility that people perceive from the act of saying "yes, I am willing to pay more for…", in order to please the interviewer, avoid embarrassment, or "look good" (Norwood and Lusk, 2011).

2. Bias problems in environmental valuation methods

The existing empirical evidence suggests that stated preference methods could be used for environmental economic valuation. However, there are many elements to consider when trying to obtain good estimations. In general, the biases identified in environmental economic valuation methods may be due to respondents expressing their opinions about complex or relatively unfamiliar environmental assets (Baker and Ruting, 2014). Although, they could also be due to estimations of intangible benefits using alternatives and hypothetical payment vehicles.

The discussion about the possible existence of biases in valuation methods began with the Bohm (1972) experiment. This author mentioned the possibility that people can misrepresent their true WTP in the hope of getting something for nothing, either paying too little to keep a benefit or overestimating their WTA regarding a loss. Other authors claimed that people may overestimate their responses to demonstrate their altruistic profile and raise their moral satisfaction by expressing support for good causes. This effect, called "warm glow of giving", is interpreted as the purchase of moral satisfaction (Kahneman and Knetsch, 1992), because the satisfaction increases when the size of the WTP increases. Likewise, among the different aspects that may distort the economic valuation, one can highlight the potential of "information bias" or "interviewer bias". In this context, the WTP may vary depending on the quality of the arguments used to describe a good. Because even though we may make every effort to provide accurate and balanced information, the communication could become persuasive, inevitably altering the respondents' beliefs and attitudes.,

In the literature many biases inherent to the valuation exercise, regardless of the method used, can be found, as summarised in Table 1. These biases misrepresent the WTP or the WTA and justify the need to improve the accuracy of the resulting estimated value. At the same time, those biases cause the so-called "hypothetical bias" described as the difference between a hypothetical payment (stated value or what people say they will do when asked in surveys) and a comparable actual payment (revealed value or observable buying and selling behaviour) (Bishop and Herberlein, 1979; Cummings, Brookshire, and Shulze, 1986; Sinden, 1988; Champ, Bishop, Brown, and McCollum, 1997; Liljas and Blumenschein, 2000; List and Gallet, 2001; Murphy, Allen, Stevens, and Weatherhead, 2005; Harrison and Rutström, 2008).

Many works have compared hypothetical and actual values and have raised questions about the validity of results and the causes of why respondents misrepresent their real opinions. In this context, List and Gallet (2001) shows that the hypothetical WTP was between 1 and 28.2-times higher than the actual WTP (being approximately 3.5-times greater on average). These data should be treated with caution because, as explained by List and Gallet (2001), "*…the relationship between real and hypothetical stated values may be specific to important experimental protocol, and that attempts to bridge the gap statistically might be futile unless we understand the experimental factors that cause these discrepancies"*.

Liljas and Blumenschein (2000) proposed the first ex post calibration methods to reduce the hypothetical bias. Subsequently, List and Gallet (2001) worked to identify and expand these information-categorising calibration methods into two groups: those in which the hypothetical calibration of WTP is performed without a control group (i.e., only with hypothetical data) and those in which calibration involves a control group (i.e., where a real WTP is known). Additionally, hypothetical bias can also be reduced by using incentive compatible surveys mechanisms, which include the use of binary valuation questions, and consequentiality. These mechanisms show respondents their influence over future decisions taken according to their valuation (Carson and Groves, 2007; Needham and Hanley, 2019), i.e., the consequentiality of their responses have the chance of influencing policy implementation (Vossler, Doyon, and Rondeau, 2012).

The empirical evidence of hypothetical bias can also be reduced by

Table 1
Main biases present in stated preference methods.

