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Research on people's willingness to pay for the construction of Quanzhou ecological civilization city based on CVM

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ABSTRACT

The city of Quanzhou city was investigated by CVM and Logistic model. The results show that the average willingness to pay is RMB 110.7/year. Six factors, including the length of registered residence, the length of residence, the income of the residents, the degree of understanding of the construction of Quanzhou's ecological civilization city, and the influence of the public on the ecological civilization's influence on their own lives, have a significant impact on the willingness to pay. Gender, age and occupation have little effect on willingness to pay.

Keywords: ecological civilization city; conditional valuation method; logistic model; Quanzhou; willingness to pay

1. Introduction

How to put nature on the basis of human survival and development and realize the co evolution of human and environment and the sustainable development of resources, the promotion and construction of ecological civilization is an effective path. As a higher-level civilization form after agricultural civilization and industrial civilization, ecological civilization has been the focus of the central and even local governments since it first appeared in the party's report at the 17th National Congress. The report of the 18th CPC National Congress elaborates the construction of ecological civilization in a separate chapter and integrates it into the "five in one" general layout of economic construction, political construction,

cultural construction and social construction[1]. From concept proposal, evolution to implementation, ecological civilization has been integrated into all aspects of national policies. As an important city contributing to the GDP of Fujian Province, Quanzhou has been committed to the construction of ecological civilization city since 2002. Over the years, Quanzhou has made outstanding achievements in energy conservation and emission reduction, Watershed Governance, environmental sanitation guarantee, cultural creation and so oncitizens are the core element of urban construction and are closely related to the establishment of an ecological civilized city. What are their views or attitudes towards the improvement of urban air quality, the reduction of sewage discharge, the construction of clean homes, the promotion and development of a harmonious

society and other changes in the living environment? Taking the permanent residents of Quanzhou as the research object, combined with the conditional value assessment method CVM (hereinafter referred to as CVM), this paper studies the citizens' attitude towards building an ecological civilized city in Quanzhou. It is hoped that it can provide a reference basis for how to give play to the subjective initiative of citizens, how to drive the enthusiasm of community participation and the evaluation of non use value of ecological civilized cities.

2. Research progress at home and abroad

2.1. Foreign research

In the 1960s, ecological civilization began to become a hot topic. Western scholars have formed several major thoughts about ecological civilization, such as ecological ethics, ecological Marxism and ecological socialism, green thought and environmentalism, universal ethics, political ecology and green politics, pessimism and optimism of ecological civilizationscholars have explored from the aspects of concept, system and policy, and gradually constructed a set of theoretical system. Among them, the more representative ones are circular economy theory, steady-state economy theory, ecological modernization theory, etcit was o. Yanitsky of Russia in 1981 who first applied it to practice and guided urban construction with theory. Then, after years of demonstration, the development of eco city theory has developed from the initial ecological principles to comprehensive urban ecological theories such as urban natural ecology, urban economic ecology, urban social ecology and compound ecology[2]. Eco city is called eco city in China. It is the predecessor of eco civilized city. There are differences in the evaluation system between them. Ecological civilization city is an ecological city with Chinese characteristicscvm, as a non market value evaluation method, came into being abroad. It has experienced four stages from the proposal of the preliminary concept to the current popularization and application: a. the concept proposal stage in the 1940s (at present,

the internationally recognized CVM evaluation method was proposed by Mr. Ciriacy wantrup[3], an American resource economist). b. The initial application stage in the 1960s (the typical representative is Davis[4], who used CVM to evaluate the entertainment value of camping and hunting in Maine's woodland). c. The extensive promotion stage in the 1970s and 1980s (the promotion role of the U.S. government is the most obvious). For example, in 1979, the U.S. Water Resources Commission (WRC)[5] recommended CVM and TCM (travel cost method) as two main methods to evaluate the benefits of recreation. In 1986[6], the U.S. Department of the interior recommended the use of CVM as an estimation method of natural resources, environmental existence value and heritage value, etc). d. At the current stage of universal application (according to the papers included in Elsevier SDOL paper library, thousands of papers related to CVM have been included since the 1990s, and the scope of application has also been extended to ecosystem restoration, natural resource value, cultural heritage value, environmental value and other aspects. However, since ecological civilization city is the product of China's practice of ecological civilization construction after the 18th National Congress, it is rare to introduce CVM to study citizens' views or attitudes on ecological civilization city construction.

