

RESEARCH ARTICLE

The role of social trust in public participation in environmental governance: Empirical evidence from households in China

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Abstract: This paper explored the role of social trust in public participating in environmental governance, by examining household decisions making on paying for the environment. The data was collected from World Values Survey which was conducted on over 1,900 residents in China. Individual's trust profile was identified by applying the Latent Class Analysis (LCA) approach, respectively in interpersonal trust and institutional trust dimensions. The resulted posterior probabilities of trust classes obtained from LCA were used as predictors for household's payment decisions. The results show that in contemporary Chinese societies, "extended family trust" dominates in the interpersonal dimension, while "political trust" prevails in the institutional dimension. Social trust exerts positive impacts household's willingness to pay for the environments, while the positive effects vary with trust patterns and payment patterns (donation pattern and tax pattern). Overall, interpersonal trust exerts weaker effect than institutional trust; the positive effect of trust is weaker in the tax pattern of paying than in the donation pattern of paying. The article concluded that generalized trust in institution is critical for improving civic participation in environmental governance.

Keywords: household decision, environmental governance, social capital, willingness to pay

1 Introduction

Public participation is critical for environmental governance. The environment is generally regarded as public or quasi-public good. Like all public goods, in the absence of rules, individuals tend to overuse and underinvest in it, *i.e.*, to free-ride^[1]. A vast literature has been developing around the personal and social influences on private provision of environmental public goods. The social factors include religion, urbanrural differences, norms, social class, proximity to problematic environmental sites and cultural and ethnic variations^[2]. Rudd^[3] suggests that, to understand the social driving forces that lead to environmental change, one must account for the role of social interactions, the development of norms of behavior and the development of "social capital". Social capital helps to overcome the collective action dilemmas, facilitates coordination and cooperation for mutual benefit, and enhances the benefits of investment in physical and human capital^[4]. As social capital lowers the costs of working

together, people have the confidence to invest in collective actions^[5]. As one of the core components of social capital^[6], social trust is the most important element for social cohesion^[7].

The primary purpose of this article is to explore the role of social trust in civic participation in environmental governance. The study first looks to the social capital literature to identify manners in which how trust may be link with collective action in terms of the environment, and then empirically examines the relationship between trust and household decision on whether to contribute to the environment. Specifically, this study attempts to address the questions in three aspects. (i) What patterns of social trust have the contemporary Chinese societies presented? (ii) Can social trust play a role in determining residents' willingness to pay (WTP) for the environmental? (iii) Does trust pattern matter for its impact on WTP, and does its impact vary with payment patterns? It is found that in contemporary China, interpersonal trust is dominated by "extended family trust" while institutional trust is characterized by "political trust". Trust increases the willingness to pay for the environment, while the effect varies with payment patterns and trust patterns.

This study differs from previous research on environmental behavior, mainly in three ways. Firstly, previous studies on payment willingness of environmental protection have not distinguished between payment patterns,

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while this study distinguishes between paying by tax and paying by donation. Secondly, previous researches usually use one single variable to identify “general trust”. This study divides trust into two dimensions, in terms of interpersonal trust and institutional trust, and identifies the latent classes in each dimension. The study makes the distinction because there is empirical evidence that the relationship between interpersonal trust and institutional trust is small, though generally positive^[8]. Thirdly, this study applies Latent Class Analysis (LCA) to identify individual’s trust profile, hence addressing the problem that survey data cannot satisfy the normal distribution and homogeneity assumptions in traditional multivariate statistical methods for constructing comprehensive evaluation indicators. To our best knowledge, little literature has explored the trust in Chinese societies from a structural perspective and its role of trust in determining residents’ WTP for the environment. This study provides strong evidence on the positive role of trust in improving the WTP, thus enriching the environment governance literature.

The rest of this paper proceeds as follows. Section 2 provides the literature review on association of trust and environmental behavior; Section 3 outlines the survey used for this analysis, and employs the latent class model to characterize individuals according to the trust profile; Section 4 examines whether and how households’ willingness to pay for the environment is associated with trust. Section 5 concludes.

2 Literature

In the literature, social trust has been defined in different ways. For instance Delhey *et al.*^[9] describe trust as “a part of a broad syndrome of personality characteristics that includes optimism, a belief in cooperation, and confidence that individuals can resolve their differences and live a satisfactory social life together”. Siegrist *et al.*^[10] define trust as “the willingness to rely on those who have the responsibility for making decisions and taking actions related to the management of technology, the environment, medicine, or other realms of public health and safety” (p. 354). There is also the view that social capital is “generalized trust”, formed largely as a byproduct of the activities of individuals interacting with each other within voluntary or informal associations^[3].

The importance of trust has long been emphasized by social capital literature. The role of trust being a component of civic culture cannot be overestimated^[11]. In a society of high trust, civic participation is usually more advocated. Generalized trust has a substantial and significant effect in the collective action dilemma^[12,13]. Substantial empirical evidence supports the hypothesis that

trust matters in production of public goods^[14–16]. There are several reasons to expect that trust fosters civic engagement in environmental governance.

First, any group with social resources has the scope of trust within which cooperation is effective. To facilitate activities, other elements of social capital need to be enhanced by the trust between the actors^[17]. As long as people engage in environmental management, they are taking a kind of collective actions. Collective action is facilitated by inhibition of short-term self-interested behavior via a self-reinforcing cycle of trust and reciprocity^[3].

Second, individual decision-making is subject to loss aversion (*i.e.*, the disutility of a relative loss outweighs the utility of the same outcome), as formalized by prospect theory^[18]. Loss aversion can result in environmentally damaging consumption decisions and actions, while trust helps to reduce the negative impacts of “loss aversion”. Environmentally-relevant decisions often involve the sacrifice of concrete, immediate benefits for the sake of abstract, distant goals^[19]. For instance, the loss of paying for green electricity is the higher energy price and the gains are the reduced fossil fuel consumption and the improved air quality. Apparently, the loss is sure and immediate, while the gains are uncertain and tend to be delayed in time. Individuals usually treat the cost of environmental protection as loss and environmental improvement as gain; the loss usually gets more attention, compared with the uncertain gains in the future^[20]. With the status quo as a reference point, it may be hard to convince individuals to reduce current consumption for the distant gains - such negative reaction of individuals toward green goals is a kind of loss aversion. Generally speaking, people have neither sufficient knowledge about science and technology nor enough resources to make decisions and take actions^[21]. People use trust as a strategy to reduce cognitive complexity in risky decisions^[22], *e.g.*, in accepting or rejecting a technology. Trust has been regarded as a positive predictor of intention to accept a new technology^[23,24]. Stenner *et al.*^[25] provide empirical evidence that distrust in energy utilities plays a significant role when residential consumers choose whether to accept new demand management technology such as direct load control technology. This study argues that trust may increase public willingness to pay for the environment, by enhancing consumers’ acceptance to environmental technology. Liu *et al.*^[26] provide empirical evidence that trust can exert a direct effect as well as an indirect effect on the acceptance to automated driving technology, while perceived benefit is a strong mediator of the trust-acceptance relationship.

