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Chinese urbanites and the preservation of rare species in remote parts of the country: the example of eaglewood

Abstract

Based on a contingent valuation study in Shanghai the authors assess people's willingness to contribute personally to the alleviation of environmental problems occurring in distant parts of the country. One split of survey assessed Shanghai residents' willingness to pay for the preservation of rainforest in Yunnan, while the other split referred to the willingness to pay for the preservation of a single plant species (i.e. eaglewood) growing in this rainforest. The objectives of this study were twofold. Firstly, the authors wanted to find out if people living in big Chinese cities like Shanghai take an interest in the environmental problems existing in some remote parts of the country and if they are willing to contribute personally to remedy these problems. Secondly, the authors wanted to learn more about the motivation behind this kind of empathy, if it exists. The researchers were especially interested in the question if this empathy refers to the specific environmental problems addressed in the surveys or if it is motivated more by a general feeling of obligation towards environmental issues.

Keywords: eaglewood, rubber cultivation, biodiversity preservation, contingent valuation, ecosystem services, China.
JEL Classification: D61, Q51, Q57.

Introduction

In Chinese cities people's awareness of environmental problems has grown rapidly over the past years since these problems have become more and more evident and increasingly pressing. Most of the environmental problems discussed in Chinese megacities refer to air and water pollution, but there is also an increasing awareness of the importance of biodiversity and urban green (see e.g. Chen and Jim, 2008; Chen and Jim, 2010). Not only ordinary citizens but also Chinese government became aware of the environmental problems facing the country already some time ago and they have begun to transform the Chinese economy towards more sustainability. So, after years of unchecked growth the Chinese find themselves beyond the peak of the Environmental Kuznets Curve (see Stern, 2014) where they now try to reconcile economic growth and ecological resilience. Consequently, also government has adopted this topic and official projects like "Low-carbon Cities", "Blue Skies China", "Green China" etc. have turned environmental protection and redemption into a task of national importance and a social norm that infiltrates the official statements by politicians as well as by "good" citizens.

One of the consequences of this development may be the fact that in most interviews and environment-related surveys respondents emphasize the importance of environmental protection for them. In respective willingness-to-pay studies typically a majority of respondents states that they are willing to contribute also financially to projects leading to environmental improvements (cf. e.g. Zhang, 2011; Dong, 2012; Wang and Zhang, 2009). In such studies respondents are typically confronted with rather unspecific scenarios of environmental improvements like "air quality improvement" or "biodiversity preservation" where the general social norms set up by government are rather likely to influence the results. Especially in the big cities in China where people have a better education than in the countryside and where green attitudes are fashionable people are willing to subscribe to pro-environmental opinions.

In the present study we want to find out if Chinese urbanites' willingness to contribute to the good environmental cause still persists when things become more specific (and less spectacular). In a comparative study we let two representative samples of Shanghai residents (as an example of a Chinese megacity) value two different government projects where the first project aims at the protection of tropical rainforest in general in Yunnan in southwest China, while the second project aims at the preservation of a specific plant in this rainforest, namely the eaglewood tree (*Aquilaria sinensis*). The Aquilaria trees like the whole tropical rainforest in that area are endangered by rapidly expanding rubber (Xu et al., 2014).

In a contingent valuation method (CVM) study we first assess Shanghai residents' willingness to contribute financially to the protection of eaglewood trees in Xishuangbanna in order to get an idea of how much they appreciate the preservation of a specific and well-defined plant species in a distant region of the country. In this context we also assess the socio-economic characteristics and general attitudes of the supporters of eaglewood preservation as well as of the non-supporters in order to characterize both groups in more detail. It is clear that for most of our respondents the benefits they get from this preservation project represent nonuse values only since they do not live in that region so that they will not benefit directly from this project. Nonuse values describe that part of the total value of a good that does not stem from its direct use (Nunes, 2002). Regarding environmental "goods" (like

rainforests or specific plants and animals) nonuse values might arise from the satisfaction people get from knowing that these goods will be preserved for future generations (bequest value) or from the fact they will have the possibility to utilize these goods in the future if they want (option value) or they might simply think that it is desirable that these goods exist no matter if they see or use them personally or not (existence value). Of course, also altruistic feelings might give rise to nonuse values if e.g. Shanghai people want the environment to be preserved for the local population in Xishuangbanna.

In a control study we assess Shanghai citizens' willingness to contribute financially to the preservation of the rainforest in general in the same region, i.e. in Southern Yunnan. So we can compare the results of two different CVM studies conducted with the same urban population where one study assesses the willingness to pay (WTP) for the protection of a specific plant species in Yunnan and the other assesses the WTP for the protection of a whole ecosystem, i.e. rainforest, in the same region. As an economist one would expect that the average WTP for the whole ecosystem (i.e. the rainforest in Yunnan) should be significantly higher than the WTP for one species from this ecosystem (i.e. eaglewood trees). In many studies, however, stated WTP did not increase with the scale or scope of the project to be valued. This phenomenon has been discussed at length in the literature under the names of "scope insensitivity", "nesting effect", "embedding effect", "part-whole bias" etc. (cf. Kahneman and Knetsch, 1992; Boyle et al., 1994; Carson and Mitchell, 1993; Carson and Mitchell, 1995; Brown and Duffield, 1995; Whitehead et al., 1998, etc.). Different explanations have been given, the most prominent of which is that when valuing environmental goods people's WTP refers to the "moral satisfaction" (Kahneman and Knetsch, 1992) or the feeling of "warm glow" (Andreoni, 1990) they derive from contributing to a "good cause" like an environmental improvement and not from the improvement itself. In this case it is plausible that their WTP is independent of the scope of this improvement. We will test if such scope insensitivity can also be detected for the WTP of Chinese urbanites in Shanghai for the preservation of rainforest in Yunnan in general on the one hand and of one specific plant in that rainforest (i. e. eaglewood) on the other. If it turns out that, indeed, we can identify scope insensitivity in our study this might be interpreted as an indication that the WTP stated by our respondents in Shanghai refers more to environmental preservation in general than to the specific projects in Yunnan suggested in our scenarios. This might reflect the effectiveness of the environmental social norms propagated by Chinese government (cf. e.g. the official website of the Ministry of environmental Protection of the PRC http://english.mep.gov.cn/).