2.2. Domestic research

In the 1970s, China began to deeply reflect on industrial civilization and preliminarily explore ecological civilization. According to the documents collected by CNKI, domestic scholars began to study ecological civilization in the late 1990s. Although they started later than foreign countries, the research direction and theory are characteristic in combination with China's national conditions. Attention has been paid to ecological civilized cities since 1998, which is mainly divided into two stages: the preliminary exploration stage in the late 1990s and 2008 and the practical application stage after 2008. The initial exploration stage is mainly the introduction of concepts and the exploration of the evaluation index system. For example, Wang

Guangqian put forward the construction ways and specific measures through the elaboration of the evaluation standards of ecological civilized cities. Xiang Enming preliminarily discussed the basic principles and evaluation system of building an ecological civilized city. In 2008, Guiyang opened the launching ceremony of ecological civilization city. Many experts took Guiyang as an example to conduct empirical research. Since then, there have been more and more such studies. The academic circles have avoided the shortcomings of the generalization of previous concepts. The research direction focuses on professionalism and practicability, and the research method has changed from theoretical discussion to the combination of theoretical and empirical analysis. The research contents are mostly found in the evaluation index system, development path, mechanism and system management arrangement of ecological civilized cities, emphasizing the decision-making guidance from the perspective of the government at the macro level. For example, after screening and demon-stration, Liao and others constructed the index system of municipal ecological civilized city. Ma applied the five laws coordination theory to discuss the construction path of ecological civilized city. The introduction of CVM in China began in the 1980s[7]. Xue, Bao and Li[8] studied the tourism value of ecological diversity in Changbai Mountain Nature Reserve, which is a typical application of this method. From 2005 to 2010, scholars gradually used CVM to evaluate the value of environmental resources, river ecosystem service value, wetland/cultivated land value and forest resources recreation value in the form of empirical analysis. In recent years, the research focuses on the controversial issues existing in the domestic application of CVM, such as CVM action principle analysis, deviation research, etcthe main representatives are: Dong xuewang, Zhang Jie and others commented on the deviation in the value evaluation of tourism resources, and finally tested the reliability and validity[9]. Zhang took the inland river ecological restoration in Shanghai as the evaluation object and tested the "content dependence"

in CVM[10]. Xu, Liu and Chang used WTP and WTA measurements on the same interviewee to discuss the real intention of stakeholders for ecological compensation[11]. Although the domestic attention to ecological civilization city is not late and the research on CVM is relatively mature, the research on using CVM to evaluate people's views or attitudes towards ecological civilization construction from the perspective of the people has not been involved. This paper will use CVM value evaluation method to study the citizens' willingness to pay for the construction of ecological civilization city. Taking Quanzhou as an example, so as to provide new ideas for the construction of ecological civilization.

3. Research method

3.1. Selection of CVM boot technology

Guidance technology is the key to how to quantify and truly express the respondents' willingness to pay. According to the literature collected by CNKI, the most widely used in China are the payment card format (PC) in continuous CVV and the double bound in discrete CVA. During the pre survey period, 100 questionnaires were distributed in Licheng, Fengze, Luojiang and Quangang of Quanzhou using payment card and double boundary dichotomy respectively. Through the statistical analysis of the survey results, it is found that the payment card format is more suitable for the survey of Quanzhou citizens' views or attitudes towards the construction of an ecological civilized city. Therefore, the formal investigation adopts payment card.

3.2. Questionnaire design

The questionnaire consists of four parts: the construction of research hypothetical market, the evaluation of awareness and familiarity, the collection of socio-economic characteristics, and the guidance and consultation of willingness to pay.

Hypothetical market construction

The construction of hypothetical market is mainly the introduction of the current situation of the research object, which tends to show the respondents the achievements of Quanzhou in the construction of ecological civilization city over the years, highlight the correlation between the construction of ecological civilization city and the citizens, and call on the citizens to actively participate in the construction of ecological civilization, so as to increase the enthusiasm of the respondents. The main purposes of the construction of hypothetical market are: first, to strengthen the awareness of respondents to the survey questions. Second, make the research atmosphere close to the real market and reduce the hypothetical deviation.

Recognition and familiarity evaluation

The respondents have enough awareness and familiarity with the survey content, which will facilitate the investigators to guide them to express their maximum willingness to pay, and make the survey results closer to CVM needs. The article assesses the awareness and familiarity of the respondents by asking them whether they understand the ecological civilization city, what they are interested in, and the impact of the ecological civilization city on themselves.

Collection of socio-economic characteristics

Referring to the description of individual characteristics in the social and economic characteristics of CVM and the actual situation of the questionnaire survey, the respondents' socio-economic characteristics mainly include gender, age, education, occupation, personal income, registered residence, and residence time. There are 7 aspects.