Thirdly, trust facilitates the information exchange between social members, and reduces the cost of environ-

mental information. Information can influence individual's environmental behavior^[27]. Lack of information is one of the main barriers of individual engagement in environmental governance. Information is rarely free to decision makers. The information costs may take many forms, which are pervasive in choice settings^[28]. Individuals may not be fully aware of the consequence of their environmental behaviors. There is often information bias in an individual's cognition. Liu *et al.*^[21] provide evidence that lacking subjective knowledge and mutual trust are the psychological barriers for residents to accept green labeled residential buildings, and trust enhances the voluntary cooperation by lowering the information cost of the cooperation. Trust also determines how society members evaluate and respond to the information received. Suh and Han^[29] show that trust in responsible organizations is one of the most effective tools to reduce consumers' perceived uncertainty and risks. Trust is an important measure in networked based communication mechanisms to support the worthiness of information, products, services opinions and recommendations^[30]. At the individual level, norms of trust lead to the formation of reputation, an important asset that helps to reduce the transaction costs associated with exchange in situations of information asymmetry^[31]. Moreover, information exchange may enhance individuals' perception and concern on environmental issues. Residents who believe that their well-being is more threatened by environmental problems are more likely to engage in pro-environmental behaviors^[32]. There is evidence that environmental concern is an important determinant of household decisions on whether or not to accept green electricity^[33]. Hence, this study expects that trust provide facilitate civic voluntary supply of environmental resources by information mechanisms.

Fourthly, previous studies have confirmed the differences in forms and levels of trust across countries. For example, wealthier nations, and those with greater income equality, have higher levels of trust than poorer and more in egalitarian ones; social trust is higher in societies with lower levels of social polarization^[34]. In high trust societies, societal variables of a contextual nature are likely to be more important than individual-level variables, for instance, the form of trust that developed in communist societies of east and central Europe is particularistic and limited, compared with the more generalized trust typically found in the west^[9]. Trust differences between countries lead to the significance of exploring the form of trust in the Chinese societies and its role in environmental governance.

Finally, social trust in the Chinese societies has been regarded as different from that in European nations which

is usually based on common beliefs^[6,35,36]. One of the reasons may be the long-term dominance of Confucian idea in the Chinese traditional culture. On one hand, Confucian idea particularly emphasizes the ethical value of "trust" in interpersonal relationship. On the other hand, Confucian philosophy, based on the hierarchical relationship, views interpersonal relationships as asymmetrical and reciprocally obligatory in which people always feel indebted to others^[37]. Fei *et al.*^[35] proposes Chinese-style trust and argue it was shaped in a "difference sequence pattern", with bloodrelatives and geographical relations as the basis. Similarly, Weber^[6] and Fukuyama^[36] conclude that the traditional Chinese society lacks general trust because the trust is not based on common beliefs, but a form of special trust maintained by blood relations and thus difficult to be generalized.

Tan and Tambyah^[38] find that there are variations in the level of generalized trust of countries in Confucian Asia (covering six countries namely, mainland China, Japan, Singapore, South Korea, Taiwan and Vietnam, and China Hong Kong), despite the fact that these societies share a similar background in Confucian philosophy. In recent studies, Xin and Xin^[39] provide empirical evidence that the marketization process in contemporary China correlates with a trend of declining trust. In contrast, Tao *et al.*^[40] suggest that political trust has enhanced trust in contemporary China. An average calculated on the basis of the first three waves of the World Value Study and based on the standard question of trust thus places China in fourth place after Norway, Sweden and Finland^[41]. Given these arguments, it deserves to explore the form of Chinese trust and its role in environmental governance.

3 Identifying social trust profile

There are different types of division for social trust in the literature, some of which are similar, with subtle difference. Weber^[6] divides trust into 'particularistic trust' and 'universalistic trust'. The former takes blood relations as the basis, established on the basis of interpersonal and family relations, while the latter is based on common beliefs. Mayer *et al.*^[42] divide trust into 'special trust' and 'general trust'. The former is from a perspective of individuals, relying on perceptions of specific context and object, being the result of interpersonal interactions; the latter is from a perspective of institution, being the result of social structure and institution. Mayer *et al.*^[42] further suggest that 'special trust' includes trust in organizations, and 'general trust' is the product of social structure and institution. Mishler *et al.*^[43] argue that trust in institution is an extension of interpersonal trust, and high trust leads to high political trust.

This article integrates various notions of trust in the literature, describing trust at two levels. “General trust” simply takes the notions of “universalistic trust” and “general trust” in the literature as equivalent, defined as “most people can be trusted”. “Special trust”, the focus of this study, is analyzed in two dimensions: (a) the dimension of interpersonal trust emphasizes the trust in specific group of persons, and; (b) the dimension of institutional trust involves the trust in various organizations.

3.1 World values survey

The data is from the fifth wave of the World Values Survey (WVS), conducted in China in 2007 by Peking University. Although there is a more recent wave of WVS available, the fifth wave is the only time the WVS asks the questions about household attitudes toward paying for the environment, which is critical for this empirical analysis. This survey covered 1,991 households in 40 prefectural cities of 22 provinces in China, containing a series of question about general trust and special trust.

Levels of trust reported in the survey indicate the trustworthiness of the societies in which respondents live. A great deal of trust research based on social surveys use a single variable to indicate ‘general trust’. The typical question is, “Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?” The formulation of the question has been criticized for being imprecise and asymmetrical, as it is “anonymous trust”^[44]. Whether the underlying concept of “most people” is captured equally well in all respondents is unknown. Moreover, a single variable cannot capture the deep meanings of trust, particularly the complexity. Torpe and Lolle^[44] have clearly shown the problems associated with relying solely on a single question to measure trust. Because of that, this here the indicator ‘general trust’ is only used for describing the sample.

Table 1 presents the summary statistics of trust indicators. Overall, 48.7% of respondents stated that most people can be trusted.

In terms of interpersonal trust, respondents were asked to report their trustworthiness of five groups of persons, including the family, neighbors, acquaintances, strangers, people of other religions, and people of other nationalities. With regard to each group, the respondents were asked to pick one out of four options: “Trust completely”, “Trust somewhat”, “Do not trust very much”, and “Do not trust at all”. The study integrated the responses to the first two options as “trust”, the responses to the rest two options as “distrust”, and assigned a value of 1 and 0, respectively. Hence, six binary indicators for interpersonal trust were obtained.