The rest of the paper is organized as follows: in the next section we describe the plant the protection of which is to be appraised in our CVM study, i.e. the eaglewood tree in Xishuangbanna. In section 2 we describe the details of our study and in section 3 we discuss our results. The final section contains some concluding remarks.

1. Eaglewood – a threatened plant species in Yunnan's rainforest

Eaglewood, or the wood of the gods as it is sometimes called, plays an important role in Chinese Traditional Medicine (TCM). It "promotes Qi-circulation, relieving pain, warming middle-jiao, controlling nausea and vomiting, governing inspiration and relieving asthma" (Huang et al., 2013). Besides its application in TCM it is also used in aromatherapy, as incense in religious practices of Buddhists, Muslims and Hindi, and for the manufacturing of perfumes (Chetpattananondh, 2012). Finally, the wood is used for fine bracelets and other small ornamental items and sometimes also for luxurious carvings. Actually, eaglewood is one of the most expensive raw material for perfumes in the world (Jung, 2013). In China it is known under the names of "chenxiang, chenshuixiang, shuichenxiang". It has been reportedly used by humans for more than 2000 years (Persoon, 2007).

The only source of eaglewood in China is the tree *Aquilaria sinensis*. The unique feature of 'eaglewood trees' is the formation of a dense resinous and highly fragrant wood as the result of damage-related fungus infection. The highest grades can therefore usually be found only in very old trees. Such grades reach extraordinarily high prices, while healthy trees without a fungus infection are, from an economic point of view, practically worthless (Persoon, 2007). Less than 10% of all Aquilaria trees form eaglewood at all. Additionally, the size of the valuable resin pockets, usually ranging between 50 to 1000 g, is highly variable (Gunn et al., 2004). Since eaglewood cannot be detected safely in a standing tree the trees are usually felled to see if they contain some eaglewood. The fact that on average ten Aquilaria trees have to be felled in order to find one tree with a fungus infection building eaglewood led to the near extinction of the respective trees throughout their range. The situation is aggravated in Yunnan by illegal logging practised by criminal eaglewood traders from neighboring countries like Laos and Myanmar.

Chinese Eaglewood can only be found in the southern provinces of China, in Guangdong, Guangxi, Hainan, and especially in Yunnan (Jinghong area) (IUCN, 2013). There are no figures about the available stock, but IUCN classifies the tree as "vulnerable B1+2cde (ver 2.3)" (IUCN, 2013). Neverthe-

less, this assessment dates back to the 90s of the last century. Meanwhile, the natural habitat of *Aquilaria sinensis* suffered a tremendous decline due to the transformation of its habitat into agricultural land and cash crop production like rubber. Additionally, devastating poaching decreased the number of trees. It is therefore safe to say that the most important sources of eaglewood in China are seriously threatened.

2. The study

2.1. The contingent valuation method. In line with the anthropocentric definition of environmental values economic valuation techniques focus on the change in the wellbeing of all people affected by a change in environmental quality. If we want to find out how much a person appreciates a certain environmental project we have to specify two different scenarios, one scenario describing the new state of the environment after the project has been carried out (scenario 1) and one scenario describing the status quo (scenario 0). The utility change ΔU_h^{01} experienced by a household h resulting from an environmental change from the initial situation 0 to the new situation 1 can be expressed by:

$$\Delta U_h^{01} = v_h\left(p, z^1, I_h\right) - v_h\left(p, z^0, I_h\right), \quad (h = 1, 2, \ldots H), \quad (1)$$

where p is the vector of market prices, I_h is household h's income. The vectors z^0 and z^1 describe the state of the environment before and after the environmental change, respectively, where the elements of z are parameters describing environmental quality (air quality, water quality etc.). The indirect utility function $v_h(p, z, I_h)$ describes the maximum utility the household can reach at given prices p, its income I and the state of the environment indicated by z.

If the environmental change affects the household's utility in a positive way, utility increases so that $\Delta U_h^{01} > 0$. Accordingly, in the new situation the household could give up some part of its income while maintaining the same level of utility as in the status quo situation. This reflects the fact that environmental quality can substitute for market consumption as expressed by income in terms of utility. With better environmental quality the household needs less income for market consumption without being worse off than before. The income variation that would exactly compensate an environmental improvement in terms of utility is the Hicksian compensation variation. The compensating variation can be interpreted as a household's maximum willingness to pay (WTP) for the environmental improvement, i.e. the maximum decrease in income that would compensate the household for the environmental improvement in terms of utility so that:

$$v_h\left(p, z^1, I_h - WTP_h\right) - v_h\left(p, z^0, I_h\right) = 0, \quad (2)$$

From (2) it becomes obvious that WTP refers to all kinds of environmental changes that affect a household's utility. As mentioned before these can be use values obtained directly from the utilization of environmental goods (like e.g. hiking in the rain forest) or nonuse values (like the knowledge that the rain forest or some plant or animal species is preserved for future generations). Therefore, also people who never visit the rain forest can experience a utility increase just from knowing that it will be preserved.

