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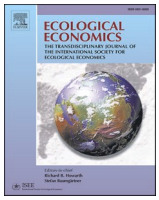

Assessing individual and social values of cultural services of a protected area through online deliberation

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ABSTRACT

The non-material benefits obtained through interaction with nature are known as cultural services. We employed an online survey to value cultural services provided by the Fanjing Mountain National Nature Reserve, China. The valuation combined a stated-preference approach with online deliberation, where participants considered and discussed the services through typing in chat groups. The services perceived by most participants, in descending order, were spiritual experiences, recreation, aesthetic appreciation, education, and scientific value. In two hypothetical scenarios, where participants were assumed to be potential visitors and local staff (tour guides), respectively, they expressed both individual and social preferences for cultural services. Individual preferences primarily represented their own interests without necessarily or explicitly considering social benefits, whereas social preferences explicitly considered what was right or desirable for society. Overall, the social preferences were lower, more converged, and less affected by demographic variables (e.g., income) than the individual preferences in both scenarios. However, such differences between individual and social preferences were not always statistically significant. Moreover, participants valued cultural services significantly higher as potential tour guides than as visitors, as their psychological states, substitutes for cultural services, prior rights to the services, and certainty in interacting with nature varied with their stakeholder roles.

1. Introduction

Protected areas are geographically defined areas "designated or regulated and managed to achieve specific conservation objectives" (CBD, 2011). They safeguard the wellbeing of humans and other species by conserving biodiversity and geodiversity and generating various material and non-material benefits. According to the Millennium Ecosystem Assessment (2005), ecosystem services are the benefits humans obtain from ecosystems, and cultural services (a category of ecosystem services) denote the non-material benefits obtained from interacting with natural areas, which encompass geological and ecological structures, components, and characteristics. Some researchers, including McCauley (2006), Sagoff (2008), Raymond et al. (2013) and more recently Díaz et al. (2018), have criticized the concept of ecosystem services—cultural services included—for its anthropocentric focus, disregard for nature's intrinsic value, implication of nature's exploitation for human benefit, and emphasis on Western utilization values. However, Costanza (2024) considered these critiques as misconceptions.

Specifically, when using the term "cultural service" in this paper, we do not imply that humans are the only species that matter, exist apart from nature, or are purely exploiters of nature. Instead, we recognize that: (1) humans and the rest of nature are interdependent, sharing diverse relationships (e.g., a protected area can serve as a sacred place, and humans can be both beneficiaries of and contributors to nature conservation); (2) the notion that nature should be protected for its own

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sake does not contradict the idea that nature conservation can also benefit humans; and (3) utilitarian values are based on assessing trade-offs. Intrinsic values are based on assigning rights to nature, not assessing trade-offs. They are fundamentally different but complementary, rather than mutually exclusive. These perspectives have also been highlighted by Schröter et al. (2014), Kenter (2018), and Chen and Costanza (2024).

One of the common approaches for valuing cultural services is the stated preference approach. This approach, according to United Nations SEEA-EA (2021), infers preferences from people's response to hypothetical questions or scenarios such as how much people are willing to pay for, or willing to accept in exchange for a loss in the quality or quantity of a service in a certain context. Stated preference valuation studies often do not involve an explicit request to consider social wellbeing associated with the service. Without an explicit request, several studies (Wilson and Howarth, 2002; Lo and Spash, 2013; Stoeckl et al., 2018; Chen et al., 2022) have noted that preferences expressed by people might not necessarily consider social wellbeing but primarily focus on self-interest. Such preferences can be termed as "individual preferences". The phrase "not necessarily" emphasizes that, while some individuals may spontaneously consider social benefits, this is not always the case.

Since cultural services in many situations are common, public, or managed through collective decision making, their values are associated with both individual wellbeing (e.g., what an individual personally likes or dislikes) and social wellbeing (e.g., public interest, fairness, sustainability, and social intention). Hence, a growing number of studies (Kenter, 2016; Schaafsma et al., 2018; Costanza, 2020; IPBES, 2022; Pascual et al., 2023; Chen and Costanza, 2024) have recognized that valuation of cultural services needs to explicitly integrate social preferences. The interpretations of "social value" or "social preferences" may vary depending on the context. Kenter et al. (2015) have summarized multiple potential interpretations, encompassing public interests, values related to public goods, values held by specific communities or societies, altruistic values, aggregated preferences of individuals, and values derived from social or collective processes. However, social preferences in this paper denote the preferences that explicitly consider social wellbeing or social benefits. Note the keyword "explicitly" here. This definition aligns with some previous literature (Schwartz, 1999; Kenter et al., 2015; Saarikoski and Mustajoki, 2021). Earlier studies, such as Kenter et al. (2016b) and Kenter (2016), have also referred to social preferences based on this definition as "fair price".

We gathered 196 participants to express their individual and social preferences for cultural services of the Fanjing Mountain National Nature Reserve (the Reserve), China, after online deliberation – the process of group discussion and collective consideration via online media or platforms. Notably, the individual and social preferences we estimated were post-deliberation preferences. We integrated deliberation into our survey because of the following potential benefits. Previous deliberation-related valuation studies (Wilson and Howarth, 2002; Kenter et al., 2011; Lo and Spash, 2013; Kenter et al., 2016c; Costanza et al., 2017; Mavrommati et al., 2020) suggested that deliberation could allow for information sharing, public debate, mutual learning and understanding, enhancement of collective knowledge about ecosystem services, and consideration and discussion of various social issues (e.g., environmental sustainability, others' preferences, and public benefits associated with ecosystems, ethics). Thus, deliberation could potentially help our participants to exchange their perspectives, to understand social intention and interest, and to consider what was right or desirable to society. This was crucial for us to infer social preferences. Furthermore, Vargas et al. (2016) and Lliso et al. (2020) indicated that deliberation enables participants to explain their reasoning and preferences and to interact with researchers. This advantage could encourage our participants to express rational and credible preferences while also helping us collect qualitative data to investigate the reasons behind their choices. However, due to limited research funding, time and travel restrictions, and lack of willingness of participants to meet in person, our survey, including deliberation, was carried out online. Online deliberation means that the participants communicated by typing in WeChat groups. WeChat is the most widely used social media platform in China, and its chat groups function similarly to those on WhatsApp and Messenger. Why we chose typing as the deliberation medium will be explained in Section 3.1 and further discussed in Section 5.4.

This study addresses two questions: First, do people value cultural services differently depending on whether they are potential visitors or tour guides in a protected area? Second, do people express the same or different social and individual preferences when assessing cultural services? Evidence-based insight into these questions can potentially aid decision makers of protected areas in understanding, influencing, or enhancing people's willingness to support, refine, or engage in conservation, management, and utilization of cultural services. Moreover, addressing these questions makes several important contributions to the existing literature:

- While existing studies have specifically assessed the value of protected areas' cultural services received by visitors (Jobstvogt et al., 2014; Lal et al., 2017) and local residential communities (Sangha and Russell-Smith, 2017; Coyne et al., 2022), no research has focused exclusively on the value of cultural services experienced by local staff. Although some studies (Whitham et al., 2015; Kenter, 2016) have included local staff as part of a larger group of stakeholders expressing preferences for cultural services collectively, these preferences do not specifically reflect the value for local staff. Consequently, it remains unclear whether the value of cultural services differs for local staff compared to other stakeholders. Additionally, we found no studies examining whether people perceive different values for cultural services in protected areas when their roles as stakeholders change. Our research questions address these gaps by investigating whether people value these cultural services differently as potential visitors versus potential tour guides of a protected area.
- This study also expands the existing understanding of whether people maintain or change their attitudes or views regarding the cultural services of protected areas when explicitly prompted to consider the social well-being associated with these services, compared to when they are not. Among the existing literature valuing protected areas' cultural services, although several studies, such as Kenter (2016), Kenter et al. (2016b), and Andrade et al. (2023), have compared social and individual preferences, most studies, especially monetary valuation studies, did not involve such comparisons.
- While an increasing number of studies (e.g., those mentioned previously) have integrated deliberation into the process of valuing ecosystem services, deliberation has usually been conducted in person. We did not find any monetary valuation studies based on online deliberation, although a few non-monetary ecosystem service assessments, such as Andrade et al. (2023), Lyon-Mackie et al. (2023), Tobin et al. (2023), and Goodson et al. (2024), have integrated online deliberation, where participants deliberated either through real-time verbal discussions in virtual meetings or by responding to posts on a website asynchronously. Both Andrade et al. (2023) and Chen et al. (2024) have emphasized that the role of online deliberation in the broader field of ecosystem service valuation (not limited to cultural services) remains largely unexplored. In this context, typing in online chat groups, which can be either in real-time or asynchronous, in our study represents a novel deliberation approach that expands the methodological toolkit for ecosystem service valuation. This approach also enhances the existing understanding of the characteristics of different deliberation media, serving as a reference for future valuation research in selecting and analyzing various deliberation media.