Table 1. Summary of the observed trust indicators (n = 1,991, trust = 1, distrust = 0)

General trust		
Most people can be trusted or that you need to be very careful?	0.487	(0.500)
Interpersonal trust		
Family	0.987	(0.114)
Neighbors	0.861	(0.346)
People you know personally	0.82	(0.384)
People you meet for the first time	0.112	(0.316)
People of other religions	0.173	(0.378)
People of other nationalities	0.129	(0.335)
Institutional trust		
Religious organization	0.224	(0.417)
The press	0.584	(0.493)
Television station	0.644	(0.479)
Labour union	0.381	(0.486)
The central government	0.867	(0.339)
Political parties	0.745	0.436
National People’s Congress	0.802	(0.399)
The Civil service	0.728	(0.445)
Major Companies	0.399	(0.490)
Environmental organization	0.531	(0.499)
Women’s organization	0.591	(0.492)
Charitable organization	0.486	(0.500)

Notes: This table reports the means of the observed binary indicators of trust, with standard deviation in parentheses.

Regarding institutional trust, the questionnaire asked respondents whether they trusted a given type of organization. The question contained 12 types of organization. For each type, respondents were asked to pick one from four options “Trust a great deal”, “Trust quite a lot”, “Do not trust very much”, and “Do not trust at all”. Similarly, responses to each type of organization were classified as “trust” and “distrust”. Thus, 12 binary indicators for institutional trust were obtained. (The questionnaire also asked questions about the armed forces, police, courts, ASEAN, and the United Nations. Because inclusion of these organizations would make the LCA analysis more complex, but generate little change in main conclusions, the five organizations were excluded from the analysis).

Trust in specific group of persons or organizations vary greatly. In the interpersonal dimension, the family, neighbors and acquaintances were generally trusted, while strangers, people of other religions or nationalities were generally distrusted. In the institutional dimension, the central government achieved the highest trust, followed by the NPC, while religious organizations were least trusted. In addition to the variations of trust in both dimensions, standard deviations of most trust indicators are large. This indicates the heterogeneity of individuals in terms of trust. Obviously, in the case of China the standard question “most people can be trusted or that you need to be very careful” does not measure generalized trust well.

The primary interest is to investigate the influence of special trust on public engagement in environmental gov-

ernment. The point is to use the information about trust as much as possible. However, Pearson's χ^2 tests strongly reject the null hypotheses of no association between each pair of trust items. Hence, directly including in regression all the trust indicators observed is likely to create severe collinearity problems and might bias estimates. Applying the Latent Class Analysis (LCA) approach to identify trust patterns enables us to use as much as relevant trust information as possible and avoid the collinearity problem.

In empirical analysis of the following sections, the first stage is to use the LCA approach to identify individual's trust profile. Main results generated from this stage are posterior probabilities of individual's membership in each trust class, and the memberships are independent of each other. The second stage is to model for the likelihood that individual pays for the environment, by using the posterior probabilities as explanatory variables.

3.2 Latent class analysis of trust

To develop the conceptual framework of LCA, here an individual is temporarily assumed to engage in one behavior, for the sake of simplicity.

3.2.1 LCA Method

A latent class model (LCM) is characterized by having a categorical (rather than continuous) latent variable. The levels of the categorical latent variable represent groups (or called classes) in the population. Suppose individuals in these groups behave differently, but there is no observable indicator to identify the groups. The LCA lets us identify these unobserved groups, and know who is likely to be in a group and how that group's characteristics differ from other groups. In the case of this study, although individual's trust system is not observable, each individual has responded to a series of questions about special trust. These responses can be used to estimate respondents' latent classes of trust. The basic idea of LCM is that the probability of a specific response pattern is the average probability of the response pattern given each class, weighted by the prior probability of class membership^[45].

A LCM contains two parts. One fits the probabilities of who belongs to which class, and the other describes the relationship between the classes and the observed indicators. Let's suppose an individual's trust class is represented by an unobserved discrete latent variable, and responses to the questions about trust are the indicators with error of that unobserved latent construct. Further suppose that individual's intrinsic motivations (values, norms, cognition, and so on) associated with the utility depend the individual's class membership, and each membership corresponds to a set of intrinsic motivations. Let

$i = 1, \dots, I$ denote respondents. Suppose a LCM with L classes from a set of J categorical items of trust. $l_i = 1, \dots, L$ is the latent class membership of individual i and L is assumed to be a finite number. The vector $y_i = y_{i1}, y_{i2}, \dots, y_{iJ}$ represents individual i 's responses to the J items of trust questions. y_{ij} is a binary variable with random error. According to the local independence assumption of the LCA, if the relationship between any two observed indicators within a class has been captured by the latent class variable, the observed indicators would be independent of each other. The probability of individual i 's response pattern can be expressed as the weighted probability as follows:

$$\begin{cases} p(y_i) = \sum_{l=1}^L p(l_i = l) p(y_i | l_i = l) \\ p(y_i | l_i = l) = \prod_{j=1}^J p(y_{ij} | l_i = l) \end{cases} \quad (1)$$

Where $p(l_i = l)$ is the probability that individual i holds membership l , $p(y_{ij} | l_i = l)$ represents the conditional probability of individual i 's response to observed indicator j when the individual belongs to class l . The conditional probability is the basis of LCA. The probability of latent class can be indicated by Logit function. Let the first class be the reference class (Choice of the reference class does not affect the fitting results of latent class model.), the contribution by individual i to the class probability can be written as:

$$p(l_i = l) = \frac{\exp(\beta_l)}{\sum_{l=1}^L \exp(\beta_l)} = \frac{\exp(\beta_l)}{1 + \sum_{l=2}^L \exp(\beta_l)} \quad (2)$$

The conditional probability is, then:

$$p(y_{ij} | l_i = 1) = \frac{\exp(\beta_{ij})}{1 + \exp(\beta_{ij})} \quad (3)$$

The Bayesian posterior probability that individual i belongs to class l is:

$$p(l_i = 1 | y_{ij}) = \frac{p(l_i=1)p(y_{ij}|l_i=1)}{p(y_{ij})} \quad (4)$$

The LCMs are fitted using maximum likelihood methods, and the results yield the conditional response probabilities for each observed indicator of trust. The optimum LCM is determined by the smallest number of latent classes that can account for the relationship between the observed indicators. To determine the optimum LCM, let us start by assuming a one-class model ($L = 1$), *i.e.*, the observed indicators correlate to each other by one class variable. Then, increase the number of classes one by one if the model does not well fit the data. Pearson χ^2 is used to determine whether each model can be fitted. Bayesian information criterion (BIC) based on likelihood ratio is used to compare the fitted models of different number of classes (Akaike Information Standard (AIC) can also be used for this purpose. Lin and Dayton^[46] suggest that BIC would be a better solution when the sample includes

Table 2. Fitting results of Latent Class Model

	Statistics	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
Institutional trust models	LL	-14535	-12049	-11341	-11081	-10942	-10772
	$p > \chi^2$	0.000	0.001	0.960	0.998	1.000	1.0000
	BIC	29162	24287	22970	22549	22129	22371
Interpersonal trust models	LL	-2137	-1978	-1886	-1880	-1879	
	$p > \chi^2$	0.000	0.000	0.829	0.973	0.902	
	BIC	4314	4045	3910	3946	3992	

Notes: The Pearson statistics for $p > \chi^2$ is larger than 0.10 indicates that the latent class model can fit the data.

thousands of observations.). The smaller the BIC value, the better the model fits^[46]. Each individual in each latent class is assigned a posterior probability of membership, according to the Bayes rule. These membership probabilities then are included in the regression model for estimating the likelihood that individual participates in environmental governance.