The overall social benefit accruing from an environmental improvement can be defined as the sum of individual WTP of all households affected by this improvement (Bateman, 2002):

$$B^{social} = \sum_{h=1}^{H} WTP_h . \quad (3)$$

This value can then be compared to the social costs that a project leading to the environmental improvement would imply. From the social point of view the respective project should only be implemented if its benefits outweigh the costs.

Various different valuation techniques can be used to estimate individual WTP for an environmental improvement (cf. e.g. Ahlheim and Frör, 2003). In the present study we choose the contingent valuation method (CVM). The CVM is a survey-based method where people's maximum WTP for a specific environmental project is assessed in standardized interviews. If the CVM sample is representative of the population affected by the environmental project in question the empirically assessed social benefit $\overline{B}^{social}$ can be calculated by multiplying respondents' average WTP by the total number of households affected, i.e.:

$$\overline{B}^{social} = H \cdot \overline{WTP_{sample}} . \quad (4)$$

In contrast to market-based valuation techniques like the travel cost method or hedonic prices the CVM can assess both use and nonuse values of an environmental good (Ahlheim and Frör, 2003). Furthermore, the valuation task to be performed by respondents is intellectually less demanding and less time intensive as compared to other stated preference methods such as choice experiments. This is of particular relevance for the present study since it was carried out as a street intercept survey in the busy megacity Shanghai where people have not much time for taking part in interviews.

2.2. Definition of the affected population. It can be seen from equation (3) that the social benefit of

an environmental protection policy is determined by two factors: The change in individual utility that is reflected by a household's maximum WTP and the number of households whose WTP is taken into account when computing the social benefit. Thus, besides correctly assessing individual WTP the definition of the population affected by an environmental improvement is critical for the overall result of the study.

For the present survey we have to define who are the beneficiaries of an effective protection policy of the Chinese eaglewood population as well as of the rainforest in Yunnan. There is one rather 'obvious' group of stakeholders who would most likely enjoy the implementation of an eaglewood protection policy, namely the local population. This group would receive (nonmarket) use values as well as nonuse values from an improved eaglewood or rainforest preservation in Yunnan. In addition to the local population there is the group of people who make actively use of eaglewood products like bracelets or tea. Since these are market goods for which consumers pay separately in the respective markets these benefits have to be ignored in our study in order to avoid double counting. Finally, there is a third group that is often overlooked: People who neither enjoy products made from eaglewood nor enjoy the respective nonmarket use values of the plant or of the rainforest in Yunnan. Still, these people enjoy some nonuse values as explained above accruing from eaglewood or rainforests. They may want to preserve the option of enjoying the goods or services of these "goods" for the future. Furthermore, they may be happy to know that people living in Yunnan do not have to suffer soil erosion or water pollution, two problems that are likely to grow if the population of eaglewood trees further shrinks. They may also want to preserve the eaglewood population for future generations.

The broad definition of the total economic value of an environmental resource implies that environmental projects are likely to generate nation-wide benefits. Accordingly, the WTP of the entire nation should be taken into account when calculating the social benefit of a particular policy. It is clear that this would be an extremely time-intensive and expensive undertaking. However, in this study we want to test the hypothesis that also people who are not directly affected by the protection of the Chinese eaglewood population or the rainforest in Yunnan on site would nevertheless experience an increase in utility thanks to the respective environmental improvements. In the present study the urban population of Shanghai was chosen as an example of a population that is mostly indirectly affected by the suggested preservation projects and, therefore, will at most receive nonuse benefits from them.

A second goal of this study is, as mentioned before, to compare the results of two CVM studies where the first refers to the protection of eaglewood in Yunnan and the other to the preservation of the rainforest in the same region, which would, of course, include the preservation of eaglewood. We want to test if nonuse values exist for both preservation projects and we want to compare the WTP statements for the two projects. Our hypothesis is that the WTP for the rainforest protection should be higher since this project implies the preservation of eaglewood which is part of the rainforest.

2.3. The survey. Both surveys were carried out in the second half of 2013. They were designed as street intercept surveys with face-to-face interviews, i.e. we did not hand out the questionnaires to respondents but, instead, read out the questions to them. Respondents were randomly addressed at different spots in twelve districts of Shanghai. In order to obtain data that is representative for the urban population of Shanghai a quota sampling approach was used, thereby controlling for gender, age and education of the respondents. Information concerning these three criteria was obtained from the Shanghai Statistical Yearbook, 2012 (Shanghai Municipal Statistics Bureau, 2013). In an attempt to only account for people permanently living in Shanghai only people who had been living for at least five years in the city were interviewed.