Consultation on willingness to pay

According to the CVM questionnaire design criteria published by the CVM senior Committee of NOAA[12], combined with the per capita disposable income of urban residents in Quanzhou, it is obtained after repeated modification and confirmation by means of expert consultation and pre survey. Finally, it is determined that the initial bid value is 25, the bid spacing is between RMB 2 and RMB 30, and the minimum (zero willingness to pay is not in this category) and maximum bid values are RMB 3 and RMB 360.

Table 1. Description of questionnaire collection (88 valid questionnaires) (effective rate: 95.5%)

Pre investigation (100 copies in total) (Total 100%)	Valid questionnaires (8) (effective rate: 95.5%)		Invalid questionnaire (12 copies) (Inefficiency 12%)
	Positive payment (83 copies) (83%)	Zero payment (5) (5.0%)	
Formal investigation (Total 900 copies) (Total 100%)	Effective questionnaires (813) (effective rate 90.3%)		Invalid questionnaire (87 copies) (Invalid rate 9.67%)
	Positive payment (741) (82.3%)	Zero payment (72 copies) (8%)	

3.3. Questionnaire implementation

In order to reduce the deviation in the questionnaire distribution process such as hypothetical deviation and information deviation, I have the honor to help Chen Hui, Yu Li and Shi Rong, who often use the questionnaire method to write papers, participate in the questionnaire survey process. After giving a detailed account of the research background, purpose, research content and matters needing attention in the investigation, pre investigation (100 copies) and formal investigation (900 copies) were carried out in Fengze square, lingshowtiandi, Donghu Park and other popular gathering places in Licheng, Fengze, Luojiang and Quangang of Quanzhou from October 5 to October 8 and October 15 to October 24, 2013, respectively. The results of questionnaire collection are shown in **Table 1**.

4. Data analysis

4.1. Deviation handling

When using CVM to investigate the willingness to pay of Quanzhou citizens in the construction of ecological civilization city, the traditional CVM deviation is handled as shown in **Table 2**.

Table 2. Description of deviation treatment

Deviation type	Causes of deviation	Deviation treatment method
Hypothetical bias	Respondents find it difficult to engage in hypothetical market scenarios	a. Emphasize the correlation between the content of the questionnaire and the interest of the respondents. b. Use both pictures and text to make the description of the scene more realistic
Bid starting point deviation	The setting of the starting point, higher value, lower value of the bid value and the distance between bids will affect the respondents to a certain extent	Through the implementation of pre investigation, two points are determined: a. The guiding technology of formal investigation. b. Understand the expected WTP of respondents to determine the bid value
Strategic deviation	Due to psychological factors, respondents may overestimate or belittle the expected WTP	a. Explain the intention and significance of the questionnaire to the respondents. b. Emphasize the anonymity of the questionnaire. c. Try to keep a distance from the respondents when answering sensitive questions to reduce their vigilance. d. Thank the interviewees
Information deviation	The quantity, quality and order of information provided affect the respondents' WTP	Maintain the accuracy of information transmission and the authenticity of scene creation
Does not reflect deviation	The respondents who are unwilling to cooperate with the survey result in	a. Use small objects or words to give guidance. b. The layout of the questionnaire is simple and clear,
	Population representativeness deviation caused by class deletion	The questionnaire questions are simple and easy to answer
Protest bias	Caused by respondents' rejection of hypothetical market or payment method	a. Eliminate the protest number one sample during data processing. b. Original design zero payment
	Deviation	Due to investigation
Partial integral/embedded deviation	Deviation caused by respondents' failure to distinguish between the overall environment and components[13]	Remind respondents to clarify their revenue and expenditure constraints
Investigator bias	The deviation caused by the difference in payment of respondents due to the expression of investigators' investigation skills and methods	a. Unified standards are required to screen the investigators. For example, the second-year graduate students with multiple questionnaire survey experience are selected for this survey. b. Describe the background, content and significance of the questionnaire to the investigators in detail. c. Unified questionnaire style
Residence time length deviation	The deviation caused by the psychological impact of the respondents' time spent on the questionnaire on completing the WTP	a. Strictly control the survey time of the four components of the questionnaire for 3~10min. b. Observe words and expressions, and extend or shorten the survey time according to the attitude and expression of the respondents when receiving the information
Survey method deviation	Payment deviation caused by different investigation methods such as face-to-face interview and telephone inquiry	Face to face communication ensures the accurate transmission and immediate adjustment of information

4.2. Socio economic characteristics and distribution of willingness to pay of respondents

Based on previous research and analysis, the socio-economic characteristics of respondents have an impact on their willingness to pay to a certain extent. **Table 3** shows the socio-economic characteristics and distribution of willingness to pay of respondents in 813 valid questionnaires.