Since our survey took place in China in 2020, we used CNY (Chinese currency) in 2020 as the valuation unit in this paper. Notably, valuation

in monetary units in this study does not imply commercialization or privatization of cultural services. Rather, earlier studies, such as de Groot et al. (2012), Costanza et al. (2014) and Chen et al. (2023), have argued that monetary values can complement values expressed in other value units, and at least intend to: (1) establish a foundation for crafting financial incentives to invest in the conservation and sustainable utilization of cultural services; (2) convey the value of cultural services to diverse audiences by expressing it in a universally understandable unit (money); and (3) enable decision-makers to compare financial benefits and cultural services using the same metric.

2. Study area

The Reserve, also known as Fanjingshan, is situated at the confluence of Jiangkou County, Yinjiang County, and Songtao County, within Tongren Region of Guizhou Province, Southwestern China (Fig. 1). The Reserve encompasses approximately 775 km^2 of land in total with a forest coverage of 97.6 %, containing subtropical primitive evergreen broadleaf forests, deciduous forests, coniferous forests, and shrubs. The land includes 403 km^2 of strictly conserved heritage area and 372 km^2 of a buffer zone where scientific research, education, managed ecotourism, and limited agricultural activities can be conducted (Fanjing Mountain, 2024). Designated as a World Natural Heritage Site and being part of the International Man and Biosphere Network, the Reserve is rich in both biodiversity and geodiversity. Specifically, it harbors 2317 recorded animal species, with 38 species classified as globally threatened, and 3724 recorded plant species, including 64 species classified as globally threatened. Many of the plant and animal species trace their origins back to the Tertiary period, spanning from 65 million to 2 million years ago (UNESCO, 2018). It also contains various types of geological relics and landscapes, including 4 world-class geological relics (Ye et al., 2020). With the altitudes ranging between 500 m and 2570 m and a humid monsoon climate (Ye et al., 2020), many of its areas are often surrounded by fog or clouds.

Scenic areas in China are officially ranked into five levels based on their attractiveness and importance, and the Ministry of Cultural and Tourism of China (2018) designated the Reserve as the highest level in 2018. Due to its stunning landscapes (Fig. 2), as well as its ecological, geological, and cultural attractions, the Reserve is popular among domestic and even international visitors. Interacting with the Reserve provides a range of non-material benefits that enrich people's lives spiritually, culturally, and emotionally. Specifically, its landscapes may inspire creativity, provide aesthetic enjoyment, and foster emotional well-being, while recreational activities like hiking, sightseeing, wildlife viewing, and photography enhance physical health and mental enjoyment Visitors also gain educational insights into its rich biodiversity and geodiversity, promoting conservation awareness. Furthermore, it is a sacred Buddhist site (Fanjing Mountain, 2024), offering spiritual and religious fulfillment, a sense of awe, and a connection to Buddhist culture and traditions. It fosters social bonding through shared experiences and cultural exchange, deepening connections to both nature and community.

3. Methods

To value cultural services, we first convened our participants to engage in online deliberation. Subsequently, we collected data on their preferences for cultural services by asking them to complete an electronic questionnaire. For emphasis, the participants expressed post-deliberation preferences, rather than pre-deliberation preferences. For simplicity, the rest of this paper uses "preferences", "willingness to pay" (WTP), or "willingness to accept" (WTA)" to refer to the post-deliberation preferences assessed in this study.

The electronic questionnaire, as shown in Appendix 1, investigated basic demographic variables. It also contained a link of the Reserve's official website to obtain an overview of the Reserve, and an invitation link through which people could access the deliberation groups on WeChat. To understand what cultural services people could obtain from the Reserve and which type was the most frequently perceived, the questionnaire presented participants with multiple potential types of cultural services to choose from, including recreation, aesthetic appreciation, education, scientific value, and spiritual experience. Participants could select more than one type, and the frequency of selection for each type was used to establish a ranking. More importantly, the questionnaire included two hypothetical scenarios, which are presented below, to infer the participants' preferences for cultural services.

Scenarios 1: Consider two job offers (A and B) as tour guides in the Reserve. Both positions entail the same workload (40 h per week) and contract length (1 year), with a 1-h lunch break provided daily (not included in workload). Additionally, employees will receive training to

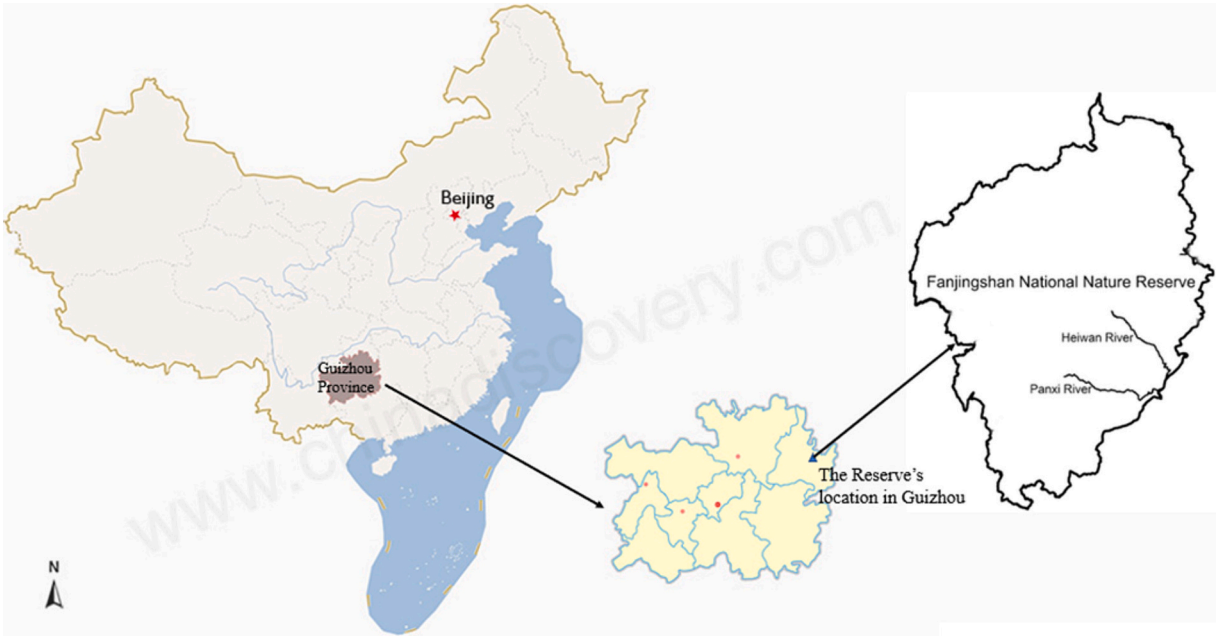

Fig. 1. Location of study area adapted from Tapley et al. (2015) and China Discovery (2020).