Type of bias	Description	Related publications
Strategic or "free-rider"	Strategic bias arises when respondents have an incentive to conceal their true WTP or WTA for a good and deliberately misrepresent their answers to try to influence the results of the study. Thus, they deliberately provide misleading information.	Bohm (1972); Bukszar (1999); Klose (1999); Köhlin (2001); Wheeler and Damania (2001); Fowkes and Wardman (2008); Cheng, Cao, Woo, and Yatchew (2017); Meginnis, Burton, Chan, and Rigby (2018).
Warm glow effect	The "warm glow effect" occurs when WTP is interpreted as the purchase of moral satisfaction, rather than as a measure of the value of a good.	Kahneman and Knetsch (1992); Diamond and Hausman (1994); Champ, Bishop, Brown, and McCollum (1997); Chilton and Hutchinson (2000); Diamond (2006); Meyerhoff and Liebe (2006); Bischoff and Krauskopf (2015); O'Brien and Kassier (2019).
Information or interviewer	This bias occurs when the information offered to respondents is incomplete or strategically biased by the interviewer (persuasive communication). Thus, WTP or WTA is not truly reflected.	Mitchell and Carson (1989); Ajzen, Brown, and Rosenthal (1996); Spash (2002); Dong, Zhang, Zhi, Zhong, and Li (2011); Hye-Kyung (2008); Viteri and Brandt (2017); Snowball and Willis (2011).
Symbolic	This bias occurs when a respondent values a symbolic entity instead of the researcher's intended good.	Mitchell and Carson (1989).
Payment vehicle	This bias occurs when the payment vehicle (taxes, prices, etc.) is misperceived or is itself valued in a way not intended by the researcher.	Mitchell and Carson (1989); Morrison, Blamey, and Bennett (2000); Svenningsen and Jacobsen (2018).
Part-whole	This bias occurs when a respondent values an entity that is larger or smaller than the researcher's intended good.	Boyle, Desvousges, Hohnson, Dunford, and Hudson (1994); Brown and Duffield (1995); Bateman, Munro, Rhodes, Starmer, and Sugden (1997); Whitehead, Haab, and Huang (1997); Hanley, Schläpfer, and Spurgeon (2003); Bennett, Cheesman, and Milenkovic (2017).
Embedding effect	This effect occurs when respondents assign a lower value of WTP to a more inclusive good (including the one asked about individually) rather than a particular good if the particular good is evaluated on its own.	Kahneman and Knetsch (1992); Diamond and Hausman (1994); Goldberg and Roosen (2007); Donoso, Cancino, and Villar (2010); Chen, Aertsens, and Liekens (2014); Perez-Verdin et al. (2016).
Starting point or anchoring effect	This bias occurs when a valuation survey begins by consulting individuals about an initial value (e.g., in an iterative bidding approach) and the final WTP is influenced, systematically, by the magnitude of the value of the starting bid. In addition, repeated questions can annoy or tire the respondents, making them respond quickly to end the interview.	Thayer (1981); Boyle, Bishop, and Welsh (1985); Mitchell and Carson (1989); Liljas and Blumenschein (2000); Köhlin (2001).
Range	This bias occurs when the elicitation method presents a range of potential WTP amounts that influences a respondent's WTP amount.	Mitchell and Carson (1989); Whynes, Wolstenholme, and Frew (2004); Covey, Loomes, and Bateman (2007); Luisetti, Bateman, and Turner (2011); Shackley and Dixon (2013); Soeteman, van Exel, and Bobinac (2017).
Order effect	This effect is the name given to the tendency to assign a different WTP when a particular good is valued in a given sequence of a set of goods. That is to say, the perception of a good by the respondents depends on where in a sequence it is valued.	Mitchell and Carson (1989); Kahneman and Knetsch (1992); Diamond and Hausman (1994); Halvorsen (1996); Kjaer, Bech, Gyrd-Hansen, and Hart-Hansen (2006); Talberth, Berrens, Mckee, and Jones (2006); Day et al. (2012); Wang, Hie, Kim, and Kamata (2013); Nguyen et al. (2015); Voltaire, Donfuete, Pirrone, and Larzillière (2017).
Dissonance cognitive	This occurs when a respondent experiences a conflict between his/her beliefs and overt behaviour.	Blamey et al. (1999); Alfnes, Yue, and Jensen (2009); Morrison and Brown (2009).
Hypothetical	This bias is defined as a difference between a hypothetical payment and a comparable actual payment.	Bishop and Herberlein (1979); Cummings, Brookshire, and Shulze (1986); Sinden (1988); Champ, Bishop, Brown, and McCollum (1997); List and Gallet, 2001; Murphy, Allen, Stevens, and Weatherhead (2005); Harrison and Rutström (2008).
Social desirability	This bias occurs when people provide responses that they think will please the interviewer or will be consistent with social norms.	Fisher (1993); List and Harrison (2004); Lusk and Norwood (2009a, 2009b); Norwood and Lusk (2011), Yadav, Thomas, Rensburg, and Kelley (2013).

applying a technique known as "Cheap Talk". This refers to the costless transmission of signals and information through a discussion of the meaning and underpinnings of hypothetical bias in stated preference surveys (Bosworth and Taylor, 2012). There is empirical evidence that cheap talk does mitigate hypothetical bias but none showing that it can remove it totally (Cummings and Taylor, 1999; List, 2001; Brown, Ajzen, and Hrubes, 2003; Murphy, Allen, Stevens, and Weatherhead, 2005; Özdemir, Johnson, and Hauber, 2009; Alfnes, Yue, and Jensen, 2009; Morrison and Brown, 2009; Mahieu, Riera, and Giergiczny, 2012; Howard, Roe, Nisbert, and Martín, 2017; Voltaire, Donfuete, Pirrone, and Larzillière, 2017).

In general, the literature shows that the hypothetical nature of environmental economic valuation calls into question the results of any valuation method used if techniques or approaches designed to control hypothetical bias are not taken into account. However, it is rarely found in the literature the use of techniques or approaches to control the SDB in order to identify differences in WTP, in spite of the fact that, in many cases, people give socially desirable answers, or try to match the interviewer's expectations. In this study, in addition to the aforementioned techniques to counteract hypothetical bias, the IVA, proposed by Lusk and Norwood (2009a), has been considered to explore existence of SDB. In proposing this method, the authors assumed that people obtain some utility from the act of saying that they, unlike the others, are willing to pay for something. They call it "social desirability" (Vassilopoulos, Avgeraki, and Klonaris, 2019), whereby people provide responses they think will please the interviewer or will be consistent with societal norms. Therefore, the utility of "say yes" is likely related to social desirability.

In this context, and in line with the works of Yadav, Thomas, Rensburg, and Kelley (2013), Drichoutis, Lusk, and Pappa (2016), Khong, Loch, and Young (2019) and Vassilopoulos, Avgeraki, and Klonaris (2019), an IVA has been used in order to confirm that the SDB may be mitigated by inferring the actual WTP on the basis of the responses given by individuals about what the general society would perceive.

Given the hypothetical scenario, which at the same time offers a *"cheap opportunity to enhance one's self-image"* (Carlsoon, Daruvala, and Jaldel, 2010), the value even undergoes a further increase. This increment is the resulting difference between the former response and the response using the point of view of others through IVA (Yadav, Thomas, Rensburg, and Kelley, 2013) mitigating somehow the hypothetical bias.

3. Methodology

3.1. Case study description

The NRMP is a document promoted by the Environment Ministry of Murcia Region (Spain) under the umbrella of the European Habitats and Birds Directives. Its general objective is to maintain, preserve and restore the richness and diversity of species, habitats and landscapes, as well as the structure and function of ecosystems and ecological processes in the protected areas of the Mar Menor and the Coastal Strip of Murcia Region. Throughout the study area there are spaces protected by the Natura 2000 Network, SPAMI, and RAMSAR convention on wetlands of international importance, and by current Spanish environmental legislation as "Protected Natural Area" (OISMA, 2016). The biodiversity components described in the NRMP are distributed in an area of 31,123.45 ha (Fig. 1), including special areas of conservation (SAC), sites of Community importance (SCI) and special protection areas (SPA).

Traditionally, the Mar Menor and the Coastal Strip of Murcia Region have been popular tourist destinations, although their true importance lies in the great biodiversity that they house, combined with a cultural diversity and a valuable historical heritage. However, currently, these protected areas have to support certain pressures derived from the performance of inappropriate practices in activities such as tourism, agriculture (crops and livestock) and salt extraction activities. Thus, to counteract these pressures, the NRMP projects a series of conservation and management measures that imply, to a greater or lesser extent, benefits derived from the achievement of the objectives of the NRMP. The plan has implementation costs of 15 million euros over six years (OISMA, 2016).

