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<https://doi.org/10.5109/7340486>

出版情報：九州大学大学院農学研究院紀要. 70 (1), pp.91-100, 2025. 九州大学大学院農学研究院
バージョン：
権利関係：



Willingness to Pay for Rural Kitchen Waste Recycling: The Effect of Face–concept and Social Norms

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(Received November 5, 2024 and accepted November 6, 2024)

Due to a lack of funds and recycling facilities, kitchen waste has received limited attention in rural China. In acquaintance society, face–concept and social norms orchestrate their daily lives. It is necessary to combine kitchen waste recycling willingness with people's social network. This study evaluates the influence of face–concept and social norms on willingness to pay (WTP) for kitchen waste recycling. Based on a rural survey in Shaanxi Province, China, the results show that households' average WTP was 4.12 RMB/month, face–concept and social norms help explain WTP for kitchen waste recycling. Moreover, the effects of face–concept and social norms on the WTP vary by gender. Therefore, the WTP for kitchen waste recycling can be stimulated by promoting face–concept, strengthening social norms from neighbors and village cadres, and gender–dependent tailoring for different measures.

Key words: kitchen waste recycling, face–concept, social norms, contingent valuation method, rural area

INTRODUCTION

With the growing emphasis on sustainability, there is a new urgency in the need to better understand what motivates people to adopt environmentally friendly behaviors. Kitchen waste (KW), composed of an organic fraction that containing carbohydrates, proteins, fats, and lipids, has received limited attention in China's rural waste management despite the high proportion of rural household waste (40%–60%, wet basis) (Wang *et al.*, 2015; Li *et al.*, 2022). China recycles less than 20% of the more than 30 million tons of KW they generate annually, and the proportion of KW recycled in rural areas is much lower than in urban areas due to a lack of funds and KW recycling facilities (Li *et al.*, 2019; Li *et al.*, 2022). Due to the long-term existence of numerous informal dumping practices such as open–air and ditch dumping, rural KW has accumulated many adverse consequences, which pose a great threat to the sustainable development of society and human health (Liu and Huang, 2014; Wang *et al.*, 2019a). For instance, underground water, soil, and air are contaminated, and land resources are now utilized for storing and treating rural KW, harboring houseflies and mosquito–borne diseases (Li *et al.*, 2022).

KW recycling is the most effective way for successful KW management (Li *et al.*, 2020). Recycling KW is compelling for at least three reasons: (1) KW contains a lot of organic matter that can be converted into fertilizer and biogas, and recycling KW is insurance against resource dilemmas (Kasavan *et al.*, 2022); (2) recycling KW is to prevent its release into the environment as toxic materials and the spread of pathogens (Liu *et al.*, 2020); (3) recycling KW helps minimize landfill usage and lowers KW disposal costs (Giwa *et al.*, 2022). However, while Chinese

governments have successively promulgated various strategies aimed at rural KW recycling, the assessment has demonstrated a minimal effect. For example, the Ministry of Housing and Urban–Rural Development piloted four–classification of household waste programs in 100 counties in 2017, while the on–site recycling of KW was not supported by most rural households (Li *et al.*, 2022).

Several reasons explain this situation: (1) these KW recycling policies are not enforced or are inadequate (Wang *et al.*, 2019b); (2) lack of funds for KW recycling programs (Li *et al.*, 2022); (3) rural households are not aware of the risks of improper disposal of KW, or do not know how to dispose of them (Li *et al.*, 2020); and (4) some psychological factors in traditional Chinese rural areas affect households' recycling behavior of KW, such as social psychosocial factors (Yuan *et al.*, 2016). We focus here on the impact of face–concept and social norms on rural households' WTP for KW recycling because understanding their impact on households' willingness is the key to improving their KW recycling behavior.

