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Role of risk preferences in explaining the public's willingness to pay for marine turtle conservation in China

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ABSTRACT

This study examines the role of risk preferences in explaining the public's willingness to pay for marine turtle conservation in China. Respondents (n = 218) were randomly selected from eight districts in Beijing. They were interviewed in person and participated in a risk experiment. The results show that residents in Beijing had some knowledge about marine turtles. The typical respondent in Beijing is risk averse. We found that the risk preferences of individuals have significant effects on their willingness to pay for marine turtle conservation. Risk taking respondents are more likely to support the marine turtle conservation program. Results also indicate that increases in the bid value, household income levels, years of education and participation in public environmental issues have significant effects on the public's acceptance of marine turtle conservation. The findings of this study can help resource managers and/or policy makers to improve the conservation of marine turtles in China.

1. Introduction

Marine turtles are important species, not only for their economic and intrinsic value, but because their presence is often an indicator of healthy marine ecosystems (Rathnayake, 2016). With a total marine area of over 4,700,000 km^2 and a coastline of 32,000 km, China is home to a wide range of marine species, including marine turtles. Five species of marine turtles can be found in China, including loggerheads *(Caretta caretta),* green turtles (*Chelonia mydas*), leatherbacks (*Dermochelys coriacea*), hawksbills *(Eretmochelys imbricata*), and olive ridleys (*Lepidochelys olivacea*). All of these species have been facing serious threats from habitat destruction and poaching (Gong et al., 2017; Chan et al., 2007; Cheng, 1998) and are listed as endangered or vulnerable on the International Union for Conservation of Nature Red List (IUCN, 2017). Thus, there is a need to conserve these species and their habitats (Rathnayake, 2016).

Biodiversity conservation activities can generate a wide variety of use and non-use values (Freeman, 2003). Because there are no market prices for non-use values, traditional market economic analysis methods cannot be used to measure the total benefits of marine turtle conservation. The contingent valuation method (CVM) is a typical non-market valuation technique that queries individuals' willingness to pay (WTP) or willingness to accept (WTA) using contingent markets (Mitchell and Carson, 1989). Several scholars have found that the CVM is an appropriate method for valuing endangered species conservation (Chambers and Whitehead, 2003; Bandara and Tisdell, 2004; Jin et al., 2008; Rathnayake, 2016). This study applied CVM to analyze the public's demand for marine turtle conservation.

A thorough understanding of the issues determining public demand for marine turtle conservation is an important prerequisite for conservation programs or activities. For this reason, recent research into correlates of the public's demand has attracted attention from scholars in the fields of economics, sociology, and psychology (Jin et al., 2016; Volland, 2017). One important factor is risk preference (Liu, 2013; Chuang and Schechter, 2015; Hao et al., 2016). For biodiversity conservation, the public may show risk-averse behavior due to uncertain benefits of conservation and the irreversibility of investments (Farsi, 2010).

There is a substantial body of theoretical literature that has emphasized the importance of uncertainty and risks in investment and consumption decisions (Gollier, 2002; Newell and Pizer, 2003; Howarth, 2009), but there have been few empirical studies (Farsi, 2010; Qiu et al., 2014). Bocquého and Jacquet (2010) employed a theoretical model and simulation method, and found that risk attitudes play an important role in farmers' adoption of renewable energy production. Erdem et al. (2010) found that risk-taking consumers in Turkey were willing to pay a higher price for hybrid vehicles. However, Erdem et al. (2010) elicited consumer risk preferences by asking individuals to indicate their own risk attitudes on a scale from 1 to 5. A concern with this method is that survey questions may not be incentive compatible

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(Dohemen et al., 2011). Various factors, including inattention, self-serving biases, and strategic motives could distort the risk preferences reported by respondents (Camerer and Hogarth, 1999). The contribution of this study extends the literature by using a well-established experimental technique to better elicit the risk preferences of individuals and to explore the role of risk preferences in explaining the public's WTP for marine turtle conservation in China. The findings of this study can provide useful implications for resource managers and/or policy makers with an improved understanding of how best to move marine turtle conservation forward in China.

2. Materials and methods

2.1. Survey design

Six focus-group discussions (FGDs) and two pre-tests provided feedback that served as the basis for the survey design. A total of thirty environmental and biological experts as well as local residents participated in the FGDs. The purpose of the FGDs was to identify the bid levels and ensure that items in the survey were practical and easy to understand. The discussions were planned and guided by a facilitator. Participants were encouraged to share their opinions and attitudes about the topics discussed. The pre-test surveys were conducted to validate the bids used in the questionnaire and to identify potential problems.