Fig. 2. Snapshots of the landscape (photos by Ida Kubiszewski).

proficiently perform both indoor and outdoor duties.

Guide A is restricted to indoor venues, such as the visitor center, with no opportunity for outdoor interaction.

Guide B has the flexibility to choose between indoor and outdoor work, offering the option to engage with the outdoor environment or remain indoors.

Individual WTA: Given an annual fixed salary of 35,000 CNY for Guide B, what should be the minimum salary (CNY) for Guide A to be preferable to you, assuming you are a job candidate?

☐ 35,000 ☐ 35,100 ☐ 35,200 ☐ 35,500 ☐ 36,000 ☐ 37,000 ☐ 40,000 ☐ 45,000 ☐ 55,000 ☐ Higher than above.

Social WTA: Considering the broader pool of job candidates from society (not just yourself), if Guide B, who has the option to work both indoors and outdoors, receives an annual salary of 35,000 CNY, what would be the equitable annual salary (CNY) for Guide A, who is limited to indoor work, to fairly offset the potential absence of opportunities to work in outdoor nature?

☐ 35,000 ☐ 35,100 ☐ 35,200 ☐ 35,500 ☐ 36,000 ☐ 37,000 ☐ 40,000 ☐ 45,000 ☐ 55,000 ☐ Higher than above.

Note: No option was provided below 35,000 CNY, as Guide A would not be preferable to Guide B if their salary was lower than this threshold. Guide B had the option to freely choose whether to engage with nature by working outdoors, or to remain indoors and have the same working environment as Guide A if Guide B did not prefer the outdoor natural area.

Scenario 2: Visitors are required to possess an entrance card to access the Reserve, as entry is not permitted without one. The entrance card grants access to the natural sightseeing and recreational areas of the Reserve exclusively to cardholders for the duration of one year.

Individual WTP: If you live in proximity of the Reserve and are considering becoming a visitor and purchasing such a card for yourself, what is the maximum price (in CNY) you're willing to pay?

☐ 0 ☐ 100 ☐ 200 ☐ 500 ☐ 1000 ☐ 2000 ☐ 5000 ☐ 10,000 ☐ 20,000 ☐ Higher than above.

Social WTP: What entrance card price do you believe would be the fairest and most beneficial for society, taking into account not only your own perspective but also those of local residents, local government, other potential visitors, and the Reserve?

☐ 0 ☐ 100 ☐ 200 ☐ 500 ☐ 1000 ☐ 2000 ☐ 5000 ☐ 10,000 ☐ 20,000 ☐ Higher than above.

The value of cultural services assessed by our survey is not always directly reflected by real-world market prices (e.g., staff of the Reserve do not pay for obtaining cultural services). Also, the cost of replacing these services with alternative artificial services, as well as the damage costs resulting from their loss, are not always directly observable. In this case, valuation literature (Farber et al., 2002; Pascual et al., 2010; Liu et al., 2010; Costanza et al., 2017) has suggested that researchers can value these services through observing how people trade off these services and other benefits (e.g., money) in hypothetical scenarios. Scenarios 1 and 2 enabled us to: (1) examine how people would trade off a tour guide's potential income and opportunity for interacting with natural sites; and (2) investigate how people would trade off a visitor's potential payment and opportunity of accessing nature. The rationale for valuing cultural services in these two scenarios assumed that the sole objective of accessing and interacting with a natural site was to acquire cultural or non-material benefits. This assumption overlooks the reality that human-nature interaction could serve multiple purposes (e.g., visiting a park solely to accompany clients rather than enjoying nature). Nonetheless, this assumption is widely employed and accepted for valuing cultural services in existing literature (Martínez-Espiñeira and Amoako-Tuffour, 2009; Pascual et al., 2010), given the infeasibility of quantifying every potential factor affecting human-nature interaction.

In short, Scenario 1 inferred participants' (1) individual WTA, which refers to the compensation they were personally willing to accept for losing opportunities to interact with natural area, assuming they were local tour guides in the Reserve, and (2) social WTA, which refers to the

just and fair amount of financial compensation that should be given to general employees of the hypothetical tour guides from society for lacking opportunities to interact with nature. Scenario 2 inferred their (1) individual WTP for visiting the Reserve through buying a hypothetical entrance card, assuming they were potential visitors, and (2) social WTP, which was the entrance card's fairest and most desirable price for society, including local government, reserve managers, local people, as well as other potential visitors.

The WTA of each participant in Scenario 1 was measured by subtracting Guide B's fixed salary of 35,000 CNY from the selected salary option of Guide A. For example, if the selected salary option of Guide A was 50,000 CNY, the WTA would be 15,000 CNY (50,000 CNY – 35,000 CNY). In Scenario 2, the WTP of each participant was directly indicated by their choice of a price option. If a participant expressed WTA or WTP at higher than 20,000 CNY in the two scenarios, we used 20,000 CNY as the conservative estimate.

Both the WTA and WTP reflected the participants' overall willingness to interact with nature, rather than being specific to each specific type of cultural service. As many cultural services (e.g., aesthetic enjoyment may contribute to recreation) may overlap, double counting may arise when aggregating the values of separately measured cultural services. Based on the WTA and WTP reported in the two scenarios, we compared the preferences for cultural services between the induvial and social perspectives, compared the preferences between two stakeholder roles, and analyzed the impacts of demographic variables on preferences. The subsequent subsections further illustrate how we conducted survey to collect data and how we analyzed data.

3.1. Survey process

3.1.1. Questionnaire development and pretesting

We drafted the questionnaire and designed the survey by consulting multiple ecological economists and nature conservation specialists and referring to previous stated preference valuation studies, such as Tu et al. (2020),Schaafsma et al. (2018), Wang et al. (2017), Kenter et al. (2016b), and Kenter et al. (2011). Before formal distribution, we pretested the draft questionnaire with 20 individuals. They comprised experts, colleagues, non-expert friends/acquaintances, and strangers from the study area. The pretesting aimed to gather feedback on various aspects of the survey design, such as its length and the clarity of descriptions. Additionally, Johnston et al. (2017) indicated that pretesting sought to improve the overall quality of the questionnaire by identifying and rectifying any errors, while also providing insights into how participants might respond to the questionnaire.

3.1.2. Distributing the questionnaire and deliberation invitation

The questionnaire (including the invitation link to access online deliberation groups) was distributed via the subsequent approaches: (1) We paid Tencent Wenjuan and Wenquanxing, two prominent platforms that offer questionnaire-distributing service in China, for disseminating the questionnaire. (2) We adopted a snowball sampling approach via WeChat. Specifically, we sent the questionnaire to our personal WeChat contacts and groups. Additionally, we posted it on WeChat Moments, a social feature through which users can share text, images, and links with their contacts. We encouraged our WeChat contacts to further share the questionnaire with their own contacts, groups, and on their WeChat Moments. (3) To reach local people near the Reserve, we enlisted the assistance of five local individuals: two university students, one public servant, one employee of a local enterprise, and one manual laborer. They were paid to share the questionnaire with other locals.

3.1.3. Conducting deliberation and completing the questionnaire

After participants accepted the deliberation invitation and accessed the WeChat deliberation link, we separated them into fourteen groups. Such separation was because large group gatherings often risk being dominated by a few outspoken or influential individuals, potentially marginalizing those who are more reserved, less assertive, or less experienced, as indicated by Saarikoski and Mustajoki (2021). Breaking a large assembly into smaller subgroup meetings fosters active participation and gives as many attendees as possible an opportunity to contribute. Within each subgroup, we facilitated the deliberation through several steps in Table 1.