3.2. Choice experiment

Given that the NRMP includes multiple key conservation elements that offer different ecosystem services, a choice experiment was considered the most appropriate elicitation method to obtain the people's WTP, as a measure of the social benefit. The choice experiment allows one to identify the value of an individual attribute of a good generally supplied in combination with other attributes (Hanley, Mourato, and Wright, 2001). The number of attributes considered for each alternative should ensure that the information provided is easily manageable by the respondents and does not lead to inconsistent responses. In this context, two management scenarios with four attributes each were considered in order to assess the impacts of the NRMP. The baseline scenario, or status quo, was the current situation of environmental assets and the ecosystem services flow provided. The alternative scenarios corresponded to the environmental status reached by the asset with the application of the NRMP, implying variations in the levels of the ecosystem services flow.

The attributes and levels were selected by considering the impact avoided by adoption of the NRMP. They were identified from the NRMP and confirmed along the face-to-face stakeholder interviews conducted in May and June 2017. Table 2 provides the list of attributes and levels of the choice experiment design, considering the main economic, social and environmental impacts to be avoided. The attribute related to economic activities measures included two levels: avoiding deterioration of traditional fishing and avoiding deterioration of traditional salt extraction. For social activity measures, one level related to avoiding deterioration of leisure activities (hostelry, restoration, environmental observation, etc.) and another related to avoiding deterioration of sports

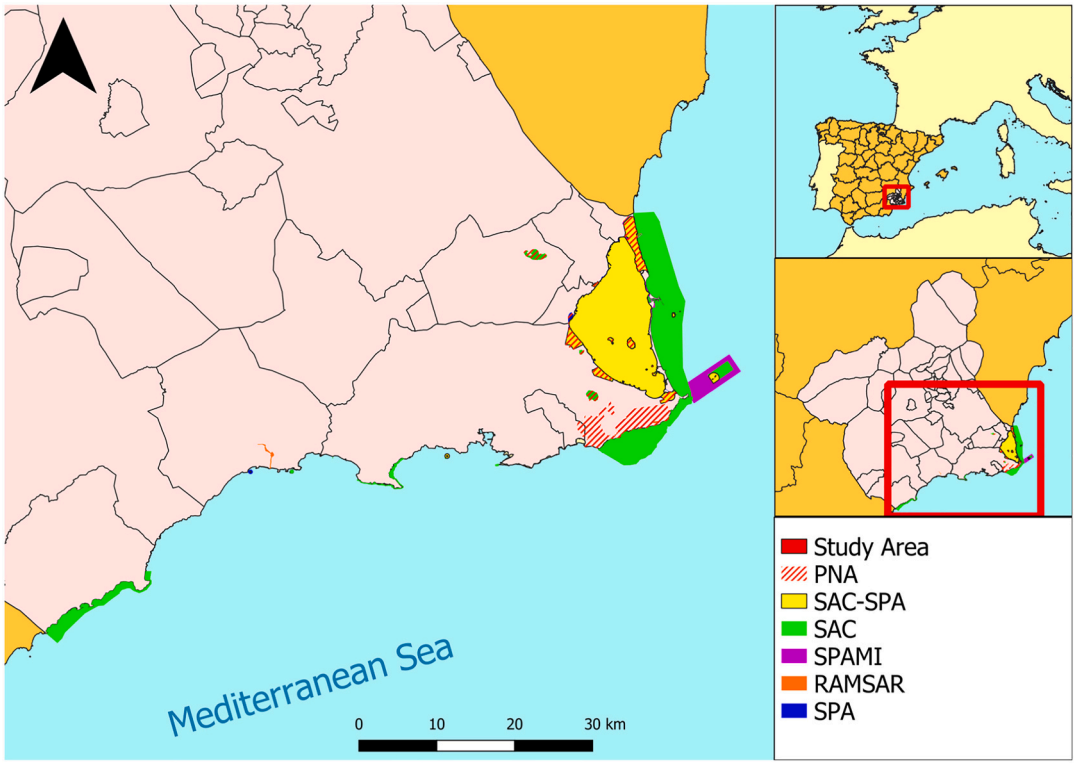

Fig. 1. Study area.
PNA: Protected Natural Area. SAC: Special Area of Conservation. SPA: Special Protection Area. RAMSAR: Convention on Wetlands of International Importance Especially as Waterfowl Habitat. SPAMI: Specially Protected Areas of Mediterranean Importance.

Table 2
List of attributes and attribute levels underlying the choice experiment.

Attributes	Description	Levels
I. Extractive activities measures	Avoiding impacts in extractive activities	▪ Do nothing to avoid these impacts (SQ) ▪ Avoiding deterioration of traditional fishing ▪ Avoiding deterioration of salt extraction
II. Tourism activities measures	Avoiding impacts in tourism activities	• Do nothing to avoid these impacts (SQ) • Avoiding deterioration of leisure activities • Avoiding deterioration of sports activities
III. Environmental measures	Avoiding impacts in the environment	▪ Do nothing to avoid these impacts (SQ) ▪ Avoiding deterioration of water quality ▪ Avoiding the decrease in species
IV. Annual contribution	€ per year and household, over a period of six years, that would be assigned from taxes paid annually to achieve the selected scenario	• 10 • 20 • 30 • 40

activities (diving, water sports, hiking, etc.) were considered. Regarding the environmental measures, one level related to avoiding deterioration of water quality (pollution, turbidity, jellyfish, etc.) and another related to avoiding a decrease in animal and plant species (marine and terrestrial) were included. The selected attributes, and their levels, were compatible to each other as stated in the NRMP, and confirmed by the stakeholders. The annual economic contribution was defined as the amount of money, of their annually-paid tax, that respondents would reallocate to pay for the chosen alternative.