In the eaglewood (rainforest) survey a total of 399 (397) people were interviewed. On average one in six persons contacted by an interviewer agreed to take part in the survey. This response rate of 16% is low but appears to be acceptable for an intercept survey in a busy megacity. Two (three) questionnaires had to be discarded because of missing information concerning a respondent's home district. The sample thus consists of 397 (394) valid questionnaires. One (four) respondent(s) did not give any answer to the WTP question and five (36) respondents chose the 'don't know' option on the payment card leading to 391 (354) WTP statements. The questionnaire used for the eaglewood survey consisted of five parts. First of all, the purpose of the study was briefly introduced and respondents were asked several questions concerning their socio-demographic characteristics. Afterwards, respondents' previous knowledge about eaglewood and its importance for humans was assessed. Subsequently, a very detailed text about the main characteristics of eaglewood and about its endangerment in China was read out to the respondents during the interviews. In this text it was mentioned that part of the endangerment of eaglewood is due to illegal logging, partly by criminals from adjoining countries. It was reported that the ille-

gal activities of these logging firms disturbed the wildlife there and reduced biodiversity. We also mentioned that China would depend on eaglewood imports from other countries if it were extinguished in China because we wanted to learn how important China's independence of other countries is for Chinese people. After that the details of a hypothetical government program for the preservation of eaglewood in Yunnan, which we called the 'eaglewood protection program', were described. The program was presented as a long-term policy measure implemented by the Chinese central government which aims at effectively monitoring and protecting Yunnan's remaining eaglewood population.

We then explained to respondents that government would need additional funds in order to finance this protection policy. They were told that it was planned to raise the value-added tax for this purpose. Pretests had confirmed that this payment mechanism was well understood and accepted by Chinese people. Respondents were explained that their monthly household expenditures would increase through the eaglewood protection program and asked whether they would support the new policy under this condition or not. Those who gave a favorable opinion were asked to make a WTP statement on a payment card, where maximum WTP amounts were stated instead of payment intervals as in an ordinary payment card. On this payment card RMB amounts reaching from 'max 2 RMB' to 'more than 150 RMB' were displayed. In addition a 'don't know' option was displayed on the payment card (cf. appendix for the exact wording of the elicitation question). The last part of the questionnaire consisted of a series of questions concerning the financial situation of a respondent's household as well as attitudinal questions aiming at identifying additional determinants of WTP statements. The questionnaire of the rain forest survey was structured analogously. Here respondents obtained an introduction to the ecosystem services of natural rainforests and the consequences of their destruction by the rubber industry. A government project for the preservation of the rainforest in Yunnan in general was suggested, and then respondents were asked which increase of their monthly household expenditure they would accept at maximum in order to get this project realized. Also in this survey we used the payment card as an elicitation format.

3. Results and analysis

3.1. Sample characteristics. The demographic characteristics of the overall sample (eaglewood and rainforest survey) are displayed in Table 1. 53% of the respondents are male that come close to the share of 52% reported in the Statistical Yearbook. The representation of different age groups is very similar to the official data and the share of people with higher education reflects the official numbers very well. The average household size in the sample of approximately 3.1 people is not significantly different from the official number of 2.9. Respondents dispose of an average income of 10 512 RMB per month (1 267 €[1]). This figure is significantly higher than 8 759 RMB reported by the Shanghai Municipal Statistics Bureau. Since the official figure stems from a household survey conducted in 2010 the two figures are not strictly comparable. The higher income of the respondents in the present study is likely to correctly reflect a general increase in household income from 2010 to 2013. It can be concluded that the sampling procedure has successfully yielded a sample that is representative of Shanghai's urban population. Nevertheless the two subsamples differ significantly in several characteristics (age, household size and disposable income) as shown in Table 1. This will be considered when evaluating the data.

Table 1. Demographic characteristics of the survey sample

	Total sample	Eaglewood sample	Rainforest sample	T-test of equal means across subsamples
Variable	Mean (std. dev.)	Mean (std. dev.)	Mean (std. dev.)	*p*-value
Male	0.529 (0.499)	0.504 (0.501)	0.555 (0.498)	0.149
Age	40.8 (17.0)	38.8 (15.6)	42.8 (18.180)	0.001
Education level	4.306 (1.209)	4.335 (1.194)	4.277 (1.226)	0.503
Household size	3.095 (1.145)	2.977 (0.922)	3.215 (1.326)	0.004
Monthly disposable household income (in 1000 RMB)	10.512 (7.594)	11.038 (6.993)	9.959 (8.151)	0.049

Note: A description of the several variables can be found in the appendix, Table A.2.

[1] At an exchange rate of 1€ = 8.297RMB, October 1, 2013.

3.2. Respondents' familiarity with eaglewood. In the first part of the questionnaire respondents' knowledge about eaglewood and their experience with it was assessed. Only 30% of the respondents said that they had already heard of the eaglewood plant before participating in the survey. Thus, the majority of respondents were ignorant of the environmental good to be valued prior to the CVM interview. Those who had already heard about it were asked which uses and properties of eaglewood they were familiar with. The three most frequently mentioned associations with eaglewood were its positive effects on human health, bracelets with eaglewood beads and scented wood. In spite of assessing how familiar people in Shanghai are with eaglewood the researchers aimed at identifying those who had already made use of it. Merely 11% of all survey respondents said that they had already enjoyed products gained from eaglewood. The most frequently named products they had enjoyed were eaglewood bracelets (88%). Scented wood and tea from eaglewood leaves turned out to be less popular products (19% and 17% respectively).