Compared with other dimension-reduction methods that have been generally applied in multivariate statistical analysis, such as factor analysis (FA) and principal components analysis (PCA), LCA has several advantages in terms of avoiding collinearity^[47]. First, it is grounded in a probability framework and therefore enabling the calculation of goodness-of-fit statistics that justify model selection in a less arbitrary way than typically employed in FA and PCA. Second, either FA or PCA assumes that the observed indicators and the unobserved underlying factors are continuous and normally distributed, and these methods generate standardized scores rather than classes. In the case of survey study, the data usually cannot satisfy the assumptions of normality and continuity. Specifically, responses to a series of questions about trust are dichotomous/ categorical variables that, taken together, would characterize a trust system that is categorical rather than continuous. With these advantages, LCA is more suitable for the purpose of identifying individual's trust profile.

3.2.2 LCA results

Table 2 reports goodness-of-fit statistics for latent class model, respectively in the case of interpersonal trust and institutional trust. For the LCMs of institutional trust, the p -value of Pearson statistic indicates that the latent class model fits the data well when the number of classes is between three and six. Among these three models, the five-class model has the lowest BIC value. Therefore, this study will present the empirical results of institutional trust based on the five-class model. In the case of interpersonal trust, the latent class model fits the data well when the number of classes is three, four and five, while the three-class model has the lowest BIC value. Therefore, this study will present the main results of interpersonal trust based on the three-class model.

Table 3 reports the probability distributions of trust classes, respectively based on the five-class model of

institutional trust and the three-class model of interpersonal trust. In each half panel, the first row presents the latent class probability along the dimension of institutional/interpersonal trust, calculated according to the class to which an individual is assigned with the largest Bayesian posterior probability (see Equation 4). The rows thereafter in the same column present the intra-class conditional probability of each observed response.

(1) Institutional-trust classes

As far as institutional trust is concerned, the optimum LCM has five latent classes. Class 1 contains 14% of the observations. Individuals of this class show very low response probabilities to the twelve observed trust indicators, in a consistent manner. The largest probability is 0.132. These results imply that individuals of the class generally have deep distrust of various organizations. Let us name it "trust missing class" for convenience.

Class 2, with 28% of the sample, is the second largest class in institutional-trust dimension. Individuals of this class show a high likelihood of trusting representatives of the media such as the press and television, in addition to trusting the civil service. In particular, they are extremely likely to trust political institutions, including the central government, political parties, and the National People's Congress (NPC). Since the organizations that are most trusted by this class are characterized by politics, name it "political trust".

Class 3 is the absolute minority, containing only about 8% of the sample. Individuals of the class are likely to trust charities, environmental organizations, and very likely to trust women's organizations. The altruism values held by these organizations may prevail in this class; hence, name it "care-based trust".

Class 4 contains 12% of the sample. Individuals of the class are very likely to trust kinds of political organizations, and typical commonweal and care organizations. Let us name the class "political-care mixed trust".

Class 5 contains 38% of the sample, being the largest class in institutional trust dimension. Individuals of the class are very likely to trust kinds of organizations except religious groups. Particularly, they have a high likelihood of trusting representatives of the media, political institutions, women's and environmental organizations. Name

Table 3. Distribution of social trust, estimated from LCM

	Class 1	Class 2	Class 3	Class 4	Class 5
Institutional trust	Trust missing 0.14	Political trust 0.283	Care-based trust 0.078	Political-care mixed trust 0.123	General institutional-trust 0.377
Religious organization	0.068	0.109	0.219	0.199	0.376
The press	0.050	0.609	0.482	0.033	0.965
Television station	0.132	0.686	0.518	0.226	0.966
Labor unions	0.049	0.193	0.321	0.527	0.609
The central government	0.33	0.998	0.534	0.989	0.998
Political parties	0.129	0.833	0.163	0.924	0.97
National People's Congress	0.124	0.901	0.466	0.955	0.998
The Civil service	0.051	0.763	0.349	0.865	0.987
Major Companies	0.026	0.206	0.276	0.385	0.713
Environmental organizations	0.000	0.114	0.567	0.795	0.948
Womens organizations	0.015	0.177	0.751	0.881	0.986
Charitable organizations	0.035	0.100	0.596	0.674	0.858
Interpersonal trust	Family trust 0.084	Extended family trust 0.75	General interpersonal trust 0.166		
Family	0.844	0.999	0.988		
Neighbors	0.000	0.951	0.977		
People you know personally	0.13	0.869	0.947		
People you meet for the first time	0.000	0.072	0.421		
People of other religions	0.003	0.047	0.794		
People of other nationalities	0.019	0.037	0.644		

Notes: This table reports latent class probabilities, and the conditional probabilities of responses to each trust item in each class.

it “general institutional trust”.

In institutional-trust dimension, the latent class probabilities of Classes 2, 4, and 5 add up to 78%. These three classes all have a great tendency to show high “political trust” - the trust in state power organs. This is remarkable, but not surprising. Cultural theories hypothesize that trust in political institutions originate outside the political sphere in long-standing and deeply seeded beliefs about people that are rooted in cultural norms and communicated through early-life socialization^[48]. The high “political trust” in China may stem from the heritage of Confucian idea. Confucian teachings consider “family” the prototype of all social organizations, the social network is characterized by the hierarchical relationships^[37]. Concepts such as loyalty, obedience, and filial piety practiced in the family are transferred to social organizations in which authoritarian values and habits of subordination to discipline are fostered^[49].

High “political trust” may be an important feature that distinguishes China from other countries. Tao *et al.*^[40] provide strong evidence that political trust enhances social trust in China. Michler and Rose^[48] show in the post-Communist societies of in Eastern and Central Europe, the overall trust pattern is one of severe skepticism, *i.e.*, skepticism and distrust in institutions is pervasive. Wang^[50] also confirms the high political trust of China - though the Chinese public expresses fairly strong criticism of some aspects of Chinese society, they express higher levels of confidence in government than those found in most advanced industrial societies. Wang^[50] suggests that economic development has the immediate

effect of enhancing public support for the government. This study expects that “political trust” plays a critical role in determining civic participation in environmental governance.

(2) Interpersonal-trust classes

As far as interpersonal trust is concerned, the optimum LCM in this dimension has three latent classes. Class 1 contains only eight percent of the sample. Individuals of this class are very likely to trust the family, but unlikely to trust any non-family members. This is exactly the blood-based “special trust”, as described by Weber^[6]. Thus, let us name the class “family trust”.