A Bayesian design was used to design the choice-sets (Vermeulen, Goss, Scarpa, and Vandebroek, 2008), using a subsample of the population. The design was generated with the Ngene 1.0.2 software. The priors of the design were estimated based on 30 pilot surveys in the study area. The design consisted of 12 choice sets, grouped in 3 blocks of 4 choice sets. Each block was randomly assigned to an individual during the survey. Hence, each individual saw and answered four choice sets.

3.3. Statistical model

The statistical model used was the mixed, or random parameter, logit model. It is a type of utility model, which assumes that the functional form and the arguments of utility function are common but that taste varies among individuals (Burton, Marsh, and Patterson, 2007).

The mixed logit model assumes that when an individual faces the choice of one alternative from a choice set, the usefulness that the interviewee i obtains from the alternative j in a situation of choice t is given by:

$$U_{ijt} = \beta_i' x_{ijt} + e_{ijt} \quad (1)$$

where x_{ijt} is the vector of observed variables, β_i the vector of coefficients that is unobserved for each i and varies randomly representing the different tastes of individuals and e_{ijt} represents the unobserved random term that is independent and identically distributed. The vector of coefficients β_i can be expressed as a population mean b and a specific individual deviation for that mean η_i, allowing tastes to vary among individuals in the population, but not within the different choices made by the same individual. Hence, the utility function that the interviewee i obtains from alternative j in a situation of choice t can be rewritten as follows:

$$U_{ijt} = b' x_{ijt} + \eta_i' x_{ijt} + e_{ijt} \quad (2)$$

The unobserved portion of utility is $\eta_i' x_{ijt} + e_{ijt}$. This term is correlated with the tastes of individuals due to the influence of η_i. Therefore, in a situation of choice the same tastes are used by individuals to evaluate each alternative. The unobserved portion of utility is correlated with taste since it is not completely observed (Train, 1998). Following Alcon et al. (2019), the mixed logit model relaxes the assumption of independence or irrelevant alternatives and allows the parameters to be randomly distributed across the population, to capture unobserved preference heterogeneity (Ben-Akiva and Lerman, 1985). The mixed logit model is described by Train (1998), Revelt and Train (1998), Train (1999) and Train (2003).

Specifically, the functional form for the utility (V_{ij}) of an individual $_i$ for alternative $_j$ is specified in this study as:

$$V_{ij} = \beta_0 SQ_j + \beta_1 DTF_j + \beta_2 DSE_j + \beta_3 DLA_j + \beta_4 DSA_j + \beta_5 DWQ_j + \beta_6 DS_j + \beta_7 COST + \varepsilon_{ij} \quad (3)$$

where β_0 is the coefficient for the status quo alternative (SQ). β_1 and β_2 are the coefficients for the measures to avoid impacts in traditional extractive activities such as fishing (*DTF*) and salt extraction (*DSE*). β_3 and β_4 refer to the measures to avoid impacts in tourism activities such as leisure (*DLA*) and sports (*DSA*), while β_5 and β_6 are associated with measures to avoid impacts in the environment, such as water quality (*DWQ*) and species (*DS*). Finally, β_7 is the cost coefficient (COST). The utility function underlying the impacts avoided by the implementation of the NRMP, modelled using the mixed logit model specification, assumes a normal distribution function for the associated coefficients.

The choice experiment allows examination of the response of individuals to the change in the levels of the attributes. From the β parameters obtained, the marginal rate of substitution can be calculated, as an exchange rate between any of the estimated attributes (Louviere, Meyer, Stetzer, and Beavers, 1973). Therefore, if the experiment contains a monetary attribute, the implicit prices or *WTP* are understood as the marginal rate of substitution between a specific attribute and the monetary one, as follows:

$$WTP = \frac{-\beta_k}{\beta_p} \quad (4)$$

where β_k is the coefficient of the attribute of interest and β_p is the coefficient of the price attribute. Assuming a linear utility function, the welfare change or the economic value associated with the proposed implementation of a combination of specific measures can be estimated by comparing the utility of the specific alternative to that of the status quo (Alcon et al., 2019). The corresponding so-called compensating surplus measure is specified in the following equation (Bennett and Blamey, 2001):

$$CS = -\left(\beta_0 + \sum \beta_k X_{ijk}\right) \Big/ \beta_p \quad (5)$$

where β_0 represents the coefficient of the status quo, β_p is the coefficient of the monetary attribute and the sum of β_k relates to the specific economic, social and environmental measures of interest, multiplied by the relevant attribute(s) level X_{ijk} which represents the specific measure (0 or 1 depending on whether the attribute is excluded from or included in the welfare measure).

3.4. Survey implementation

The questionnaire used for the survey is comprised of three sections. Section one contained questions related to the interviewee's knowledge of and relationship with the protected area (e.g., existence of protected areas, number of visits, activities carried out, etc.). The second section contained the description of the choice sets and follow-up questions to

check the citizen's motivations to participate (or not) in the choice experiment. Finally, the last section contained questions to identify household and socioeconomic characteristics.

An informative brochure was used to illustrate the objective of the survey and to inform interviewees about the current situation of the study area (location, protected areas, size, protection information and main elements of interest for conservation). Subsequently, the interviewer informed the interviewees about the objectives of the NRMP, the main measures to be executed, how they will be achieved and its total cost. Likewise, they were then informed about the main impacts that could derive from non-execution of the NRMP and its main action measures, in the medium-long term.