3.3. WTP for an effective monitoring and protection of the Chinese eaglewood stock in Yunnan[1]. The mean willingness to pay of the sample amounts to 34.75 RMB (4.19 €) per month[2]. This corresponds to about 0.31% of the average monthly household income. It is to be noted that the median willingness to pay of approximately 10.00 RMB (1.21 €) is significantly lower than the mean estimate. This is due to the distribution of WTP statements that is displayed in Figure A1 (see in Appendix). The relatively lower median reflects the considerable number of respondents who stated a WTP of zero (30%), while the mean estimate is affected by the outliers of 150 RMB and higher.

3.4. Determinants of WTP. It can be expected that WTP importantly varies across different groups in the population. For example, respondents with higher incomes can be expected to have a higher WTP for the environmental program than those with lower incomes. But also other demographic variables may affect stated WTP. The identification of such determinants of WTP for an environmental improvement is of interest for two reasons. First such relationships between WTP and certain socioeconomic characteristics (like e.g. income) can be interpreted as indicators of the validity and economic plausibility of the collected data, since according to economic theory WTP should increase e. g. with income. Second, the socio-demographic characteristics of the groups stating the highest WTP and the lowest WTP for an environmental project characterize the winners and the losers of such a project (in terms of utility) if eventually it is implemented without additional costs for the population. Since this is typically the case the determinants of WTP can also be interpreted as indicators of the distributional effects of the environmental project in question.

In order to detect such determinants three different Tobit regression models[3] with increasing complexity are computed (cf. Table 2). In Model 1 the maximum WTP amount is regressed against some standard socio-demographic characteristics. In Model 2 additional variables referring to the previous knowledge of respondents with respect to Xishuangbanna and eaglewood are included in the regression analysis. In Model 3 further explanatory variables are added to the model, namely variables referring to certain aspects of a respondent's subjective life satisfaction, the emphasis respondents put on China's independence of eaglewood imports from other countries and their personal interpretation of the duties of a good citizen ("It is the duty of a good citizen to support the eaglewood protection program"). Additionally, a variable describing protest attitudes of citizens (e.g. "Taxes are already so high that an additional surcharge on the value-added tax is not a good way to finance the program") was considered in this model.

In the first model merely two out of the five demographic variables have a significant effect on WTP in this model: A respondent's income (INCOME) affects WTP positively while AGE affects it negatively. While the effect of age disappears when including additional explanatory variables in Models 2 and 3, the income effect persists. This is taken as an indicator of the theoretical validity of the results.

[1] For the sake of briefness the analyses of WTP is limited to the eaglewood sub-sample. Descriptive and analytical statistics for the rainforest sub-sample can be found in the Appendix.

[2] In the present study the sample's average WTP has been calculated as follows: The answers of respondents who answered 'no' when asked whether they would support the eaglewood protection program although it would increase their monthly household expenditures were counted as a WTP of zero. The responses of those who answered 'yes' in a first step but chose 'don't know' from the payment card were coded as missing answers. The amount chosen from the payment card by all other respondents is assumed to reflect their 'true' maximum WTP for the program. The answers of those who selected 'more than 150 RMB' from the payment card were coded as an amount of 200 RMB.

[3] The standard model for analyzing a two-step elicitation question would be a two-step Heckman regression model. However, due to the small sample size and the little insights that could be gained from the predictions of the Heckman outcome equation, we decided to combine the answers of the first and the second step in a single variable. The generated variable takes the value of zero if a respondent refused to make any financial contribution and the value corresponding to the selected payment card amount otherwise. This dependent variable ranges from 0 to 200. Since the data are left-censored we use a Tobit model for the analysis (Maddala, 1983).

Table 2. Tobit regression models displaying determinants of WTP

Variable[1]	Model 1		Model 2		Model 3	
	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.
CONSTANT	-9.723	15.578	-34.757**	16.967	-171.1***	25.639
AGE	-0.341*	0.199	-0.204	0.199	-0.057	0.187
MALE	8.029	5.808	2.525	5.803	5.398	5.406
EDUCATION	3.321	2.654	1.760	2.609	4.227*	2.453
INCOME	2.444***	0.418	2.054***	0.427	1.385***	0.426
KIDS	2.685	5.969	1.932	5.915	-1.902	5.554
KNOW_XB						
– HEARD_XB			32.028***	9.749	14.596	9.455
– BEEN_XB			47.955***	12.928	30.026**	12.375
KNOW_EW						
– HEARD_EW			11.875*	6.479	8.249	6.070
– USED_EW			6.801	9.596	-0.842	9.089
ECOSIT					9.099*	5.609
SAT_LIFE					12.930**	4.656
SAT_5YEARS					12.280***	4.492
INDEP					16.301***	5.903
GOOD_CIT					7.550**	3.100
PROTEST					-1.892	5.896
Observations	357		357		357	
Log likelihood	-1430		-1420		-1359	
Pseudo R-squared	0.017		0.024		0.045	

Note: Confidence at *** 1%-level, ** 5%-level, *10%-level.
A detailed description of the explanatory variables used in the regression models can be found in the appendix, Table A.2.