Typing was selected as the preferred mode for online deliberation for two reasons. First, some participants expressed discomfort deliberating with strangers via voice or video, whereas typing offered a higher level of confidentiality, thus making them feel more at ease. Second, they had varying availability, making synchronous online media like video and audio meetings impractical. Typing allowed for both synchronous and asynchronous written communication, permitting participants to exchange written messages or information without needing to be online or present at the same time. Instead, they could view, write, and respond to points of view at their own convenience. For example, if we presented a question or a participant expressed a point of view in a deliberation

Table 1
Steps of facilitating deliberation.

Steps	Descriptions
Introduction	We introduced our research briefly, including the research objectives, how the data collected from participants would be used, and how the research outcomes would be applied. We also introduced the Reserve and its cultural services.
Cultural service identification	We asked participants to identify and describe the cultural services they could derive from the Reserve, such as recreation, aesthetic appreciation, education, scientific value, and spiritual experience.
Expression of thoughts	We asked participants to share their thoughts on the preference-inferencing questions related to the two scenarios.
Cross-group information sharing	To ensure each group could understand the thoughts of other groups, we collected and shared information across all groups
Promotion of inclusive and critical thinking	We emphasized that there were no right or wrong answers and there was no need to reach a consensus. However, participants were encouraged to discuss and debate in a respectful way. Sometimes we presented opposing views to participants and asked for their feedback. For example, when certain participants said they preferred free entrance to the Reserve and others did not express different views, we said: "some people have suggested that nature conservation requires funding. Therefore, free entrance may not support conservation efforts. What do you think?".
Reminder of social perspectives	We reminded participants about other stakeholders of the Reserve that they might have overlooked. For example, when a certain group focused only on how visitors and the Reserve could be affected by the price of the hypothetical entrance card, we pointed out: "Local governments may also care about the revenue generated by the Reserve. Do you think they would prefer a low-price or high-price option?".
Cheap Talk Scripts	We informed participants to answer the questions as if they were in a real situation, even though the scenarios were hypothetical. This approach, known as "Cheap Talk Scripts," is used to encourage realistic preference expression in valuation studies (Ladenburg and Olsen, 2014; Haghani et al., 2021).
Response to participants	If participants raised any questions or concerns about our survey, we responded to them at our earliest convenience
Ending deliberation	When a group stopped providing new thoughts for a day, we asked: "Do you have any other thoughts before we finish the deliberation?" If no additional thoughts were provided, we ended the deliberation for that group. Following the group deliberations, participants were asked to promptly complete the questionnaire. As an incentive, we provided each participant who completed the questionnaire with 5 CNY via WeChat.

group, others could choose to respond immediately or later in a few hours. Potential strengths and shortcomings of typing as a deliberation medium will be discussed in Section 5.4.

3.1.4. Data collection

We collected both qualitative and quantitative data from a total of 196 participants. Qualitative data was qualitative information of why they expressed certain WTA and WTP and was recorded during deliberation. Quantitative data, including demographic information, WTA, WTP, and the number of participants perceiving each specific type of cultural service, was collected from the questionnaires completed by the participants after deliberation. These participants were anonymous adult citizens from China, representing diverse backgrounds. Specifically, 102 individuals (52 %) hailed from the local communities within the counties where the Reserve is situated, while the remaining 94 (48 %) were outsiders. Our sample was also carefully balanced in terms of gender representation. However, it is noteworthy that young adults aged between 18 and 44 constituted approximately 95 % of the sample, and individuals holding a tertiary education degree (equivalent to a bachelor's degree or higher) accounted for 77.5 %. Appendix 2 describes the demographic information of the participants in detail.

3.2. Estimating the effects of personal factors on preferences

To answer whether demographic variables (see Table 2) have impacts on individual and social WTA and WTP, we estimated an ordered probit model shown by Eq. 1. Tu et al. (2020) suggested that this model could offer an intuitive and illustrative method for observing the impacts of variables on preferences. Moreover, to check the robustness of the model results, we performed a bootstrap for the standard errors of each coefficient. Bootstrap is a resampling technique used to estimate the sampling distribution of a statistic by repeatedly resampling with replacement from the observed data (Hesterberg, 2011; Horowitz, 2019). We ran the regressions using Stata 16.0. Table 2 presents the definitions of the variables in Eq. 1, as well as the reasons for integrating the variables.

$$P(W_t = m) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 V_t + \varepsilon \quad (1)$$

4. Results

4.1. Perceptions of cultural services

Based on the responses of 196 participants to the questionnaire regarding whether they could receive non-material benefits from the Reserve, 5 participants (2.5 %) said that they did not, 29 participants (14.8 %) either did not know or felt unsure, while 162 participants (82.7 %) said that they did and then were further asked to identify multiple options of cultural services. Spiritual experience was the cultural service perceived by 151 participants, accounting for 77.0 % of the total participants; recreation was identified by 131 participants (66.8 %), followed by aesthetic appreciation, which was identified by 121 participants (61.7 %); however, education service and scientific value were only identified by 86 and 75 participants (43.9 % and 38.3 %), or less than half of the participants. This might be because the main purpose of experiencing nature for many participants, as they indicated during deliberation, was to have enjoyment, relaxation, exercise, or happiness, rather than expecting to actively learn something new or gain scientific knowledge. In addition, 54 participants (27.5 %) identified all these specific types of cultural services. Notably, the ranking reflects how frequently participants perceived each type of cultural service, but it does not necessarily indicate the relative importance or value participants assigned to each service.

Table 2
Variables in Eq. 1.

Variables	Definitions	Reasons for integration
Wt	WTP for cultural services or WTA compensation for losing cultural services	This reflects the value of cultural services.
X_1	A dummy variable taking the value of one if the participant was a local.	Interests in a protected area may vary from locals to outsiders (Watson et al., 2014; Chen, 2020).
X_2	A dummy variable taking the value of one if the participant had ever been to the study area	Individuals who have and have not visited a location may possess varying levels of knowledge regarding its cultural service. People's preferences for a service may be contingent upon their knowledge of the services (Costanza, 2020).
X_3	The weekly frequency of being out in nature	The effects of this variable on WTA and WTP are unknown but required investigation.
X_4	A dummy variable taking the value of one if the main workplace of the participant was an indoor area	Individuals primarily engaged in indoor work may have different environmental interests compared to those primarily working in outdoor natural areas (Tu et al., 2020)
V_t	A vector of multiple demographic variables, including gender, age,[a] monthly income,[b] education level,[c] marital status,[d] and "having a child under 18 years of age". (1) Gender is a dummy variable taking a value of one if the participant was a female. (2) If the selected options related to age and income fell into a closed interval (e.g., 18 years–25 years, 2000 CNY-5000 CNY), we used the median as the estimate; if the selected options were ">65 years" or ">10,000 CNY", we used 65 and 10,000 CNY as the age and income, respectively. (3) We gave the value of education a level between1 and 8 in accordance with a stated-preference study assessing environmental benefits in China (Tu et al., 2020). A higher value indicates a higher level of education. (4) Marital status is a dummy variable taking a value of one, if the person was married when responding to our survey. (5) "Having a child under 18 years of age" is a dummy variable taking a value of one if the participant had a kid aged under 18.	Different genders may hold different interests in a protected area (IUCN, 2020; UNEP, 2021). Whether age influences preferences is unknown and requires investigation. Income may constrain the expression of preferences for a service (Arrow et al., 1993). People with different educational backgrounds may hold divergent awareness of and preferences for ecosystem services (Urama and Hodge, 2006; Kenter et al., 2016a). Married and unmarried individuals might have varying levels of awareness regarding environmental benefits, with married individuals more likely to consider their spouses (Tu et al., 2020). Additionally, some participants in our survey noted that they would be more inclined to visit the Reserve if they had kids.
ε	Error term	It reflects the uncertainty of the model.

[a] Age options included "18–24", "25–44", "45–64", and "> 64". They were established according to international age classification standards, as outlined by the United Nations (1982), which categorize adults into youth over 18, young adulthood, middle adulthood, and older adulthood.