> *"Human activity is producing significant environmental pressures and impacts in these protected areas (pollution, urban pressure and associated port infrastructure, etc.). It has generated some critical pollution episodes in the Mar Menor and the Coastal Strip of Murcia Region. In the medium and long term, if the* NRMP *is not executed, the area will suffer very important negative impacts such as those seen in the following images..."*

Later, the citizens were shown an example of a choice set and the meaning of each attribute was explained to them. They were informed that they could choose between two management alternatives to avoid negative impacts in the ecosystem services, with an associated economic contribution, and an opt-out option. The latter refers to the status quo, which means doing nothing with regard to the ongoing degradation in the study area (Fig. 2). Finally, the corrective entreaty ("cheap talk") was included to minimize the hypothetical bias (Cummings and Taylor, 1999). The cheap talk script reads as follows:

> *"Now, we will show you 4 scenarios with different management alternatives. Please indicate the option you most prefer. You can also choose "neither one" of the proposed options. If you choose "neither one", conservation actions will not be carried out. Please consider that it is a hypothetical experiment and no contribution will be allocated to you. However, we ask you for your sincere answer since in similar surveys it has been found that people respond overestimating their willingness to pay when they are not required to make a real contribution. You must consider that the following proposed measures require an annual contribution, over the next 6 years. It would be paid from the taxes that you already pay. Thus, keep in mind the amount of taxes that you pay annually and tell us, for each scenario, which option seems more appropriate to you."*

To apply the IVA, about 47% of respondents were provided the sequences of the 4 different choice sets and they were asked their preferred alternative. Later, they were given the same 4 choice sets and they made inferences according to their criteria about what the general public choice would be. Similarly, the remaining 53% of the respondents were asked to make inferences before making decisions for themselves, in order to minimize the order bias (Yadav, Thomas, Rensburg, and Kelley, 2013).

The survey was administered, by personal interviews between August and September 2017, to a stratified proportional random sampling of 431 citizens of Murcia Region. The survey was performed in public places. The geographical distribution of the surveys was in proportion to the number of households in each geographical area, as described in Table 3. The sample size, for a 95% confidence level, provided a sample standard error below 5%.

Scenario 1.1	Alternative 1	Alternative 2	Neither
Avoiding impacts in extractive activities	 Avoiding deterioration of traditional fishing	 Avoiding deterioration of salt extraction	
Avoiding impacts in tourism activities	 Avoiding deterioration of leisure activities	 Avoiding deterioration of sports activities	
Avoiding impacts in the environment	 Avoiding deterioration of water quality	 Avoiding the decrease in species	
Annual contribution	40 €/year	30 €/year	nothing
Choice			

Fig. 2. Example of a choice set.

Table 3
Household distribution and surveys by geographical area.

Geographical area	Households		Survey		
	Households	%	Sample size required	Sample size obtained	%
Mar Menor y Campo de Cartagena	130,658	24.52	94	144	33.41
Alto y Bajo Guadalentín	85,270	16.00	61	56	12.99
Vega Media y Alta del Segura	259,655	48.73	187	189	43.85
Altiplano	21,776	4.09	16	16	3.71
Noroeste	35,461	6.66	26	26	6.03
Total	532,820	100.00	384	431	100.00

3.5. Descriptive sample statistics

The analysis of the 431 valid questionnaires obtained in the Region of Murcia showed that the sample comprised 51.04% women and 48.96% men. In terms of age, people between 35 and 44 years of age represented the highest proportion (38.05%), followed by people between 45 and 54 years old (23.43%), people between 25 and 34 years old (18.79%), people less than 25 years old (12.06%) and, finally, people more than 55 years old (7.66%).

Regarding the level of education, the sample was mostly made up of people educated to high-school level (75.64%), followed by those with university studies (13.92%). The average monthly income was € 2154. The majority of the interviewees can be considered "users" of the study area (85.35%). Only 44.78% of the members of the sample showed any kind of link with the Mar Menor or the Coastal Strip.

Comparing the characteristics of the sample with those of the total population of the Region of Murcia, important similarities are appreciated, in terms of gender, income and education level, and no significant differences are observed. Therefore, the sample obtained was considered valid for the economic valuation of the NRMP. The main characteristics of the respondents of the sample and of the region are reported in Table 4.

Table 4
Sample and Murcia Region household characteristics.

Variable	Description	Sample	Murcia R.	*t*-Test (p-value)
Gender (%)	% Women	47.76	49.90[a]	1.03 (0.30)
Household Income (€)	Average monthly income	2317	2325[b]	0.15 (0.87)
				Pearson $\chi 2$ (p-value)
Age (Years)	Less than 25 years	8.93	29.55 [a]	27.44 (0.00)
	Between 25 and 34 years	17.53	13.03 [a]	
	Between 35 and 44 years	39.86	17.22 [a]	
	Between 45 and 54 years	24.57	14.95 [a]	
	55 years and older	9.11	25.25 [a]	
Education level (%)	Lower education	1.37	3.5[c]	3.44 (0.33)
	Primary education	9.45	16.30 [c]	
	Secondary education	51.48	46.60 [c]	
	High school	37.70	33.60 [c]	
User (%)	Yes, I visited the site less than 2 years ago	85.35%		
	No, I visited the site over 2 years ago	14.62%		
Non-user (%)	Yes, I have a direct link with the area	44.78%		
	No, I have no link with the area	55.22%		
Order (%)	CSP replied first	53.36%		
	IVA replied first	46.64%		

Source: *Statistical data of [a]INE (2018)[b]INE (2017) and [c]INE (2019).

4. Results

The results show that 412 households (95.59%) were willing to finance the implementation of the NRMP. The rest (4.41%) did not value the environmental asset or showed a protest response. The protests (17 individuals) were excluded from the analysis, while the only two real zeros were kept. Protest zeros were those individuals who did not participate in the hypothetical market and they were identified through a follow-up question (Villanueva, Glenk, and Rodríguez-Entrena, 2017). Protest always preferred SQ arguing that either the polluter should pay, the payment should be done by the people living in the area, or by the government. These values are unusual since in this type of work the percentage of protest zeros is usually higher. This situation can be explained by the high awareness of the poor state of the Mar Menor at the time of data collection.

Table 5 presents the attribute coefficients estimated for the CSP and IVA. CSP-1 and IVA-1 include order variables to test the no existence of order effect. CSP-2 and IVA-2 contain only significant variables in CSP-1 and IVA-1 respectively and perform better according to the LR test. Those attributes whose coefficients did not follow a distribution function were estimated as non-random coefficients, as was the case of the attributes associated with the current situation, avoiding decrease in salt extraction, avoiding deterioration of leisure activities and avoiding deterioration of water quality. In the estimated models, all coefficients were significant, except the possibility of avoiding the deterioration of sports activities in the CSP model. This means that citizens did not perceive utility from this attribute.