In the extended model (Model 2) two categorical variables indicating how acquainted a respondent is with the project site and the environmental good to be valued are included. The variable KNOW_XB takes three levels, namely "1" for respondents who have neither been to nor heard of Xishuangbanna, "2" for respondents who have heard of but never been to Xishuangbanna and "3" for respondents who have already been to Xishuangbanna. The first category (being completely unacquainted with the project site) serves as base category. The variable KNOW_EW also consists of three levels, namely a base level indicating that a respondent has neither used nor heard of eaglewood products, a second level indicating that a respondent has already heard of eaglewood but never used an eaglewood product and a third level for respondents who have already consumed an eaglewood product. While a respondent's acquaintance with the project site (KNOW_XB) matters for stated WTP, familiarity and experience with the environmental good in question (KNOW_EW) have no statistically significant effect on stated WTP. Those who have already heard about Xishuangbanna and those who have even been there are willing to contribute more money to the Eaglewood Protection Program as compared to respondents who are completely ignorant of Xishuangbanna. It is interesting that an analogous effect of the acquaintance of respondents with eaglewood itself on stated WTP cannot be observed. This could be interpreted as an indication that respondents' WTP refers more to the preservation of the biodiversity hotspot Xishuangbanna as a whole than to the preservation of a single species, namely eaglewood. In this case average stated WTP for eaglewood in this survey and average WTP stated in the survey on the preservation of Yunnan's rainforest in general should not differ significantly. This would be a classic case of a "part-whole bias" (cf. Whitehead et al., 1998). We will come back to that point later.

Finally, Model 3 shall give some more insight into the motivations underlying a respondent's WTP statement. A respondent's judgment of his or her economic situation relative to others (ECO_SIT as well as a respondent's satisfaction with her life as a whole (SAT_LIFE) and her life satisfaction today as compared to her life five years ago (SAT_5YEARS) have positive effects on stated WTP. These effects are also in line with the results from previous CVM studies (cf. e.g. Ahlheim et al., 2012; Spash, 2006). The effects of the remaining attitudinal variables are also intuitive and indicate the validity of the WTP estimate: respondents who believe that it is their duty as good citizens to support the environmental project (GOOD_CIT) have a higher WTP than others. Also respondents who assign a high importance to China being independent of eaglewood imports from other countries (INDEP) have a higher WTP. The latter effect points to the relevance of a certain patriotic attitude for the support of public projects

aimed at protecting a natural resource in one's home country. Rather than taking a purely individualistic perspective people tend to base their WTP decision on broader considerations, for example the wellbeing of their country (INDEP). The variable GOOD_CIT (agreeing with the statement "It is the duty of a good citizen to support the eaglewood protection program") hints at the importance of social norms when it comes to environmental protection. The Chinese government supports efforts towards environmental protection very strongly in its official statements and this seems to have an effect also on single citizens' attitudes towards these issues.

The variable PROTEST refers to respondents' objections to the payment mechanism presented in the survey, more precisely, to an opposition against increasing the value added tax in order to fund the Eaglewood Protection Program. Since this effect is not statistically significant in our analysis reservations towards the payment vehicle which might have biased our results do not seem to influence stated WTP in our survey.

3.5. WTP for the preservation of eaglewood vs. WTP for the preservation of Xishuangbanna's rainforest. As can be seen from Table 3 the mean WTP for eaglewood is significantly higher in absolute terms than the WTP for the rainforest in general, if only at the 10% level. However, looking at the share of stated WTP of household incomes we find very similar results for both surveys. This is due to the fact that average household income is significantly higher in the eaglewood sample (see Table 1). It is interesting to note that the share of WTP statements of zero RMB as well as the share of missing answers is significantly higher for the rainforest survey than for the eaglewood survey. One possible explanation for these results could be that people take less interest in the general rainforest scenario than in the eaglewood scenario, which might appear more tangible and also more credible than the broader rainforest scenario.

Table 3. WTP for eaglewood and WTP for Xishuangbanna's rainforest

Variable	Eaglewood survey	Rainforest survey
Mean WTP		
absolute value (std. deviation)	34.757 (43.191)	28.893 (47.134)*
% of income	0.032%	0.029%
Share of WTP of zero RMB	0.298	0.382**
Share of missing answers	0.015	0.102***

Note: Means are different at *** 1%-level, ** 5%-level, *10%-level according to the results of a Kruskal-Wallis test.

In the view of the differing socio-demographic characteristics of the two subsamples and, thus, potentially confounding effects on the WTP estimates the difference in WTP has also been assessed by means of regression adjustment and propensity score matching (cf. e.g. Wooldridge, 2010; Robins and Rotnitzky, 1995; Abadie and Imbens, 2011), thereby controlling for age, household income and household size. The results are shown in Table 4.

Table 4. Treatment effects on WTP

Method	Rainforest survey [1]	Eaglewood survey [2]	Average treatment effect [1]-[2]	Robust s.e.	*p*-value
Regression adjustment	29.765	32.189	-2.423	3.279	0.460
Propensity score matching	27.104	31.393	-4.289	4.017	0.286

Note: The average treatment effect corresponds to the difference between the assessed mean WTP of the rainforest subsample minus the mean WTP of the eaglewood sample. The following control variables have been included: AGE, INCOME, HH_SIZE.

As can be seen from Table 4 after these adjustments average stated WTP for the realization of the general rainforest scenario on the one hand and for the more detailed eaglewood scenario on the other do not differ significantly. One plausible explanation of this result could be that though in our questionnaire we explain to respondents the ecosystem services people might expect from enhanced rainforest areas this is still rather abstract for them as compared to a single plant with especially attractive properties like the eaglewood trees. Such a single plant species might appear much more concrete and easier to imagine than a whole ecosystem. It might be easier to build up a kind of personal relationship with one specific plant species which is portrayed in detail than with a whole ecosystem. An analogous psychological effect is used e.g. by charitable organizations collecting donations for the education of children in developing countries. They try to build up a personal relationship between one specific child and potential donors by providing photos of the child and details of its family and ethnic background etc. because they expect people to be more generous towards this single child than towards the whole population in the respective country. We suppose that a comparable effect is at work here.