[b] Income options included "< 2000 CNY", "2000–5000 CNY", "5000–10,000 CNY", and "> 10,000 CNY". They were established in accordance with income classification criteria outlined by the Chinese National Bureau of Statistics (2019).

[c] In China, the eight education levels encompass no formal education, primary education, lower secondary education, upper secondary education, technical secondary school education, junior college education, bachelor's degree, and postgraduate education (master's or doctorate). We opted not to utilize years to categorize education levels because the duration of education may not accurately reflect an individual's level of education. For instance, individuals with junior college education typically receive a similar duration of education as those with bachelor's degrees, but are often perceived as less educated.

[d] Marital status takes value of zero if the participant had never been married or was widowed or divorced.

4.2. Values estimates

Table 3 summarizes participants' preferences in two scenarios. In Scenario 1, there were 124 participants (63.3 %) who expressed the same social and individual WTA. 20 participants (10.2 %) expressed higher social WTA than individual WTA, while 52 participants (26.5 %) expressed lower social WTA than individual WTA. One average, the individual WTA/yr/person was 5975 CNY, higher than the social WTA/yr/person at 4565 CNY. This means that the participants were willing to accept compensation of 5975 CNY/yr/person on average to forgo their own opportunities of working outdoors to interact with nature and receive non-material benefits, assuming they were tour guides in the Reserve. However, general tour guides from society should receive fair financial compensation, averaging 4565 CN/yr/person, for losing opportunities to interact with nature in the Reserve. Using a paired *t*-test to check the difference between individual and social WTA, we estimated the *p*-value to be 0.0002815, suggesting that such difference was statistically significant.

In Scenario 2, there were 156 participants (79.6 %) who expressed the same social and individual WTP. However, 11 participants (5.6 %) expressed higher social WTP than individual WTP, while 29 participants (14.8 %) expressed lower social WTP than individual WTP. On average, the individual WTP/yr/person was 523 CNY, higher than the social WTP at 398 CNY/yr/person. This means that the participants were willing to pay 523 CNY/yr/person on average to access and interact with the Reserve and receive non-material benefits, assuming they were visitors. An average of 398 CNY/yr/person was considered the most desirable price that should be fair and beneficial to society, including local government, reserve managers, local people, as well as other potential visitors. However, the difference between the individual and social WTP was not statistically significant, because the *p*-value of a paired *t*-test for such difference was 0.4145.

Due to asymmetric distribution of preferences and expression of high values, the mean value exceeds the median value in many stated preference studies (Alberini and Cooper, 2000). Such a situation also arose in our survey: in both scenarios, most of the mean values exceeded the median values, except that the social WTA in Scenario 1 had a larger median value than mean value.

4.3. Distributions of WTA and WTP

Fig. 3 displays the distributions of participants based on their WTA in Scenario 1 and WTP in Scenario 2. In Scenario 1, 23 participants (11.7 %) expressed individual WTA at 0 CNY, and 31 participants (15.8 %) expressed social WTA at 0 CNY/yr/person. Also, both individual and social WTA were most frequently expressed at 5000 CNY/yr/person. In Scenario 2, there were 7 participants (3.6 %) who expressed individual WTP at 0 CNY/yr/person, and 9 participants (4.6 %) who expressed social WTP at 0 CNY/yr/person. Both individual and social WTP converged at 200 CNY and 500 CNY, with 100 CNY following closely. While the distributions of social and individual preferences were different in both scenarios, such difference was not statistically significant: a Kolmogorov–Smirnov test for the social and individual WTA in Scenario 1 estimated the *p*-value to be 0.3802, while another Kolmogorov–Smirnov test for the social and individual WTP in Scenario 2 estimated the p-value to be 0.9791.

Table 3
values of cultural services (CNY/yr/person).

	WTA in Scenario 1		WTP in Scenario 2	
	Individual	Social	Individual	Social
Mean	5975	4565	523	398
Median	5000	5000	200	200
Standard deviation	6253	5172	1672	1426

4.4. Impacts of demographic variables on preferences for cultural services

Table 4 shows the estimates of the impacts of variables of participants' personal features on their preferences for cultural services. Columns (1) and (2) are associated with individual and social WTA in Scenario 1, respectively. Columns (3) and (4) are associated with individual and social WTP in Scenario 2, respectively.

In Scenario 1, participants with higher income, younger age, and higher education levels were more likely to express higher individual WTA. Higher education level were also positively correlated with social WTA. Moreover, married participants showed a higher probability of expressing higher social WTA than those who were not married. Conversely, other variables did not demonstrate statistically significant impacts on individual and social WTA in Scenario 1, In Scenario 2, income was the only variable positively associated with the probability of expressing individual WTP, while no variable had a significant effect on the likelihood of expressing social WTP. Overall, there were fewer variables influencing social WTA and WTP, as opposed to individual WTA and WTP.

5. Discussion

5.1. Possible reasons for participants' preferences

During the deliberation, we encouraged participants to voluntarily express and explain their WTA and WTP. A some chose to do so, others opted not to share. Since the reasoning behind the preferences of those who did not share their thoughts remains uncertain, the distributions of WTA and WTP described in Fig. 3 cannot be fully explained from the qualitative data we collected. Nevertheless, the recorded insights provide partial explanations, as discussed below.

In Scenario 1, several participants suggested that working outdoors did not equate to recreational activity and was unlikely to generate additional well-being compared to indoor work. Additionally, due to diminishing marginal benefits, the opportunity to interact with the Reserve's natural area might not be significant for a tour guide who works there regularly on weekdays. These two points may partly explain both individual and social WTA at 0 CNY/yr/person. The fact that both individual and social WTA were most frequently expressed at 5000 CNY/yr/person might be attributed to the following reasons: as some participants noted, compensation below 2000 CNY/yr/person was considered negligible when spread across each month; with earnings exceeding 10,000 CNY/yr/person, they could afford to travel to other natural sites, making it not worthwhile to sacrifice this amount or more per year solely for interaction with the Reserve.

In Scenario 2, a participant indicated that cultural services should be a gift from nature and exclude no one, which partly explains why individual and social WTP at 0 CNY/yr/person were observed. However, Fig. 3 shows that most participants did not choose free entrance. This fact may be explained by the following perspectives of some participants: maintaining the Reserve required financial resources, such as funding for personnel expenses and ecological restoration; local governments might also anticipate income from the Reserve to sustain nature conservation and make profits; free entry was deemed ineffective in controlling visitor numbers, potentially resulting in overcrowding within the Reserve. The fact that both individual and social WTP were the most frequently expressed at 200 CNY/yr/person and 500 CNY/yr/person may be due to several factors suggested by some participants: a price exceeding 1000 CNY/yr/person would be considered too high for many local residents, especially in rural residents; they could also spend 1000 CNY on visits to multiple natural areas rather than solely on the Reserve; 100 CNY was deemed somewhat undervalued for an entrance pass allowing unlimited annual access, considering that the price of a