4.3. Questionnaire analysis of zero willingness to pay

A semi open option was set in the questionnaire to analyze the motivation of 72 respondents. The results showed that among the citizens with zero willingness to pay: 36% thought that donating money could not achieve the effect. 27% of the people believe that all the costs of ecological civilization city construction should be borne by the

government or tax paying enterprises. 14% willing to pay but unable to pay. 12% felt it had nothing to do with themselves. Another 11% are unwilling to pay for other reasons such as their temporary residence in Quanzhou.

Table 3. Distribution of respondents' socio-economic characteristics and willingness to pay

Social characteristics	Classification	Number of respondents (person time)	Proportion (%)	Willingness to pay			
				Positive payment		Zero payment	
Gender	Male	488	60.00%	443	90.78%	45	9.22%
	Female	325	40.00%	298	91.7%	27	8.30%
Household register	Quanzhou people	491	60.40%	480	97.76%	11	2.24%
	Outsiders	322	39.60%	261	81.06%	61	18.94%
Years of residence	Within one year	49	6%	38	77.55%	11	22.45%
	2–5 years	152	18.70%	129	84.87%	23	15.13%
	5–10 years	164	20.20%	151	92.07%	13	7.93%
	10–20 years	243	29.90%	228	93.83%	15	6.17%
	More than 20 years	205	25.20%	195	95.12%	10	4.88%
Age	18–25 years old	86	10.60%	76	88.37%	10	11.63%
	26–35 years old	302	37.10%	280	92.72%	22	7.28%
	36–45 years old	236	29%	226	95.76%	10	4.24%
	46–55 years old	153	18.80%	135	88.24%	18	11.76%
	Over 55	36	4.40%	24	66.67%	12	33.33%
Education	Primary school	9	1.10%	8	66.89%	1	11.11%
	Junior high school	181	22.30%	170	93.92%	11	6.08%
	High school	188	23.10%	175	93.09%	13	6.91%
	College and University	300	36.90%	270	90.0%	30	10.00%
	Graduate or above	135	16.60%	118	87.40%	17	12.60%
Monthly income	RMB 3,000 and below	141	17.30%	131	92.91%	10	7.09%
	RMB 3,001–5,000	180	22.10%	168	93.33%	12	6.67%
	RMB 5,001–8,000	207	25.50%	187	90.33%	20	9.66%
	RMB 8000 and above	285	35.10%	255	89.47%	30	10.53%
Occupation	Farmer	18	2.20%	15	83.33%	3	16.67%
	Worker	73	9%	66	90.4%	7	9.6%
	Enterprise staff	206	25.30%	186	90.29%	20	9.71%
	Businessman	243	29.90%	216	88.89%	27	11.11%
	Civil servant	140	17.20%	137	97.86%	3	2.14%
	Government-affiliated institutions	73	9%	65	89.04%	8	10.96%
	Other	60	7.40%	56	93.33%	4	6.67%

4.4. Calculation of average willingness to pay

The CVM's willingness to pay of payment card guidance technology can be obtained by means of mean value method, expected value method, etc. The expected value method is to obtain the expected value, i.e. The average willingness to pay, through the probability distribution of the willingness to pay of each major bid value and the product of the number of payers. This method is simple and flexible. According to the statistical data in **Table 4**, the average willingness of citizens to pay for the construction of ecological civilization city in Quanzhou is RMB 110.70/year.

4.5. Correlation analysis of influencing factors

In order to understand the correlation between cognition and familiarity, socio-economic characteristics and willingness to pay for the construction of Quanzhou ecological civilization city, the willingness to pay is set as a dependent variable and each influencing factor is set as an independent variable, and the binarylogistic model is used for correlation analysis. **Table 5** shows spss17 Binarylogistic[14] model output of 0.

Table 4. Distribution of willingness to pay

Bid value BI/RMB	Payment distribution n (person time)	Relative frequency PI (%)	Cumulative frequency PJ (%)	Bid value BI/RMB	Payment distribution n (person time)	Relative frequency PI (%)	Cumulative frequency PJ (%)
0	72	8.86%	8.86%	80	38	4.70%	54.51%
3	12	1.47%	10.33%	100	43	5.29%	59.80%
5	16	2%	12.33%	120	42	5.17%	64.97%
7	13	1.60%	13.90%	150	44	5.40%	70.37%
10	21	2.60%	16,50%	180	34	4.20%	74.57%
15	30	3.70%	20.20%	200	32	3.90%	78.47%
20	32	3.90%	24.10%	210	39	4.80%	83.27%
25	24	3%	27.05%	240	20	2.46%	85.73%
30	30	3.70%	30.75%	260	34	4.18%	89.91%
40	39	4.80%	35.55%	280	17	2.05%	91.96%
45	31	3.80%	39.35%	300	24	3%	95%
50	46	5.66%	45.01%	330	21	2.58%	97.54%
60	39	4.80%	49.81%	360	20	2.46%	100%
Total	813	100%					