Conclusion

The objectives of this contingent valuation study were twofold. Firstly, we wanted to find out if people living in big Chinese cities like Shanghai take an interest in the environmental problems existing in some remote parts of the country and if they are willing to contribute personally to remedy these problems. Secondly, we wanted to learn more about

the motivation behind this kind of empathy, if it exists. We were especially interested in the question if this empathy refers to the specific environmental problems we addressed in our questionnaires or if it is motivated more by a general feeling of obligation towards environmental issues triggered by the social norms of good citizenship.

With respect to the first question we found that there exists a non-negligible willingness to contribute financially to the preservation of the environment in Yunnan even though we surveyed residents of Shanghai. This implies that projects serving environmental preservation in Yunnan yield not only use values for the population living there or spending their holidays there, but that such projects also produce nonuse values for Chinese people living far away from the project site. This contradicts the general image of modern Chinese people being individualistic and primarily interested in consumption and their personal enjoyment (cf. e.g. Wang and Xu, 2009). The respondents in our two surveys showed a considerable interest and empathy towards environmental problems they will never be confronted with personally.

Regarding our second research question we found that this readiness to help to alleviate environmental problems in other parts of the country does not seem to refer to specific environmental issues which are considered especially grave by respondents but more to a general willingness to improve and preserve the environment in China. This interpretation is supported by the fact that respondents' willingness to contribute to the preservation of eaglewood was especially pronounced among those who showed high scores regarding the importance of "good citizenship" for them or regarding the importance of China being independent of imports from other countries. These are very general motives to contribute to environmental preservation in China which do not depend on specific preservation projects.

These results show that when appraising the overall social benefits accruing from an environmental project in China it is important to assess not only the ensuing use values but also the nonuse values accruing to people living far away from the project site. Further, our results support the hypothesis that Chinese people do care for environmental issues in general, and that this environmental empathy is not constrained to some specific issues of environmental preservation but refer to the preservation of the environment in China in general.

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Appendix

Table A1. Wording and structure of the elicitation question used in the survey

Question	Answer options
Considering that your monthly household expenditures would increase through the eaglewood protection ["Preserve Xishuangbanna"] program would you still be willing to support it?	○ Yes → go to next question ○ No → drop next question
Considering the benefits of the eaglewood protection ["Preserve Xishuangbanna"] program, what is the maximum increase of monthly expenditure your household would be willing to tolerate in order to get the program realized?	○ Don't know ○ Max 2 $\overline{\pi}$ ○ Max 5 $\overline{\pi}$ ○ Max 10 $\overline{\pi}$ ○ Max 25 $\overline{\pi}$ ○ Max 40 $\overline{\pi}$ ○ Max 55 $\overline{\pi}$ ○ Max 80 $\overline{\pi}$ ○ Max 100 $\overline{\pi}$ ○ Max 150 $\overline{\pi}$ ○ More than 150 $\overline{\pi}$

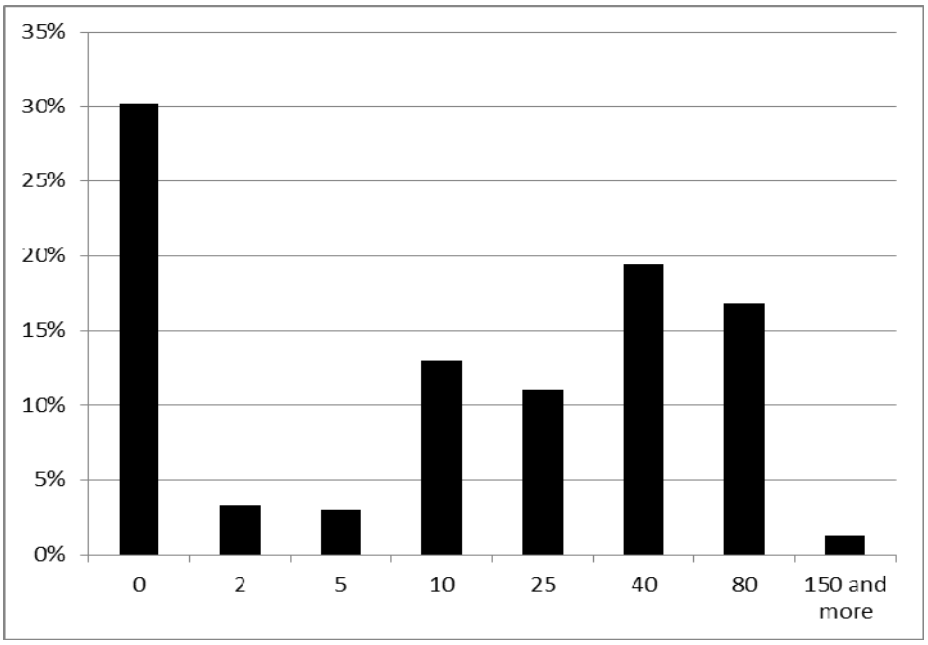

Fig. A1. Distribution of max. WTP amounts (eaglewood sample)