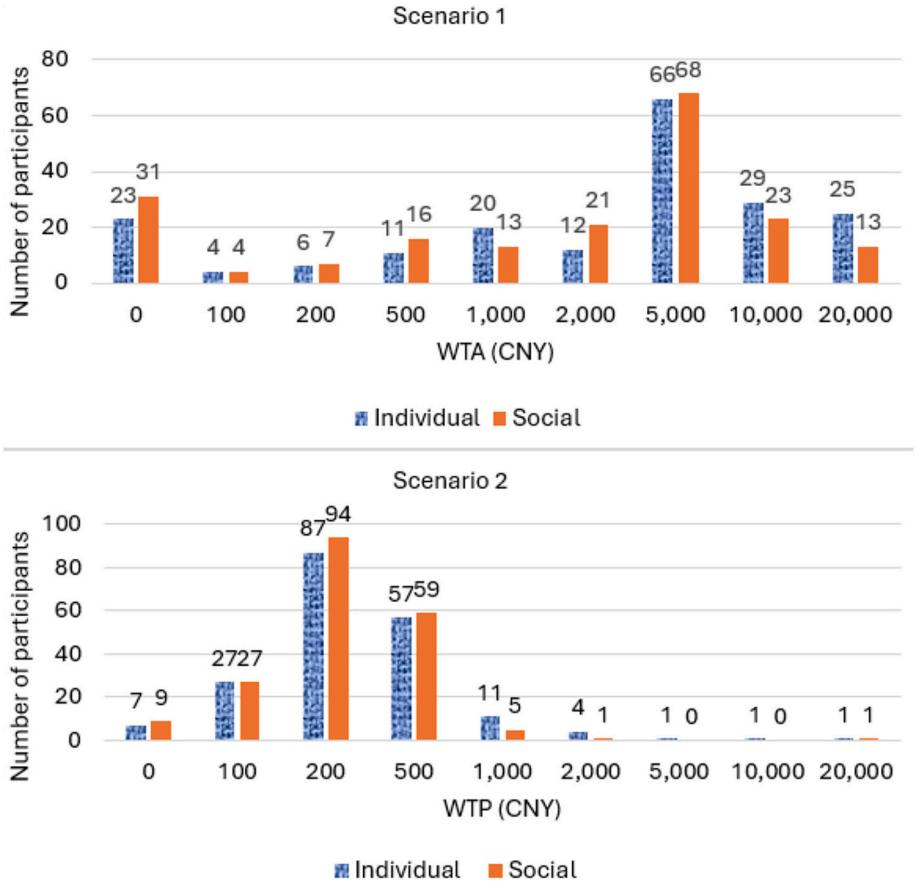

Fig. 3. Distribution of participants with different WTA and WTP.

one-time entrance pass in some other nature reserves in China could reach 100 CNY.

The reasons why better educated, younger, married, and wealthier participants had higher individual WTA in Scenario 1 may include the following. First, the Chinese Ministry of Ecology and Environment (2020) reported that environmental education has been continuously enhanced in schools in China, and hence the younger generation nowadays are more environmentally conscious than the older generation, showing more recognition of cultural services. Rewitzer et al. (2017) suggested that increased education levels may lead to greater awareness of the cultural significance of nature. Moreover, Tu et al. (2020) indicated that married individuals may consider both their own wellbeing and those of their spouses. Finally, Hirons et al. (2016) indicated that poorer people are more constrained to express preferences in monetary units. This reason also explains why wealthier participants expressed higher individual WTP in Scenario 2.

5.2. Do people express the same or different social and individual preferences when assessing cultural services?

Previous literature (Kenter et al., 2015; Orchard-Webb et al., 2016; Kenter et al., 2016a; Hansjürgens et al., 2017) has suggested that expressing social preferences encourages individuals to seek common benefits and to look beyond self-interest, making consensus more likely. This implies that the differences between individual and social preferences may be reflected in the convergence of their distributions and the influence of demographic variables on them. These differences may also manifest in the magnitudes of WTP or WTA. For example, Kenter (2016) found that the social WTP for the protection of endangered species was higher than the individual WTP, as the social WTP accounted for greater consideration of the species' environmental and cultural importance. However, Kenter et al. (2016b) discovered that people stated lower social WTP for entering a natural area than individual WTP, due to the concern that a higher entrance fee could potentially exclude those who with low income.

Consistent with the assumption of previous studies above, our study found that demographic variables (e.g., income) had less significant impacts on the social preferences than on the individual preferences (Table 3), implying that personal traits have less constraint on the expression of social preferences. However, while the social preferences demonstrated smaller standard deviations, narrower disparities between means and medians, and hence more converged distributions than individual preferences in both scenarios of our survey, this result does not provide sufficient evidence to support the claim that the expression of social preferences was more inclined to reach a consensus. This is because the difference between the distributions of the social and individual preferences was not statistically significant.

In terms of the magnitude of preferences, our study found that the average social preferences were lower than the average individual preferences in both scenarios (Table 3). However, this finding does not suggest the consideration of social interest and fairness substantially shapes people's references. This is because, in both scenarios, most participants expressed similar social and individual preferences, with the lower average social preferences resulting from fewer participants exhibiting high values (Fig. 3). Additionally, the difference in the magnitudes of social and individual preferences was statistically significant only in Scenario 1, not in Scenario 2.

The lack of statistically significant differences in the magnitude and convergence of the distributions of social and individual preferences in our estimates does not necessarily mean that the assumptions in previous literature are incorrect. Murphy et al. (2017) and Ainscough et al. (2024) suggested that deliberation helps align self-focused preferences

Table 4
Estimates of correlations between personal variables and preferences.

Variables	Scenario 1		Scenario 2	
	(1) Individual WTA	(2) Social WTA	(3) Individual WTP	(4) Social WTP
Whether the participants were a local (1 = Yes, 0 = No)	−0.162 (0.201)	−0.145 (0.202)	−0.166 (0.207)	−0.062 (0.211)
Whether the participants had been to the Reserve (1 = Yes, 0 = No)	−0.241 (0.182)	−0.063 (0.182)	0.213 (0.187)	0.238 (0.191)
Main workplace of participants (1 = indoor areas, 0 = outdoor areas)	0.223 (0.265)	0.355 (0.267)	0.009 (0.272)	−0.213 (0.279)
Weekly frequency of being out in nature (times per week)	0.051 (0.036)	0.014 (0.035)	−0.047 (0.036)	−0.041 (0.037)
Whether the participants had a child under 18 (1 = Yes, 0 = No)	0.114 (0.259)	−0.289 (0.258)	−0.061 (0.262)	0.179 (0.274)
Age (years)	−0.027** (0.011)	−0.010 (0.011)	0.001 (0.011)	0.009 (0.012)
Gender (1 = female, 0 = not female)	−0.066 (0.160)	−0.050 (0.161)	−0.093 (0.165)	−0.032 (0.168)
Marital status (1 = being married, 0 = Not being married)	0.308 (0.261)	0.622** (0.263)	0.071 (0.266)	−0.199 (0.281)
Education level (1 = no formal education, 2 = primary education, 3 = lower secondary, 4 = upper secondary, 5 = technical secondary school, 6 = junior college, 7 = bachelor, and 8 = postgraduate)	0.130*** (0.074)	0.163** (0.076)	0.054 (0.074)	−0.004 (0.075)
Monthly income (CNY/month)	0.0001* (0.000)	0.000 (0.000)	0.0001** (0.000)	0.000 (0.000)
R^2	0.02	0.02	0.03	0.02
Observation	188	188	188	188

Note: *** $p < 0.01$. ** $p < 0.05$. * $p < 0.1$. The numbers in parentheses show the standard errors. Observation here is 188, rather than the total number of participants (196), because the data of 8 participants did not provide the complete demographic information we needed and was dropped for this analysis.

more closely with social preferences. Since the individual and social preferences we assessed were expressed after deliberation, their lack of statistically significant differences might result from the effects of deliberation. Nevertheless, as this study does not include pre-deliberation preferences, the impact of deliberation remains unclear and warrants further investigation.

5.3. Do people value cultural services differently depending on whether they are potential visitors or tour guides in a protected area?

Regardless of whether from a social or an individual perspective, both the median and mean values of a hypothetical tour guide's WTA in Scenario 1 were substantially higher than the median and mean values of a hypothetical visitor's WTP in Scenario 2, due to the following reasons. Participants expressed the certainty that, as tour guides in Scenario 1, they would visit the Reserve nearly every weekday, with the Reserve being their sole place of interaction with nature during working hours. This assurance ensured a high frequency of potential nature interactions and receipt of cultural services. Conversely, as a potential visitor in Scenario 2, participants were uncertain about their frequency of accessing the Reserve. Even without the entrance card, they still had alternative choices to obtain cultural services through visiting other nature parks.