Class 2 contains 75% of the sample. Individuals of the class are very likely trust “insiders” including the family, neighbors, and acquaintances. This reflects the Chinese typical psychology of “trusting only the familiar” and “distrusting strangers”. In this article, the class is named “extended-family-trust class”.

Class 3 contains about 17% of the sample. Individuals of the class present extensive trust in various groups of persons, except strangers. Specifically, they are very likely to trust “insiders” and likely to trust people of other religions or nationalities. Though the trust of this class covers extensive groups, it is not equivalent to “general trust” or “universalistic trust”. For example, it is not known whether they would trust other ethnic groups. However, just for convenience, let us name it “general interpersonal trust class”.

(3) Heterogeneity of trust in the population

The results generated from LCA highlight the com-

plexity of social trust. For example, while Classes 2, 4, and 5 in institutional trust dimension are all characterized by a high level of “political trust”, they are significantly differ from each other in level of trusting other types of organizations among these classes. Moreover, comparison between the trust level indicated by “general trust” (*i.e.*, most people can be trusted) and the probabilities of trust latent classes reveals that the former is coarse in measuring social trust. Using the former measure leads to the conclusion that the level of “general trust” in Chinese society is as high as 48%. The findings based on LCA however are less optimistic: the level of general trust in interpersonal dimension is only 17%, and 38% in institutional dimension. These finding also confirm the conclusion of Tan and Tambyah^[38] that the relationship between generalized trust and institutional trust is weak. Obviously, compare to the single indicator “General trust”, the LCA approach has the advantage of identifying the complexity and heterogeneity of trust in each dimension.

The LCA results also show that trust patterns differ with individual’s demographic characteristics. Take the “political trust” class as an example. Overall, the posterior probability of having the membership of this class is 28% in the sample. However, it increases to 35% for those with education attainment of high school and below, and decreases to 21% for those with a higher level of education attainment. For people working in private sectors, the posterior probability of “political trust” is 30%; while for people working in government or state-owned enterprises, it decreases to 18%.

To test whether social and demographic factors can fully explain the heterogeneity of population in terms of trust, the study estimated OLS models of posterior probabilities of each class on social and demographic variables including education attainment, income, gender, age, health, and region. The R-squared value ranges from 0.03 to 0.12. Accordingly, demographic factors are weakly associated with trust, but they cannot totally explain the variations in individual’s trust profile. This is consistent with the finding of Delhey and Newton^[9] that in seven typical European counties demographic characteristics (gender, age, and education) are not closely associated with trust. This study expects that latent class memberships of trust still play a role in determining individual’s environmental behavior after controlling for social and demographic characteristics.

4 Role of trust in environmental governance

The central concern of this section is whether and how household’s willingness to pay for the environment is associated with individual’s trust profile. This article employs a bivariate probit model to empirically explore

the question.

4.1 Modelling household decision

Empirical studies on individual behavior have generally employed the random utility analysis framework. Suppose u^* represents the difference in the latent utilities of alternative decisions of binary choice, the observed behavior can be expressed as:

$$y = \begin{cases} 1, & u^* > 0 \\ 0, & u^* < 0 \end{cases} \quad (5)$$

This study simultaneously examines two patterns in which an individual pays for the environment: (a) paying by donation; and (b) paying tax. The two patterns have different implications for households. The former means providing occasional contributions. It is usually a lump-sum payment, voluntary, and sometimes might generate rewards (*e.g.* being praised). The expenditure in the latter pattern is compulsory, regular, and permanent. These differences may lead to a difference in individual’s acceptances to the payment. Two patterns may be not mutually exclusive. One might be willing to take the obligation of paying an environmental tax; meanwhile, he might also be willing to occasionally donate a (great or small) part of income for environmental improvement.

This study measures households’ payment willingness with two binary variables. Let y_{don} denotes the binary choice of paying by donation, and y_{tax} denotes the binary choice of paying tax. Suppose that the unobserved factors affecting these two decisions are related. Under a framework of two decisions, an individual’s binary choice can be expressed as the following bivariate probit model^[51]:

$$\begin{cases} y_{don} = 1(u_1^* > 0) = 1(\beta_1 x_1 + \varepsilon_1 > 0) \\ y_{tax} = 1(u_2^* > 0) = 1(\beta_2 x_2 + \varepsilon_2 > 0) \end{cases} \quad (6)$$

Where $\varepsilon_1, \varepsilon_2 \mid x_1, x_2 \sim N(0, 0, 1, 1, \rho)$. In Model (6), each decision is modelled by a probit equation. ρ is the correlation coefficient of error terms, subject to the two-dimensional standard normal distribution. represent the observed decisions. $1(\cdot)$ is an indicative function, the value is 1 if $\beta x + \varepsilon > 0$ holds, 0 otherwise. The two decisions are associated means the null hypothesis $\rho = 0$ can be rejected. Given the null hypothesis being rejected, separately estimating two single-equation probit models generates consistent estimates, but not efficient estimates.

The two-dimensional joint probabilities for estimating Model (6) are constructed as follows^[52]:

$$\begin{cases} P_{11} = P(y_{don} = 1, y_{tax} = 1 \mid x_1, x_2) = \phi(X_1^1 \beta_1, X_2^1 \beta_2; \rho) \\ P_{10} = P(y_{don} = 1, y_{tax} = 0 \mid x_1, x_2) = \phi(X_1^1 \beta_1, -X_2^1 \beta_2; -\rho) \\ P_{01} = P(y_{don} = 0, y_{tax} = 1 \mid x_1, x_2) = \phi(-X_1^1 \beta_1, X_2^1 \beta_2; -\rho) \\ P_{00} = P(y_{don} = 0, y_{tax} = 0 \mid x_1, x_2) = \phi(-X_1^1 \beta_1, -X_2^1 \beta_2; \rho) \end{cases} \quad (7)$$

Where ϕ represents the joint normal cumulative distribution function. The partial probabilities of payment choice can be calculated by:

$$\begin{cases} P(y_{don} = 1) = P_{11} + P_{10} \\ P(y_{tax} = 1) = P_{11} + P_{01} \end{cases} \quad (8)$$

Model (6) can be estimated with the Maximum Likelihood (ML) method. The likelihood function is:

$$\log L = \sum_{i=1}^n \log \phi[(2I_1-1)X_1'\beta_1, (2I_2-1)X_2'\beta_2, (2I_1-1)(2I_0-1)\rho] \quad (9)$$

4.2 Variables

The study takes the posterior probabilities estimated from the LCA as the key predictors for household's decision on paying for the environment. Eight trust variables were created based on these posterior probabilities. The first set includes five trust variables that represent the posterior probabilities in institutional trust dimension, obtained from the five-class LCM. The other set consists of three trust variables representing the posterior probabilities in interpersonal trust dimension, obtained from the three-class LCM.

In addition, a set of covariates is used to control for individual's social and demographic characteristics, including gender, age, education attainment, health status, occupation, household income, the interaction term of education and age, and the interaction term of gender and education. A town size indicator and province dummies are used to control for regional effects.