In general, the signs of the estimated coefficients of the attributes were positive, indicating a positive utility derived from implementation of the NRMP, through avoidance of the expected economic, social, and environmental impacts. The sign of these coefficients is interpreted as the desirability of the proposed attributes for the respondent. The sign of the coefficient of the economic contribution to support the measures was negative, confirming that higher levels of payment were less desired. The negative sign of the status quo coefficient suggests that citizens strongly prefer to move away from the current situation in which the expected economic, social and environmental impact is not avoided. In general, estimated attributes coefficients are similar between both approaches, except for the annual contribution one, as respondents get more disutility in the IVA from it. Approach differences can be also found on the preference for the SQ option, as respondents showed a higher propensity to choose the SQ in the IVA. More specifically, and according to the conventional preferences approach, the SQ option was chosen in 7.9% of the alternatives, whereas in the IVA approach, the SQ alternatives were chosen in the 19.4% of the cases.

Estimations of WTP for the avoided impacts are shown in Table 6. According to the conventional preferences estimated, citizens would be willing to pay € 200.97 per household and year to avoid deterioration of water quality and € 148.94 per household and year to avoid species decline. Regarding economic activities, citizens would be willing to pay € 51.63 per household and year to prevent the deterioration of traditional fishing, and € 65.08 per household and year to avoid deterioration of traditional salt extraction. Of the two social alternatives evaluated, the WTP to avoid the deterioration of sports activities was null. This indicates that there is no social benefit derived from the protection of sports activities, while protecting leisure activities was well valued by citizens, with a WTP for their protection amounting to € 103.91 per household and year.

According to the IVA, citizens would be willing to contribute € 57.97 per household and year to avoid deterioration of water quality and € 42.54 per household and year to avoid species decline. With regard to economic activities, citizens would be willing to pay € 20.07 per household and year of their taxes to prevent the deterioration of

Table 5
Estimated choice models according to the estimation approach.

Mean	CSP-1			CSP-2			IVA-1			IVA-2		
	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
Current situation (SQ)	−1.00	***	0.41	−0.83	***	0.33	−1.73	***	0.47	−2.10	***	0.39
Avoiding deterioration of traditional fishing	0.94	***	0.24	0.95	***	0.24	0.81	***	0.21	0.81	***	0.21
Avoiding deterioration of salt extraction	1.19	***	0.28	1.19	***	0.28	0.54	***	0.23	0.53	***	0.23
Avoiding deterioration of leisure activities	1.91	***	0.40	1.91	***	0.40	1.18	***	0.31	1.18	***	0.30
Avoiding deterioration of sports activities	0.17		0.16	0.17		0.16	0.21	*	0.13	0.21	*	0.13
Avoiding deterioration of water quality	3.65	***	0.39	3.65	***	0.40	2.36	***	0.29	2.34	***	0.29
Avoiding the decrease in species	2.73	***	0.25	2.73	***	0.25	1.72	***	0.21	1.72	***	0.21
Annual contribution	−0.02	*	0.01	−0.02	**	0.01	−0.04	***	0.01	−0.04	**	0.01
Order x SQ	0.30		0.39				−0.67		0.55			
Order x Annual contribution	0.00		0.01				0.01		0.01			
Standard deviation												
Current situation (SQ)	1.94	***		1.93	***	0.30	4.00	***		4.06	***	0.44
Avoiding deterioration of salt extraction	0.87	*		0.87	**	0.40	0.63			0.66	*	0.49
Avoiding deterioration of leisure activities	2.91	***		2.91	***	0.42	2.92	***		2.93	***	0.43
Avoiding deterioration of water quality	2.03	***		2.03	***	0.43	1.69	***		1.67	***	0.34
n	414			414			414			414		
Log Likelihood	−1117.68			−1117.98			−1397.207			−1398.89		
LR chi2	165.78			166.19			498.09			502.06		
Prob > chi2	0.00			0.00			0.00			0.00		
R2	0.38			0.38			0.23			0.23		

CSP: Conventional Stated Preference Technique. IVA: Inferred Valuation Approach.
***, **, *, significance at 99, 95 and 90%, respectively.

Table 6
Willingness to pay according to the estimation approach.

Alternative	CSP			IVA					
	WTP (€)	CI 95%		WTP (€)	CI 95%		$\Delta_{CSP-IVA}$	t-Test p-value	CSP/IVA
Avoiding deterioration of traditional fishing	51.63***	18.92	84.34	20.07***	14.33	25.82	31.53 a	0.000	2.57
Avoiding deterioration of salt extraction	65.08**	64.65	65.51	13.05**	12.66	13.45	51.52 b	0.000	4.98
Avoiding deterioration of leisure activities	103.91**	101.34	106.48	29.17**	25.05	33.29	75.35 c	0.000	3.56
Avoiding deterioration of sports activities	9.20	−11.66	30.07	5.21**	1.89	12.31	−5.20 d	0.000	1.76
Avoiding deterioration of water quality	200.97**	199.23	202.71	57.97**	55.87	60.07	141.69 e	0.000	3.47
Avoiding the decrease in species	148.94**	15.76	282.13	42.54**	31.89	53.18	106.70 f	0.000	3.50

CSP: Conventional Stated Preference Technique. IVA: Inferred Valuation Approach.
***, **, *, significance at 99, 95 and 90%, respectively.
Different letters show statistical differences between alternatives at $p \leq 0.05$.

traditional fishing, and € 13.05 per household and year to prevent deterioration of traditional salt extraction. Of the two social alternatives evaluated, the WTP to avoid the deterioration of sports activities was € 5.21 per household and year, while the maintenance of leisure activities was well valued by citizens in the IVA, with a WTP for their protection amounting to € 29.17 per household and year. Higher values of the ratio between CSP and IVA would be expected when considering the non-use values in comparison to those of use values. However, results do not show a clear pattern.