In the existing literature, WTA also tends to be higher than WTP. This disparity is due to multiple factors. First, Horowitz and McConnell (2002) and Wegner and Pascual (2011) emphasized that WTA typically assumes the respondent already has a prior right to a good or service, whereas WTP assumes that the respondent must pay to obtain that right. Such assumptions are also reflected in Scenarios 1 and 2 of our survey (a hypothetical tour guide had prior right to experience cultural services, whereas a hypothetical tour guide did not). People tend to value what they already own more highly than equivalent goods they do not own. This fact is referred to as an endowment effect in the existing studies (Plott and Zeiler, 2005; Coren, 2007). Furthermore, WAT corresponds to the compensation of a loss, while WTP is payment for a gain. Tversky and Kahneman (1991), Isoni (2011), and Chapman et al. (2023) have noticed that, due to psychological loss aversion, individuals often perceive losses as more significant than equivalent gains. Additionally, Whittington et al. (2017) indicated that WTP may be constrained by income, whereas WTA may overcome such constraints.

Our findings address key research gaps: the lack of assessment of values of cultural services specific to local staff in protected areas and whether people's perceived values change with their stakeholder roles. Our hypothetical tour guides perceived significantly greater value in cultural services compared to visitors, due to differences in psychological status, the availability of substitutes for cultural services, their prior rights to such services, and the certainty of their interactions with nature. While previous studies (Lal et al., 2017; Sangha and Russell-Smith, 2017; Chen, 2021; Coyne et al., 2022) have highlighted the non-material importance of protected areas to visitors, indigenous communities, and residents, this study further extends this understanding to local staff. Opportunities for local staff, such as tour guides, to interact with protected areas offer them valuable non-material benefits, the loss of which may warrant compensation exceeding 10 % of their annual salaries.

5.4. Effectiveness of online tying for deliberation

Compared to in-person deliberation, our online deliberation overcame travel restrictions and significantly reduced the time and financial costs associated with in-person meetings, making it easier to gather participants. Also, Wilson and Hoehn (2006) and Talpin and Wojcik (2012) expressed concern that the perceived power or social status of other participants (e.g., their appearance or attire) can influence an individual's confidence to communicate. Online deliberation, which discloses less physical information about participants compared to in-person deliberation, may mitigate such concerns. However, online deliberation may exclude or disadvantage individuals with lower digital literacy, potentially affecting the sample representativeness. Albrecht (2006) and Smith et al. (2009) also noticed that participants' different IT skills and media preferences can influence their interest and ability to engage communication online. Sherman et al. (2013) found that some people may feel less connected and bonded with others online compared to in-person interactions.

Compared to video and audio meetings, which are also commonly used for online communication, typing has two main differences: (1) it allows participants to communicate either synchronously or asynchronously (although many chats in our deliberation were asynchronous), whereas video and audio meetings are synchronous; (2) it does not convey facial information or voices. These two features of typing may potentially hinder or foster deliberation (Table 5). Despite its shortcomings, online typing was the best approach available for our purposes, as explained previously.

5.5. Validity of valuation results

The hypothetical tour guides' individual and social WTA in Scenario 1 were 5975 CNY/yr/person and 4565 CNY/yr/person, respectively. Due to the lack of previous monetary valuation studies specifically assessing local staff's preferences for the cultural services of protected areas in similar regions, we cannot check the robustness of our WTA

Table 5
Potential strengths and shortcomings of typing for online deliberation.

Features	Strengths	Shortcomings
Opportunities for asynchronous communication	Chen et al. (2024), Lim (2017), and Andrade et al. (2023) suggested that asynchronous media provide greater time flexibility than synchronous media, because participants can view and respond to a written chat record regardless of when they join deliberation. Such time flexibility, according to Hsiao (2012), also offers participants more opportunities to consider their ideas and organize language, fostering in-depth and critical thinking.	Hsiao (2012), Watts (2016), and Varumo et al. (2020) found that asynchronous deliberation is less capable than synchronous chats in providing immediate interaction and creating a sense of collective action and social connection.
No disclosure of facial information or voice	Typing has a higher level of confidentiality than video and audio meetings. This was why many participants agreed to join our deliberation. According to Stromer-Galley (2002) and Strandberg and Berg (2015), concealing personal identities may also help participants focus more on what is being said rather than who is speaking.	Halpern and Gibbs (2013) suggested that hiding personal details may reduce participants' accountability for their statements, increasing the risk of disrespectful language. For example, one participant in our deliberation referred to someone with opposing views as a "stupid pig". Furthermore, Chen et al. (2024) indicated that concealing facial and vocal information may limit participants' ability to use and interpret non-written messages, such as emotions, tones, and other physical reactions.

estimates by comparing them with other studies' estimates. However, the salary options ranging from 35,000 to 55,000 CNY for hypothetical tour guides were designed to fall into the real-world annual salary range of local staff in the Reserve, which is typically between 30,000 and 60,000 CNY according to the local experts we consulted. This implies that our WTA estimates may be contextually reasonable but require further validation through evidence from real-world markets.

The hypothetical visitors' individual and social WTP for an annual entrance card of in Scenario 2 were 532 CNY/yr/person and 398 CNY/yr/person. Such estimates can complement observations in the real market. The Reserve does not sell any annual entrance cards. Instead, it charges a regular entrance fee of approximately 100 CNY, valid for three consecutive days after purchase, and offers free entry or concessions to certain groups (e.g., children under 14, students, disabled individuals, and veterans) (Fanjing Mountain, 2024). It also offers other one-time services, such as bus rides and scenic cable cars, which can cost up to 140 CNY per use. On average, each real-world visitation has generated approximately 250 CNY in revenue for the Reserve since 2019, according to the Guizhou Provincial Government (2023). However, the tourism revenue from per visitation underestimates each visitor's WTP for cultural services, because (1) it omits other travel expenses (e.g., costs of outside accommodation and commuting) and the opportunity costs of time spent traveling, as noted by Mayer (2014) and Mayer and Woltering (2018); (2) a visitor may visit the Reserve more than once each year. Our WTP estimates exceed this average revenue per visitation and, therefore, can enhance the existing understanding of the value of the Reserve's cultural services.

We agree with other researchers (Loomis, 2011; Hausman, 2012; Fifer et al., 2014), who have noted that preferences for a good or service stated in a hypothetical scenario may diverge from the preferences revealed in an identical situation in reality due to different mentalities and cognitive processes. To address such hypothetical bias, a crucial step, as suggested by Schröter et al. (2021), is to be transparent about the assumptions underlying the hypothetical scenarios, thereby clarifying the scenarios' applicability. The assumptions of our scenarios have been clarified in Section 3. Vlaev (2012) and Haghani et al. (2021) found that participants often overstate their preferences in hypothetical scenarios, for example, due to the lack of real financial commitment. To mitigate potential value overestimation, this study, as mentioned in Section 3, not only integrated Cheap Talk Scripts but also adopted 20,000 CNY as the conservative estimate if the WTA or WTP expressed by a participant was over 20,000 CNY.

Moreover, we enhanced the credibility of valuation results through investigating the reasoning behind the participants' preferences during deliberation, as discussed into Section 5.1. Deliberation also helped address participants' misunderstanding of the purposes of the survey and the scenarios. As an example, in Scenario 1, some participants believed that we were genuinely hiring tour guides and hence asked: "If I work very hard for more than a year, can you improve my salary in the next year?". Similarly, in Scenario 2, several participants thought we were truly designing an entrance card and inquired about the possibility of obtaining monthly or weekly entrance cards. Such misunderstandings can potentially diminish the quality of valuation and may even evoke resistance, as evidenced by a few participants questioning during deliberation: "I have lived around the Reserve for many years but never paid to enter it. Why are you charging me now?". Nevertheless, we addressed participants' concerns through clarifying the hypothetical nature of the scenarios and the survey's goal (which solely aimed to value cultural services, without intending to alter the entrance fee or hiring tour guides). Szabó (2011), Saarikoski and Mustajoki (2021), and Jiang et al. (2023) also highlighted that deliberation allows researchers to clarify their research to participants and engage with participants, enhancing participants' trust in and understanding of the research while also reducing participants' resistance to research.