Two dependent variables measuring household payment willingness were respectively created. The binary variable of WTP in donation pattern, labeled y_{in} , was created based on responses to the statement "I would donate a part of my income if I were certain that the money would be used to prevent environmental pollution". $y_{don} = 1$ indicates that an individual would be willing to contribute an amount of money; 0 otherwise. The binary variable of WTP in tax pattern, labeled y_{tax} , is based on responses to the question "would agree to an increase in taxes if the extra money were used to prevent environmental pollution." If the individual would be willing to pay a tax, $y_{tax} = 1$; 0 otherwise.

Since distributions of the posterior probabilities within each latent class in each trust dimension have been reported and discussed in the previous section, here in Table 4 only summary descriptions of the dependent variables and controls are reported.

4.3 Results and discussion

Because the posterior probabilities add up to 1 for each individual in each trust dimension, one class in each di-

mension needs to be dropped from regression, to avoid perfect collinearity. The dropped class is regarded as the benchmark for the remained classes in that dimension. For the classes in institutional-trust dimension, "trust missing class" was dropped, because it is characterized by extensive distrust of institution and hence an ideal reference for other classes. Thus, the null hypothesis is that increasing the probability an individual is assigned to the class membership other than "trust missing class" has no effect on the willingness of paying. For the in interpersonal-trust dimension, the "general interpersonal trust" class was dropped. The null hypothesis is, increasing the probability that an individual is classified in a class other than "general interpersonal trust" has no effect on the willingness of paying.

Table 5 presents the estimation results of Model (6). Three regression specifications were employed. Spec 1 includes the posterior probabilities of two interpersonal-trust classes, Spec 2 includes the posterior probabilities of four institutional-trust classes, and Spec 3 includes all posterior probabilities in two dimensions. Regardless of the regression specification, the null hypothesis $\rho = 0$ is consistently rejected. This means applying the bivariate probit model is more efficient than separately estimating two single-equation probit models. That ρ is positive implies that influences of the unobserved underlying factors on two decisions are in the same direction.

4.3.1 Effect of social trust

Just like general probit models, parameters of a bivariate probit model tell the directions of effects rather than the magnitudes. To facilitate the comparison between effects of different trust patterns, this study calculated the marginal effect of each trust variable, according to the estimated parameters and Equation (8). The marginal effect results are reported in Table 6. For each regression specification, the first column presents the trust effect on the probability of willing to pay in donation pattern, and the second column presents the trust effect on the probability of willing to pay in tax pattern.

The marginal effect means the effect of increasing the posterior probability of each latent class by 1% on the likelihood of each decision, everything else equal. It is important to note that changing the probability of one class by 1% would necessarily affect the posterior probabilities of being assigned to all the other classes. Because of that, a more meaningful way to discuss the marginal effect of belonging to a given class is, to compare a typical individual in each class to a typical individual in the reference class.

(1) Interpersonal-trust effect

Specification 1 includes the posterior probabilities of

Table 4. Variable definition and descriptive summary (n = 1991)

Variable	Label	Mean	Coding
Dependent variables			
Donation pattern: Whether donating an amount of money for preventing environmental pollution.	Y_{don}	0.823	yes = 1; no = 0
Tax pattern: Whether paying a tax for preventing environmental pollution.	y_{tax}	0.740	yes = 1; no = 0
Controls			
How would you describe your state of health these days?	health	0.612	good = 1; Not good = 0
Are you working for the government or for a private business or industry?	gov	0.171	government or public = 1; private = 0
Are you the chief wage earner in your household?	main earner	0.446	yes = 1; no = 0
The highest educational level of the respondent	edu	0.474	high school & below = 0; university & above = 1
Gender of the respondent	male	0.456	male = 1; female = 0
Age of the respondent (categorical variable)			
< 35	b_age1	0.254	(reference level)
36-60	b_age2	0.610	
61+	b_age3	0.136	
Income level of the family (categorical variable)			
If the national average income of household is equally divided into 10 groups, 1 representing the lowest part, and 10 the highest level, what group is your family incomes in? *	1	0.114	(reference level)
	2	0.131	
	3	0.190	
	4	0.148	
	5	0.201	
	6	0.129	
	7	0.062	
	8	0.026	
Town size (categorical variable)			
5,001-10,000	scale1	0.970	(reference level)
10,001-20,000	scale2	0.151	
20,001-50,000	scale3	0.427	
50,001-100,000	scale4	0.331	
100,001-500,000	scale5	0.060	

Note: * The respondents were asked to pick one out of 10 levels of income. There were only seven responses to the 9th and 10th levels, this study integrated these responses into the 8th level.

interpersonal-trust classes as the predictors for household willingness to pay. Only the effect of “extended family trust” is positive in donation pattern, with a value of 0.09, at the significance levels of 5%. Keep in mind that “general interpersonal trust” has been taken as the benchmark of other trust classes. Hence, the result can be interpreted as: a typical person who belongs to the “extended family trust” class with a probability of 1% has a higher probability by 9% to pay for the environment in donation pattern, compared to a typical person who belongs to the “general interpersonal trust” class with a probability of 1%, *ceteris paribus*.

The implications here is straightforward: (a) In terms of interpersonal trust, only the values and norms based on the interactions among family, neighbors and acquaintances matter for individual’s engagement in environmental governance; (b) Neither trust extending beyond interactions of the “insiders” nor that limited to the scope within family can play a role in improving the willingness to pay for the environment; (c) The payment pattern matters - in tax pattern, any form of interpersonal trust cannot improve the willingness to pay for the environmental.

(2) Institutional-trust effect

Specification 2 only includes the posterior probabilities of institutional-trust classes. Overall speaking, the positive effects of institutional-trust on the willingness of

paying are stronger in donation pattern than in tax pattern. This result once again verifies that public acceptance to paying taxes is weaker than the acceptance to providing occasional donation. Recall that “trust missing class” has been taken as the reference class in institutional-trust dimension. The four trust variables are all significant in donation pattern. That is, a typical person who belongs to any of the four classes with a probability of 1% has a higher likelihood of donating than a typical person who belongs to “trust missing class” with a probability of 1%, everything else being equal. In tax pattern, “political-care mixed trust” and “general institutional-trust” are significant and positive. The meaning is, a typical person who belongs to either of these two classes with a probability of 1% has a higher likelihood of paying a tax for the environment than a typical person who belongs to “trust missing class” with a probability of 1%, *ceteris paribus*.

Importantly, the more extensive the individual’s institutional trust, the higher the probability of willing to pay, which holds for both payment patterns. This is clearly different from what has been found in terms of interpersonal trust. Interpersonal trust only works in donation pattern and within a specific scope of trust. The conclusion here is that the role of institutional trust is much more important than that of interpersonal trust, in facilitating the collective actions regarding the environment.