Table 5. Analysis results of binarylogistic model of influencing factors and willingness to pay

	B	S.E.	Wald	Df	Sig.	Exp(B)	95%C.I.for EXP(B)	
							Upper	Lower
XB	0.161	0.544	0.088	1	0.767	1.175	0.405	3.410
HJ	-3.490	0.746	21.894	1	0.000	0.030	0.007	0.132
JZNX	-0.694	0.239	8.467	1	0.004	0.499	0.313	0.797
NL	-0.428	0.324	1.743	1	0.187	0.652	0.345	1.231
XL	0.654	0.256	6.524	1	0.011	1.923	1.164	3.175
SR	0.684	0.264	6.698	1	0.010	1.982	1.181	3.328
LJCD	-2.218	0.434	26.103	1	0.000	0.109	0.046	0.255
YXCD	-2.918	0.402	52.660	1	0.000	0.054	0.025	0.119
ZY	0.063	0.171	0.135	1	0.713	1.065	0.761	1.490
Constant	22.637	3.575	40.102	1	0.000	6.778E+09	—	—

City residents registered residence occupation, education background, income and the degree of understanding of the ecological civilization city construction in Quanzhou, and the influence of the public on the ecological civilization city's life. The 6 factors have significant impact on willingness to pay, while gender, age and occupation have little influence on willingness to pay. The specific situation is: (1) Quanzhou registered residence has more willingness to pay. b. The longer you live in Quanzhou, the more willing you are to pay a certain amount for the construction of an ecological civilized city in Quanzhou. c. The higher the education, the stronger the necessity for the construction of ecological civilization and the more obvious the willingness to pay. d. The income level basically has a positive correlation with the willingness to pay and its size. e. The degree of awareness and familiarity also determines whether citizens support the construction of an ecological civilized city and whether they are willing to pay.

5. Research conclusion and discussion

Research and analysis show that 82.3% of citizens support the construction of Quanzhou ecological civilization city, which has a certain relationship with the publicity of Quanzhou ecological civilization city construction in recent years. At the same time, it also shows that Quanzhou has achieved remarkable results in air pollution, sewage discharge, forest coverage, municipal construction, cultural construction and so on since 2002. From the perspective of WTP, the average willingness to pay of citizens is RMB 110.70/year, which is equivalent to 0.34% of Quanzhou's per capita disposable income of RMB 32,291/year in 2012. The relative ratio is small, indicating that Quanzhou citizens' willingness to pay for the construction of ecological civilization city is within a reasonable range and the data reliability is high. City registered residence, education level, income and the degree of understanding of the ecological civilization city construction in Quanzhou and the influence of the urban ecological civilization on their own life showed 6 factors: willingness to pay, gender, age and occupation. From the perspective of protest response, 8% of the citizens performed well in the early evaluation of the awareness and familiarity of ecological civilized cities, but most of them chose "paid money can't get results" and "should be borne by the government or tax paying enterprises", indicating that the citizens lack the subjective initiative to participate in public services and municipal construction, which is related to the government dependence formed by Chinese citizens for a long time.

How to change the concept of citizens and let them devote themselves to the construction of ecological civilization city is the next task of Quanzhou Municipal Government in the future. The government should continue to do a good job in the construction of ecological civilization: a. Strengthen publicity and emphasize the interest relevance of the construction of ecological civilization city, such as loading publicity advertisements on public buses and posting posters at the entrance of the park. b. Improve public participation, make the whole people invest in the construction of Quanzhou ecological civilization city, and create a new Quanzhou style in material, spiritual and ecological aspects, such as regular environmental protection activities in the community with the family as the unit, schools joining environmental protection classes, etc. c. Fully consider the influencing factors significantly related to the willingness to pay, such as how to improve the attention of outsiders and citizens with short residence years, low education and low income to the construction of an ecological civilized city in Quanzhou.

Although the article has carried out the correlation analysis of the influencing factors, it does not explain the correlation impact of the deep-seated reasons, such as why the length of residence and educational background have a significant impact on the willingness to pay, which seriously weakens the guiding significance of the research results and needs to be further studied in the future.

Conflict of interest

The authors declare no conflict of interest.

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