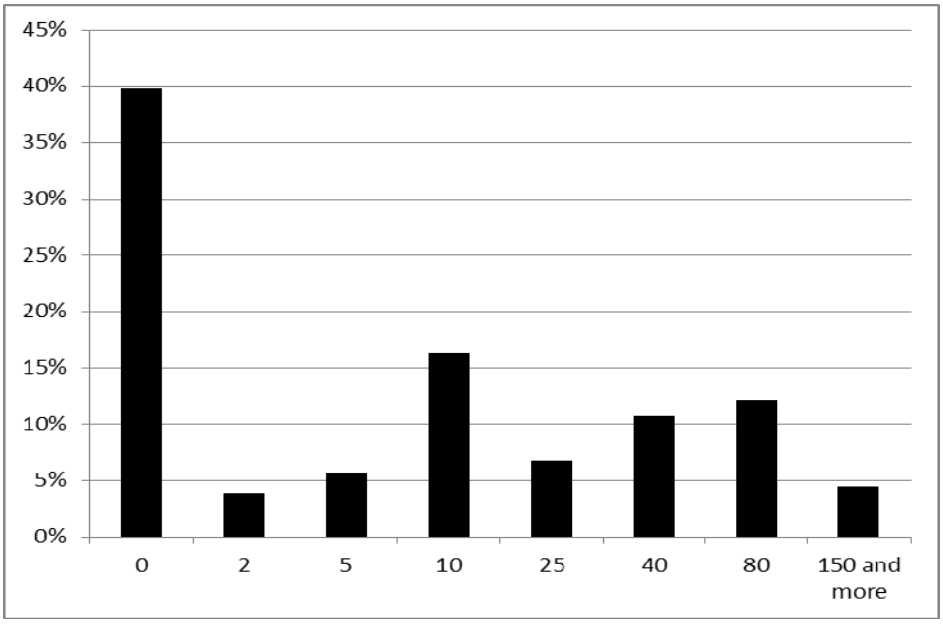

Figure A.2. Distribution of max. WTP amounts (rainforest sample)

Table A.2. Description of explanatory variables used in the statistical analysis

Variable	Description	Eaglewood (*n* = 357)		Rainforest (*n* = 323)	
		Mean	Standard deviation	Mean	Standard deviation
AGE	Age of the respondent	39.090	15.691	41.567	17.960
MALE	Gender of the respondent (1 = male, 0 = female)	0.499	0.501	0.563	0.497
EDUCATION	Level of education of the respondent (1 = did not graduate from primary school, 7 = master degree or higher)	4.331	1.193	4.279	1.230
INCOME	Monthly disposable household income in 1000 RMB	11.008	7.055	9.779	7.810
KIDS	There are children living in the respondent's household (1 = yes, 0 = no)	0.445	0.498	0.505	0.501
KNOW_XB	Acquaintance with Xishuangbanna, categorical variable	1.964	0.493	8.236	6.440
	- Never been nor heard (1)	13.6%		6.9%	
	- Heard but never been (2)	76.1%		80.9%	
	- Already been (3)	10.3%		12.2%	

Table A.2 (cont.). Description of explanatory variables used in the statistical analysis

Variable	Description	Eaglewood (n = 357)		Rainforest (n = 323)	
		Mean	Standard deviation	Mean	Standard deviation
HH_SIZE	Number of person's living in the respondent's household	2.986	0.929	3.170	1.328
KNOW_EW	Acquaintance with Eaglewood, categorical variable	1.521	0.689		
	- Never heard nor used (1)	59.9%			
	- Heard but never used (2)	29.5%			
	- Already used (3)	10.6%			
ECO_SIT	- "How would you judge the economic situation of your household in comparison with the average household in Shanghai?"	2.622	0.530		
SAT_LIFE	- Overall life satisfaction (1 = completely dissatisfied, 5 = completely satisfied)	3.384	0.747		
SAT_5Y	- "Comparing your life five years ago with your life today, how satisfied are you?" (1 = much less satisfied, 5 = much more satisfied)	3.513	0.740		
INDEPENDENT	"Did you consider the benefits of being independent of eaglewood imports from other countries? / "It does not matter if the eaglewood will be extinguished in Xishuangbanna because importing it from neighboring countries will support the economies of these countries and help the people living there" (1 = yes/no, 0 = other combinations)	0.297	0.458		
GOOD_CIT	"It is the duty of a good citizen to support the eaglewood protection program" (1 = strongly disagree, 5 = strongly agree)	3.947	0.930		
PROTEST	"Taxes are already so high that an additional surcharge on the value-added tax is not a good way to finance the program" (1 = agree, 0 = disagree)	0.689	0.464	0.759	0.429

Table A.3. Tobit regression models displaying determinants of WTP: eaglewood and rainforest compared

Variable	Eaglewood		Rainforest	
	Coef.	s.e.	Coef.	s.e.
CONSTANT	-38.645**	17.623	52.290**	25.401
AGE	-0.197	0.200	-0.945***	0.242
MALE	3.988	5.759	3.674	7.988
EDUCATION	1.982	2.612	-0.464	3.447
INCOME	2.150***	0.424	0.249	0.495
KIDS	1.019	5.924	-3.189	7.872
KNOW_XB				
- HEARD_XB	34.510***	9.662	19.309	17.019
- BEEN_XB	51.025***	12.767	37.952*	20.421
PROTEST	5.006	6.251	-33.195***	9.030
Observations	357		323	
Log likelihood	-1421		-1190	
Pseudo R-squared	0.023		0.013	

Note: Confidence at *** 1%-level, ** 5%-level, *10%-level.