While the low R^2 in Table 4 implies several limitations (see Section 6.1), it does not necessarily invalidate statistical tests for the regressors, as discussed by Mullahy (2017). Instead, our regression still provided several explanations regarding whether the demographic variables we considered could influence participants' social and individual preferences differently or similarly. Additionally, ordered probit uses pseudo-R2, instead of R^2, to measure goodness-of-fit (Daykin and Moffatt, 2002). While the low pseudo-R2 value in our ordered probit model indicates limited predictive power, assessing the model's predictability was not our objective. We also undertook bootstraps to check the robustness of the regression results and did not find any substantial inconsistency.

6. Research limitations and suggestions

Although we controlled several potential biases related to our research methods and results discussed above, we acknowledge that the results still involve uncertainties due to the limitations specified below.

6.1. Sample bias and suggestions

As noted by Costanza (2020) and Chen et al. (2024), small-sample issues are common in deliberation-based studies, including this study with only 196 participants, as deliberation requires more time, money, and labor than studies based solely on questionnaires. Although we checked the robustness of our regression results using bootstrapping, we acknowledge that preferences expressed by a small and unbalanced sample may be biased and lack sufficient representativeness.

First, a small sample combined with heterogeneity in the participants' preferences, as shown in Fig. 3, might increase the difficulty for our ordered probit model to explain how different variables affect

preferences, potentially leading to the low R^2 shown in Table 4. This low R^2, along with the lack of significant impacts of most variables on preferences, also implies that the included variables might not fully explain the preferences, highlighting the need for further investigation into unobservable factors. For example, Dhakal et al. (2012) and Ezebilo et al. (2015) suggested that attitudes towards outdoor activities and recreational hobbies (e.g., hiking, biking) can affect people's preferences.

Moreover, as demonstrated in Appendix 2, compared to the general population of the study area, our sample comprised a higher percentage of participants with younger ages, higher education degrees, higher incomes, a lower unemployment rate, and a lower marriage rate. Van Deursen et al. (2011) and Correa (2016) found that younger and better-educated people tend to be more proficient in IT skills, especially skills in using social media, and more comfortable expressing opinions online. Earlier studies (Dimante et al., 2016; Du et al., 2019; Jin and Li, 2020) also suggested that better educated people are generally more environmentally conscious. Peng et al. (2018) and Ren et al. (2020) indicated that Chinese citizens with higher incomes tend to show greater concern for environmental quality and benefits. Given these findings, it is unsurprising that our sample was overall younger, better educated, and richer than the general population. University students, who made up 40.3 % of our participants, were particularly interested in participating in our survey and were overrepresented in our sample. Murphy et al. (2005) found that the overrepresentation of university students is common in stated preference studies.

Extrapolating our value estimates of cultural services to the broader population requires further analysis with a more balanced sample that represents a diverse and inclusive range of participants. Nevertheless, we controlled for demographic variables in our statistical analysis. Both this study and numerous earlier studies (Hirons et al., 2016; Peng et al., 2018; Jin and Li, 2020; Ren et al., 2020; Tu et al., 2020) have found that individuals with higher levels of education and income tend to place greater value on environmental benefits. Consequently, we anticipate that a more balanced sample would assign a lower value to cultural services compared to our sample, as our sample was wealthier and better educated than the general population. This hypothesis can be explored in the future. Future deliberation-based surveys can also explore strategies to convene a more representative and sufficient sample for deliberation.

6.2. Limitations of survey design and suggestions

We only estimated the post-deliberation preferences without comparing them to pre-deliberation preferences. Consequently, it remains uncertain whether our participants would have expressed their individual and social WTA and WTP differently had deliberation not been integrated into our survey, although deliberation can potentially shape preferences. Future research should investigate additional roles of deliberation in value elicitation, such as whether it has a greater impact on the magnitudes and convergence of individual or social preferences, and whether it has varying impacts on different stakeholders.

The choice of deliberation media also influences how deliberation affects valuation results. Earlier studies (Monnoyer-Smith and Wojcik, 2012; Wang et al., 2017; Chen et al., 2024) indicated that the strengths and limitations of deliberation media influences deliberation effectiveness, specifically in terms of inclusiveness (involving a wide range of participants), engagement (enabling in-depth communication among as many participants as possible), and openness (allowing diverse views to be expressed transparently and respectfully). However, it remains uncertain whether other deliberation media would have been more effective than online typing for our survey. We recommend further research to compare how different media uniquely shape the expression of preferences.

While we accounted for and controlled the bias related to the hypothetical nature of value-eliciting scenarios, such bias could have been further mitigated by adopting additional strategies. For example, existing studies (Loomis, 2011; Whitehead et al., 2016; Penn and Hu, 2018) have suggested Certainty Scale Correction, based on participants' ratings of how certain they are about their preferences, and Consequentiality, which involves convincing participants that their responses will influence real-world conservation policies or practices. Although not adopted in this study, these methods may be applicable to future research.

In addition, as shown in Appendix 1, our questionnaire elicited individual preferences before social preferences. The ways in which questions are asked, including the order of questions, in stated-preference surveys may affect participants' choices. For example, Cai et al. (2011) and Day et al. (2012) noted that the initial question may influence the mindset of participants, prompting them to either highlight distinctions or maintain consistency when approaching the subsequent question. It is unclear whether our outcomes would have differed if we had elicited individual preferences later. To enhance the robustness of preference elicitation, future studies should account for and control the order effects of preference-inferring questions.

7. Conclusion

Despite several limitations, we found that the values of cultural services can be influenced by multiple factors, including (1) participants' consideration of how these services make similar or different contributions to individual and social wellbeing; (2) different stakeholder roles that involve varying psychological status, available substitutes for cultural services, prior rights to such services, and certainties of interacting with nature; and (3) demographic variables, such as income and education. Our findings also highlight that the opportunities for local staff, such as tour guides, to interact with protected areas offer them valuable non-material benefits. Moreover, assessing social preferences may complement assessment of individual preferences and enhance the understanding of the collective or public characteristics of many cultural services that benefit individuals, communities, and the public. However, consideration of more social issues, such as fairness and others' benefits, during the value elicitation process does not always lead to significantly higher, lower, or more converged preferences, although the expression of social preferences may be less affected by demographic variables compared to individual preferences.

To enhance the robustness of preference elicitation, future surveys should include a more representative sample and address biases arising from the order of preference-eliciting questions and the choice of deliberation media. Future research should also investigate the role of deliberation in value elicitation more comprehensively, such as whether deliberation has a greater impact on individual or social preferences, whether deliberation affects the preferences of different stakeholders differently, and whether differences in deliberation media influence the expression of preferences.

CRediT authorship contribution statement

Haojie Chen: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Tong Zhang:** Writing – review & editing, Methodology, Formal analysis, Writing – original draft. **Robert Costanza:** Writing – review & editing, Supervision, Methodology. **Ida Kubiszewski:** Writing – review & editing, Supervision, Methodology. **Matthew R. Sloggy:** Writing – review & editing, Funding acquisition, Supervision. **Luhua Wu:** Writing – review & editing, Investigation. **Haohan Luo:** Writing – review & editing, Investigation.

Declaration of competing interest

We declare that we 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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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ecolecon.2025.108632.

Data availability

Data will be made available on request.

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