Table 5. Estimates obtained from the bivariate probit model

	Spec 1		Spec 2		Spec 3	
	y-don	y-tax	y-don	y-don	y-don	y-tax
family trust	0.204 (0.292)	0.003 (0.280)			0.207 (0.293)	(0.041) (0.281)
extended family trust	0.369** (0.181)	0.208 (0.170)			0.323* (0.179)	0.156 (0.173)
political trust			0.404** (0.163)	0.244 (0.155)	0.409* (0.240)	0.319 (0.226)
care based trust			0.410* (0.215)	0.129 (0.197)	0.328 (0.288)	0.111 (0.272)
political-care mixed trust			0.701*** (0.195)	0.441** (0.177)	0.702*** (0.268)	0.589** (0.245)
general institutional-trust			0.921*** (0.159)	0.689*** (0.146)	1.116*** (0.239)	0.768*** (0.216)
health	0.122 (0.133)	0.025 (0.119)	0.057 (0.093)	-0.024 (0.088)	0.086 (0.134)	0.009 (0.120)
Gov	0.157 (0.175)	0.426*** (0.163)	0.181 (0.126)	0.283** (0.118)	0.107 (0.176)	0.380** (0.160)
main earner	-0.180 (0.130)	-0.026 (0.124)	-0.002 (0.100)	0.066 (0.094)	-0.211 (0.132)	-0.043 (0.126)
edu.	0.520* (0.287)	0.254 (0.266)	0.427** (0.201)	0.374** (0.188)	0.631** (0.289)	0.277 (0.268)
male	0.289 (0.187)	0.068 (0.177)	0.079 (0.141)	0.010 (0.135)	0.218 (0.192)	-0.003 (0.184)
b-age2	0.002 (0.196)	-0.011 (0.183)	0.115 (0.136)	0.113 (0.131)	0.070 (0.198)	0.029 (0.189)
b-age3	0.347 (0.292)	0.224 (0.273)	-0.145 (0.200)	-0.178 (0.186)	0.359 (0.278)	0.166 (0.277)
edu × age2	-0.435 (0.290)	-0.288 (0.267)	-0.361* (0.204)	-0.366* (0.189)	-0.584** (0.296)	-0.352 (0.268)
edu × age3	-1.169*** (0.408)	-0.635* (0.372)	-0.512* (0.287)	-0.288 (0.261)	-1.261*** (0.405)	-0.599 (0.375)
male × edu	-0.427 (0.237)*	-0.217 (0.220)	-0.182 (0.175)	-0.085 (0.165)	-0.419* (0.240)	-0.185 (0.222)
income2	0.040 (0.222)	0.090 (0.210)	0.016 (0.170)	0.146 (0.158)	0.033 (0.224)	0.058 (0.211)
income3	0.353 (0.222)	0.184 (0.201)	0.267 (0.166)	0.187 (0.148)	0.383* (0.220)	0.181 (0.201)
income4	0.542** (0.226)	0.375* (0.212)	0.392** (0.175)	0.341** (0.160)	0.568** (0.234)	0.347 (0.213)
income5	0.442 (0.228)*	0.203 (0.205)	0.288* (0.167)	0.315** (0.151)	0.429* (0.225)	0.171 (0.206)
income6	0.500** (0.253)	0.354 (0.234)	0.451** (0.184)	0.340** (0.167)	0.441* (0.263)	0.306 (0.237)
income7	0.789** (0.313)	0.499* (0.266)	0.392* (0.233)	0.256 (0.203)	0.679** (0.321)	0.374 (0.268)
income8	0.548 (0.380)	0.874** (0.354)	0.100 (0.290)	0.368 (0.266)	0.449 (0.402)	0.825** (0.341)
scale2	-0.866* (0.496)	(0.369) (0.361)	(0.514) (0.366)	(0.309) (0.276)	-1.020* (0.578)	(0.385) (0.348)
scale3	(0.620) (0.486)	(0.092) (0.353)	-0.647* (0.357)	(0.119) (0.271)	(0.547) (0.574)	0.048 (0.346)
scale4	(0.614) (0.481)	(0.018) (0.353)	-0.610* (0.354)	(0.090) (0.273)	(0.567) (0.567)	0.088 (0.342)
scale5	-1.282** (0.652)	0.430 (0.553)	-1.036** (0.471)	0.174 (0.405)	-1.358* (0.738)	0.513 (0.544)
ρ	0.931 (0.019) ***		0.881 (0.019) ***		0.930 (0.020) ***	
Wald chi2	71		124		97	
Region fix effect	Y		Y		Y	
Obs.	963		1318		963	

Notes: *, **, and *** represents significance of 0.05, 0.01, and 0.001 levels, respectively. The numbers in brackets are robust standard errors, adjusted for heteroscedasticity. If the independent variables in the two equations of Model (6) are identical, it is called "Bivariate probit model", "Bivariate SUR probit model" otherwise. The study takes the former.

Table 6. Marginal effects of social trust on payment willingness[‡]

	Spec 1		Spec 2		Spec 3	
	P(y _(don) = 1)	P(y _(tax) = 1)	P(y _(don) = 1)	P(y _(tax) = 1)	P(y _(don) = 1)	P(y _(tax) = 1)
family trust	0.050 (0.071)	0.001 (0.089)			0.048 (0.068)	-0.013 (0.087)
extended family trust	0.090** (0.0440)	0.066 (0.054)			0.075* (0.0410)	0.048 (0.054)
political trust			0.092** (0.037)	0.071 (0.045)	0.095* (0.056)	0.099 (0.070)
care based trust			0.094* (0.049)	0.037 (0.057)	0.076 (0.067)	0.034 (0.084)
political-care mixed trust			0.160** (0.0440)	0.128** (0.051)	0.163*** (0.062)	0.182** (0.075)
general institutional-trust			0.210*** (0.036)	0.200*** (0.041)	0.259*** (0.054)	0.238*** (0.065)

Notes: This table presents the marginal effects of social trust on the partial probability of the two decisions in discussion. The partial probability is defined by Equation (8). The marginal effects were calculated with the estimated parameters presented in Table 5. When calculating the marginal effects, the continuous variables (such as posterior probability) are fixed in the median, and the categorical variables keep the observed value. ***, ** and * represent the significance levels of 1%, 5% and 10%, respectively, with robust standard errors presented in parentheses. [‡] For the sake of space saving, the marginal effects of control variables are not reported.

(3) Considering both effects

Specification 3 includes all posterior probabilities in both trust dimensions. Overall, across three specifications, the estimates of each trust variable are totally consistent in sign, and the effect magnitude changes little. The estimated effects of trust based on Specification 3 are basically consistent with those based on other two specifications, in terms of significance. This implies that simultaneously including in regression interpersonal trust and institutional trust has generated little collinearity problem. In particular, the positive impacts of institutional trust have not been weakened with inclusion of the interpersonal trust effects. Actually, except the effect of “care based trust” on the payment willingness in donation pattern become insignificant, effects of other three institutional-trust variables all become larger than that have been revealed by Specification 2.