Welfare variations associated with different management scenarios were estimated based on the differences between utility functions. Following the Bennett and Blamey (2001) procedure, the compensating surplus measure was estimated for four clearly differentiated management scenarios (i.e., avoiding the economic, social, environmental, and total impacts), as shown in Table 7. Attributes included in each scenario were coded as 1.

The citizens were willing to contribute € 162.00 per household to protect extractive activities. To protect tourism, the provision amounted to € 150.34 per household and year, while for the scenario of environmental protection the contribution would be € 394.73 per home and

Table 7
Compensating surplus (CS) and total economic value (TEV).

Scenario	CSP			IVA				
	CS (€)	CI 95%		CS (€)	CI 95%		$\Delta_{CSP-IVA}$	t-Test p-value
Avoiding impacts in extractive activities	162.00	156.15	167.85	84.95	77.55	92.36	77.05 a	0.00
Avoiding impacts in tourism activities	150.34	138.67	162.00	86.20	77.00	95.40	64.14 b	0.00
Avoiding impacts in the environment	394.73	386.16	403.29	152.33	144.37	160.30	242.39 c	0.00
Avoiding all impacts	615.44	600.30	630.58	219.85	209.73	229.97	395.59	0.00
Scenario	TEV (M€)	CI 95%		TEV (M€)	CI 95%		$\Delta_{CSP-IVA}$	t-Test p-value
Avoiding impacts in extractive activities	86.30	83.20	89.40	45.26	41.32	49.21	41.05 a	0.00
Avoiding impacts in tourism activities	80.10	73.90	86.30	45.93	41.02	50.83	34.17 b	0.00
Avoiding impacts in the environment	210.00	206.00	215.00	81.17	76.92	85.41	129.15 c	0.00
Avoiding all impacts	328.00	320.00	336.00	117.14	111.75	122.53	210.77	0.00

CSP: Conventional Stated Preference Technique. IVA: Inferred Valuation Approach.
Different letters show statistical differences between scenarios at $p \leq 0.05$.

year. In overall terms, the protection of the economic, social, and environmental aspects included in the NRMP would cost € 615.44 per household and year over the next six years.

Considering with the IVA the impacts avoided for each scenario, the CS associated with the scenario where extractive activities are protected reached € 84.95 per household per year, around half the value obtained with the CSP. For protection of tourism, this provision amounted to € 86.20 per household and year, while for the scenario of environmental protection, € 152.33 would be the annual contribution per household. Globally, the welfare gain derived from the protection of the economic, social, and environmental aspects included in the NRMP amounted to € 219.85 per household and year according to the IVA. The results revealed the existence of a hypothetical bias, where the benefits are overestimated, that increases by 2.8-fold the benefits of the valued environmental assets.

5. Discussion

Economic applications of the IVA —asking individuals to predict other people's selections in a choice experiment— are relatively limited in the literature, and the evidence remains mixed as to their usefulness (Khong, Loch, and Young, 2019). The theoretical framework suggests that hypothetical WTP is greater than inferred WTP, although exceptions can be found (Lusk and Norwood, 2009a). However, the IVA seems to be useful to achieve more accurate hypothetical environmental economic valuations, its results being more aligned with real valuations. This paper uses the CSP and the IVA in environmental economic valuation using a choice experiment as an elicitation method, in order to identify the SDB.

The results show that people derive some utility from saying "yes, I am willing to pay for…", creating a gap between hypothetical and inferred payments. Probably, this choice is driven by social desirability, as Lusk and Norwood (2009a, 2009b), Norwood and Lusk (2011) and Yadav, Thomas, Rensburg, and Kelley (2013) suggested.

Although in this work there were no tests to identify these causes of bias, the differences of the stated values almost tripled that of the inferred statements of the interviewees. Therefore, the IVA valuation could improve estimates in hypothetical situations, adjusting them to a possible real situation, relatively free of bias. Also, the use of incentive-compatible survey mechanisms proposed by Carson and Groves (2007), which specifically consider the respondents consequentiality (Vossler, Doyon, and Rondeau, 2012) could reduce both hypothetical and social desirability biases.

Specific differences for alternative benefits regarding the type of value and approach (CSP vs IVA) are explored. CS mean equality test, showed in Table 8, reveals that in using the CSP approach there are no differences between use and non-use values except for avoiding impacts in leisure activities and deterioration of water quality alternatives. However, WTP estimated by using the IVA shows differences between use and non-use values in all the alternatives. In both approaches, no differences are found between direct and indirect values. Thus, in the IVA users are willing to pay more than non-users. This could be explained by their perceived consequentiality, as Needham and Hanley (2019) suggested.

Similarly, the use of IVA here is consistent with other studies that have reported similar findings, particularly those where interviews were conducted face-to-face. During the interviewing procedure it seems that people behave differently because others are observing them; this may be due to social desirability (Leggett, Kleckner, Boyle, Duffield, and Mitchell, 2003; List and Harrison, 2004; Levitt and List, 2007). Also, the difference in behaviour of the respondents could be due to additional moral motives. In fact, Yadav, Thomas, Rensburg, and Kelley (2013) found that such valuations could be, depending on the case, from 3.2 to 4.7-times greater than the inferred values. Other authors, such as Khong, Loch, and Young (2019), have claimed that people's WTP values may be inflated by a great variety of influences, which further supports the relevance of stated preference validity tests (their inferred estimates were as much as 31% lower than the real estimates).

Table 8
Compensating surplus mean equality test for use and non-use values and direct and indirect use values regarding approach and alternative.