The survey instrument used in the field included four sections. The first section was some warm-up questions to get people thinking about the environmental issues in China. Respondents were asked whether the environment and natural resources in China were cared for properly or not. They were further provided with nine environmental problems, including air pollution, water pollution and endangered species conservation. They were asked to rank the three most important issues in China. The second section focused on respondents' attitudes towards endangered species conservation and knowledge on marine turtles. Respondents were provided with six endangered species (including dugong, rhino, marine turtle, whale shark, black-faced spoonbill and eagle) and asked to indicate the species that they thought was most deserving of conservation. Several knowledge questions about marine turtles were also investigated. The third section elicited respondents' WTP for a marine turtle conservation program in China. Respondents were first presented with the current situation and threats to marine turtles in China. Then we described a conservation program designed to conserve marine turtles in China. The elicitation format employed was a dichotomous choice contingent valuation method (DC-CVM) question, which is generally considered to be a superior elicitation method (Lee and Mjelde, 2007). The respondents were asked whether they would be willing to pay a pre-chosen randomly assigned amount for the conservation program. Five different bids were used: USD 0.02, 0.50, 1.00, 5.00, and 7.50. The payment vehicle was a monthly mandatory surcharge on household electricity bills. After the DC-CVM question, the respondents were asked a series of debriefing questions, including respondents' reasons for being willing to pay or unwilling to pay. Before the valuation question, a cheap talk script initially suggested by Cummings and Taylor (1999) was used to reduce potential hypothetical bias by thoroughly describing and discussing the propensity of respondents to exaggerate stated WTP. In the final section of the survey, we collected socio-economic information of the respondents and their households.

2.2. Experimental design

To elicit and measure an individual's risk preference, we used the multiple price lotteries (MPL) method proposed by Holt and Laury (2002). Each respondent was asked to choose between matched pairs of safe and risky options for ten given choices with real money rewards. Table 1 illustrates the basic payoff matrix presented to respondents. In all rows, the payoffs are CNY 10 and CNY 20 for option A, the safe option, and CNY 5 and CNY 30 for option B, the risky option (CNY is the Chinese currency, approximately USD 1.00 = CNY 6.7).

The first row illustrates that option A offers a 100% chance of receiving CNY 10 and option B offers a 100% chance of receiving CNY 5. This question was simply a test to confirm that the subject understood the instructions, and had no relevance for risk aversion (Harrison et al., 2003). The second row in Table 1 illustrates that option A offered a 90% chance of receiving CNY 10 and a 10% chance of receiving CNY 20. The expected value for this option (EV^A) is shown in the fourth column as CNY 11, although the EV columns were not presented to respondents. Similarly, option B in the second row had a 90% chance of receiving CNY 5 and a 10% chance of receiving CNY 30, for an expected value of CNY 7.5. Thus the two options in this case had a difference in expected value of CNY 3.5. For each pair of alternatives, the difference of expected value is given by $D = EV^A - EV^B$. In our experiment, where the payoffs are fixed, the difference between the corresponding expected values depends only on the probability of winning the payoffs. As one proceeds down the matrix, the probability of the payoff in each pair increases by 0.1 for each subsequent choice. The expected value of both options increases, but the expected value of option B becomes greater than the expected value of option A. The design of the choices in our experiment is such that the sign of this difference changed from positive to negative in the fifth choice. A risk neutral person will choose the safe option A when this difference is positive and the risky option B when the difference is negative. We can predict the pattern a risk neutral person will likely choose: AAAA/BBBBBB. As in Holt and Laury (2002), the total number of times that a subject chose the safe option A in the ten decisions can be used as an indicator of risk aversion. A risk averse person will select the safe option A more than four times, whereas a risk taker will choose it less than four times.

2.3. Sample and data collection

The respondents surveyed in this study were residents from eight districts of the Beijing urban area. Based on the parameters of households published by official statistics, a total of 500 households were selected, randomly distributed in the eight districts of Beijing. The reason for using Beijing as the study area is that many residents in Beijing originally migrated from other provinces and they are assumed to have knowledge and attitudes that would be representative of other provinces in China.

This study used a multi-stage stratified random sampling method. In each district, we first randomly selected four sub-districts. In each sub-district, we identified the number of street blocks and randomly drew a sample from the appropriate street blocks. Selected blocks were divided into many buildings and every third building was selected. We approached the households on every three floors of the chosen buildings until five households agreed to participate in our study.

An invitation letter on the letterhead of the sponsoring university signed by a member of the research team was given to each selected household. Respondents were asked if they would be interested in participating in a scientific study that involved an interview survey and experiments. They would be paid CNY 50 (about = USD 7) plus different amounts of cash prizes to participate in the study. No other details about the survey or the experiment were provided. We specified that only heads of households (male or female) 18 years or older could participate in the study. A mutually convenient date and time was selected for an appointment to complete the survey. Finally, those respondents who indicated they would participate in the study were phoned two days prior to the appointment date to confirm their participation.

On the date of the appointment, each respondent was first asked to complete a questionnaire through an in-person interview and then asked to participate in the MPL experiment. The experiment was administered in a group setting with about 8–10 participants for each