Since the effect of “care based trust” becomes insignificant with inclusion of interpersonal trust effects, it needs to talk more about this. In Spec 3, the effect of “extended family trust” on the payment willingness in donation pattern decreases slightly with inclusion of institutional trust effects, compared to Spec 2. There may be a weak connection between “care based trust” and “extended family trust”. This connection might be due to the likeness in feelings. As noted in Section 3 that the “care based trust” presents a high level of trust in women’s organizations, charitable organizations and environmental organizations. As individual’s connection with these organizations is usually the extension of interpersonal relationships within relatives, friends and acquaintances, individuals can easily sense closeness and cares from the interactions with these organizations. Such sense is similar to the feelings in the “extended-family” based interactions. The emotional similarity could create a positive connection between these two special trust patterns. In spite of that,

the estimation bias resulted from the connection could not be a concern for two reasons: first, most trust variable perform strong robustness across the three regression specification; second, the association between interpersonal trust and institutional trust has been proved to be weak^[8, 38].

With the findings above, the study comes to three conclusions about the effect of trust on households WTP for the environment. (i) Trust have more powerful impact on the WTP in donation pattern than in tax pattern, in other words, the latter payment pattern is more acceptable to the public. (ii) In interpersonal trust dimension, only the “extended-family trust” (shaped by interactions within the family, friends and acquaintances) matters for individual’s WTP. (iii) In institutional trust dimension, broader trust can improve household’s WTP for the environment. The fact is, compared to the “trust missing” situation, the presence of institutional trust improves the WTP, and the positive effect becomes stronger with institutional trust being more extensive. Apparently, the norms created and followed by organizations plays a more critical role in collective actions regarding the environment, compared with the norms shaped in interpersonal interactions.

4.3.2 Results of sociodemographic factors

There are interaction terms between some sociodemographic factors in regressions. For each variable with an interaction term, the marginal effect measures the overall effect which is composed of the main and interactive effects. In order to distinguish between the two effects, this study discusses sociodemographic factors according to model parameters (Table 5) rather than marginal effects.

Generally speaking, there can be correlations more or less between demographic factors, which might lead to the collinearity problem. For example, either age or income may affect an individual’s WTP. Aged people tend to be frugal, while one’s affordability usually becomes

stronger as income increasing with aging. Hence, the association between household income and WTP may be attributed to age, which means the collinearity due to the correlation of income and age. The collinearity problem is a major reason of divergence in conclusions about demographic variables in many behavior studies. Because of this, this study would be cautious on the role of sociodemographic factors, by focusing on the variables with robustness in different specifications.

It is found in this study that people working for government or state-owned enterprises are more likely to be willing to pay a tax for the environment than those working in private sectors. This might be interpreted as the former group may know more about the importance of environmental governance and pay more attention to the problem. People with high school education level or above are more willing to paying by donation for environmental improvement. There is a significant interaction effect between age and education attainment: compared with an individual that is aged over 35, with a high school (or below) education level, a 60-aged (or over) individual of the same education level is less likely to pay. While the main effect of gender is not significant, there is a significant interaction effect between gender and education. Compared with women of high school education or above, men of the same education level are less likely to pay. One possible interpretation is that educated males are usually the primary earner in household, and thus their decision-makings tend to focus on economic the benefits of own family rather than the social welfare. The estimated parameters of income provide evidence of a non-linear relationship between household income and WTP. Groups of middle-level income are more likely to pay for the environment than the lowest-level income group.

Finally, compared with residents living in small cities (in terms of population size), residents in large cities are less likely to pay for the environment. This trust effect may be due to the linkage between trust level and city size. Previous studies show that smaller the urban unit, the higher trust is likely to be^[53]; smaller is better from the social capital point of view^[34]. The finding suggests that collective actions regarding the environment would be easier to achieve in a smaller group.

5 Conclusion and implications

This paper identifies the forms of trust in contemporary Chinese societies, respectively in interpersonal and institutional dimensions, and examines whether and how trust has been influential on civic participation in environmental governance. The results reveal the huge variations

of social trust in either dimension. Trust plays a positive role in determining household's willingness to pay for the environment, while the effect varies with trust pattern and payment patterns.

Specifically, in the interpersonal dimension, the "extended-family trust" limited to the "insiders" scope dominates; in the institutional dimension, "political trust" exerts generality in the societies. Next, in the dimension of interpersonal trust, the positive effect of trust on the payment willingness only works within a particular trust scope, and on payment in donation pattern. That is, only the relative, friend and acquaintance-based trust matters. Neither interpersonal trust beyond this scope nor interpersonal trust limited to family can affect household's WTP for the environment. In the dimension of institutional trust, the presence of any type of institutional trust helps to improve the likelihood of household paying for the environment in either of the payment patterns, compared to the situation of "trust missing". More extensive the scope of institutional trust, the higher the likelihood of paying. The positive role of "political trust" is particularly critical, which is consistent with Murphy^[54] that citizens who trust the government are more likely to display compliance behavior toward policies, laws, and regulations. Finally, Compared to paying in tax pattern, trust plays a better role in donation pattern on the payment willingness.

In terms of theoretical implications, this study provides supports for the theoretical hypothesis that trust would play a critical role in production of public goods. While the literature^[6,35,36] states that Chinese-style trust is based on bloodrelatives, this study emphasizes the role of institutional element of trust in environmental governance. The dominance of political trust in contemporary Chinese society echoes the viewpoint that trust in political institutions originate outside the political sphere; in other words, institutional trust is an extension of interpersonal trust^[11,48].

This study leads to the following policy implications. First, efficient environmental governance particularly relies on public acceptance and participation. When a society is pervaded by distrust, cooperative arrangements are unlikely to emerge^[55]. More extensive the trust is, the better the positive interactions and cooperation between the public and government, and the less the barriers in formulation and implementation of environmental policies. In an environment characterized by high trust, the public tends to behave cooperatively, which would reduce the social cost of policies, leading to positive environmental outcomes. Second, trust may express itself as trust in personals and in institutions. In the field of environmental governance, the latter dimension may be fundamental since it involves the confidence in policies. Finally, for

trust to play a more positive role in environmental governance in the long run, the transformation from “special trust” to the “generalized trust” that extends beyond the boundaries of interpersonal interaction may be critical.

Some questions remain unresolved. Firstly, studies on trust might be bedeviled by the problem of causality. In the case of this study, as it relies on cross-sectional data and no close relationship between trust and controls has been found, trust can be regarded as given in the current social context. Hence, endogeneity is not a primary concern. However, trust can be enhanced with development of voluntary associations and organizations^[12] or undermined by a weaker legal system^[56]. In that sense, trust is still endogenous in the very long run. This article has not been able to make much progress with endogeneity. Secondly, the transmission mechanisms via which trust improves civic participation in environmental governance remain unidentified. It is unclear whether the linkage of social trust with environmental governance arises due to other effects, such as concerns on the environmental quality.

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