	CSP		IVA	
Alternatives	User/ non-user (t-Test p-value)	Direct/ Indirect use (t-Test p-value)	User/ non-user (t-Test *p*-value)	Direct/ Indirect use (*t*-Test p-value)
Avoiding deterioration of traditional fishing	97.5/ 96.7 (0.72)	99.1/97.1 (0.37)	76.6/ 43.5 (0.00)	70.7/72.0 (0.67)
Avoiding deterioration of salt extraction	110.0/ 112.1 (0.40)	112.2/ 110.1 (0.38)	69.7/ 36.1 (0.00)	63.8/65.0 (0.70)
Avoiding deterioration of leisure activities	152.0/ 140.5 (0.01)	147.1/ 150.8 (0.47)	87.7/ 40.4 (0.00)	86.1/80.2 (0.13)
Avoiding deterioration of sports activities			61.8/ 28.6 (0.00)	55.8/57.2 (0.67)
Avoiding deterioration of water quality	248.0/ 230.0 (0.00)	248.9/ 244.9 (0.28)	115.8/ 74.2 (0.00)	112.9/ 109.3 (0.29)
Avoiding the decrease in species	195.1/ 194.4 (0.72)	196.8/ 194.7 (0.37)	99.1/ 66.0 (0.00)	93.2/94.5 (0.67)

CSP: Conventional Stated Preference Technique. IVA: Inferred Valuation Approach.

The magnitude of the differences between the approaches for each of the avoided impacts seems adequate to know more specifically the wider benefits derived from the NRMP. The valuation threshold can also help us to know the impact range of associated assessments of Natura 2000 network plans. This case study permits a better understanding of what motivates Murcia region citizens to favour NRMP implementation and the TEV provided. In fact, as in similar studies (Brey, Riera, and Mogas, 2007; Martínez-Paz, Martínez-Carrasco, and Perni, 2010; Martínez-Paz, Perni, and Almansa, 2012; Perni, Martínez-Paz, and Martínez-Carrasco, 2012; Martínez-Paz, Pellicer-Martínez, and Colino, 2014; Varela and Soliño, 2015; Alcon, Martínez-Paz, Contreras-López, and Navarro-Pay, 2015; Alcon, and de-Miguel, M.D., Martínez-Paz, J.M., 2020), there is evidence that environmental benefits are perceived from the changes in the provision levels of environmental goods. Even with the presence of possible SDB, the stated preferences of the citizens of Murcia Region make clear the interest that the recovery of the Mar Menor has aroused in recent years. In general, the people interviewed agreed that the degradation of these protected areas is important and incompatible with the provision of quality ecosystem services.

In the context of the Mar Menor, which represents the biggest part of the study area, previous studies, such as that of Perni, Martínez-Carrasco, and Martínez-Paz (2011), have estimated the TEV of the benefits generated from the implementation of conservation measures included in the Water Framework Directive and the Marine Strategy Framework Directive and intended to achieve a good ecological status of the ecosystems. Perni, Martínez-Carrasco, and Martínez-Paz (2011) used cost–benefit analysis and the contingent valuation method to obtain an environmental benefit of €17.4 million per year, smaller than the ones obtained in this study about environmental benefits using the IVA. Even in terms of area, the environmental benefits obtained here double the ones obtained by Perni, Martínez-Carrasco, and Martínez-Paz (2011). Similarly, Martínez-Paz, Perni, and Martínez-Carrasco (2013) estimated the environmental benefits derived from environmental conservation actions carried out in the Mar Menor ecosystem to be around €11.1 million per year, whereas in the case of cultural benefits this value was €8.5 million per year. Also, Velasco, Pérez-Ruzafa, Martínez-Paz, and Marcos (2018) assessed the natural goods and services provided by the

Mar Menor, estimating a benefit of around €43.3 million per year, mainly based on indirect and non-use values. The total benefits (3332€/ha year) estimated by Velasco, Pérez-Ruzafa, Martínez-Paz, and Marcos (2018) are similar to the total benefits obtained using the IVA (3764€/ha year). However, if authorities fail to reach environmental objectives, citizens valuations may be not rational. Therefore, estimated benefits values should be used as a qualitative indicator of political support (Perni, Barreiro-Hurle, and Martínez-Paz, 2020).

All the previous benefit estimations are considerably below the benefits obtained in this work, even when the IVA was used. It is necessary to note that the aforementioned studies evaluated different conservation measures only in the Mar Menor area and our study included a greater number of protected areas of interest, regarding their conservation, which could explain the benefit differences appreciated. However, we are aware that, due to the great scope of the NRMP, some effects that distort people's declared preferences are present in this economic valuation, and the use of the IVA accompanied by other techniques proposed in the literature to mitigate the hypothetical bias (i.e., cheap talk, certainty scales, consequential mechanisms) would be desirable to get accurate values.

Finally, it is worth mentioning that this economic valuation exercise supports the need to prioritise investment in Murcia Region, but it has some limitations that should be considered. Comparisons with real payments have not been carried out to identify the real values and the causes of SDB. In addition, the opinions of outsiders visiting the study area have not been estimated. Also, it might be of great use to test the existence of SDB in the context of incentive-compatible and consequential survey mechanisms. Thus, it would be of interest to test the existence of spatial effect on WTP, in line with Granado-Díaz, Gómez-Limon, Rodríguez-Entrena, and Villanueva (2020). Lastly, the user-effect is intensified when IVA is used. This may be due to the respondent assumption that the public are in general users. If so, when respondents are asked for what the general public choice would be, they could be asked 'what people like you would choose' instead, in order to avoid an addition bias of respondent misconception. These aspects should be considered for future research.

6. Conclusions

The existence of a social desirability bias in the valuation of environmental assets has been evidenced. This bias was identified by using an IVA. The combination of CSP and IVA allowed the estimation of a SDB equivalent to a 2.8-fold overvaluation. The presence of SDB is found in the valuation of provision and cultural services, being the highest bias associated with environmental services. In addition, users are valuing environmental protection more than non-users when IVA is used. These results will be useful to public managers, for planning and implementing environmental protection measures to be included in the management plans for the protection of Red Natura 2000 network territories.

Protection of the environmental wealth and values of natural spaces provides benefits to society. Valuation of these benefits, in term of willingness to pay to avoid environmental deterioration, is useful to quantify the economic benefits derived from the protection of the ecosystem services provided by a protected natural area, such as the coastal Natura 2000 site valuated here. The annual benefits from environmental protection in the next six years, quantified in terms of total economic value, are around € 328 million per year for CSP and €117 million per year for the inferred preferences, for the citizens of Murcia Region. The estimated benefits far exceed the cost of implementing the plan and, from the point of view of human well-being, its implementation is socially desirable.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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