Willingness to pay (WTP) refers to the amount or other equivalent that a decision maker is willing to pay for environmental improvement projects; it is a well–designed economic valuation instrument for accessing households' economic preferences for waste management (Han *et al.*, 2019; Cai *et al.*, 2021). As noted by Wu *et al.* (2021), charging waste recycling fees according to WTP can reduce the government's economic pressure on the construction of recycling facilities and improve households' environmental awareness. However, most previous studies concentrated on WTP for municipal KW management in China (Liang *et al.*, 2021). It is a pity that few scholars have studied the WTP for KW management in rural China, ignoring that the vast rural areas, with a population of nearly 500 million, could be capable of affording substantial financial support for KW recycling.

The possible contributions of this study are: First, it distinguishes rural households that are willing and unwill–

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ing to pay for KW recycling and characterize the reasons why households are unwilling to pay for it. Second, we analyze the psychosocial influence of the face concept and social norms in Chinese acquaintance society on households' WTP for KW recycling, and different responses between men's and women's WTP are observed in the results. Third, taking China as an example, it combines environmental and social psychology and contributes to a better understanding of the empirical literature on households' intentions and intended behavior. This study can provide a reference for similar developing countries to introduce a new KW recycling charging mechanism that would contribute to a more economical and sustainable recycling system for KW management in which households are willing to participate.

The rest of this study is organized as follows. Sections 2 describes the relevant literature and survey design, followed by the applied econometric models in Section 3. The results are presented and discussed in Section 4, and finally, conclusions are presented in Section 5.

LITERATURE REVIEW

Contingent Valuation Method and Willingness to Pay

Contingent valuation method (CVM) is a simple and flexible nonmarket valuation method, which is widely used in WTP analysis and evaluation (Xu and Lin, 2022). This method includes open-ended, dichotomous choice, and iterative bidding questions. Open-ended questions are most commonly used because they reduce the cognitive burden placed on the respondent without any starting point bias (Fowler *et al.*, 2023). However, the results suggest that respondents experience significant uncertainty when answering open-ended questions and may exhibit a tendency of free-riding or strategic overbidding (Poe, 2016). The dichotomous choice method allows the respondents to complete the valuation, and the strategic bias in the WTP values may be minimized because it is an incentive-compatible approach (Matthews *et al.*, 2023). Despite its advantages, this method attracts a starting-point bias and cannot derive the actual willingness-to-pay amount (Schuermann and Woo, 2022). One of the advantages of the iterative bidding method is that it provides relatively better results because it gives respondents a "market-like" situation where they can research their preferences (Matthews *et al.*, 2023). Moreover, this method has been widely applied in numerous CVM studies conducted in developing countries.

WTP has commonly been used to indicate people's willingness to compensate for environmental impacts. Previous studies have verified the effects of various factors on the WTP for sustainable waste management in both developed and developing countries. The main factors affecting WTP identified in the literature can be divided into three categories. The first one is external environments, such as policy and facility convenience, which also affect the WTP (Chung and Yeung, 2019; Hao

et al., 2019). Second, individual psychology is valued in estimating WTP (Li *et al.*, 2022). Third are socioeconomic characteristics, such as age, gender, and income (Chung and Yeung, 2019; Wang *et al.*, 2019b).

In addition, research has established that social psychology determines pro-environmental willingness and behavior to varying degrees in different national contexts (Tam and Chan, 2017). Social interactions with a particular group strongly influence how public environmental decisions are framed (Kaplan Mintz *et al.*, 2019). For instance, the value consensus among British workers that construction waste is inevitable in the UK construction industry has led to ineffective construction and demolition waste management strategies (Ajayi *et al.*, 2015). Some empirical evidence in the Basque Country of Europe also shows that value identity considerably influences WTP to protect natural resources (Hoyos *et al.*, 2009).

Face-Concept and Social Norms in Rural China

Residents living habits and behaviors in traditional Chinese rural society are closely related to rural etiquette and customs (Greif and Tabellini, 2010). For rural Chinese people deeply influenced by rural etiquette and customs, face-concepts and social norms help them orchestrate their daily lives, influence how they interact with others, and bring delicate philosophical nuances into the realm of daily life (Chen and Lunt, 2021). However, few studies have examined WTP for waste management related to face-concepts and social norms in traditional rural Chinese society. To address this gap, our study attempts to integrate the effects of environmental and social psychology into the WTP for KW recycling.

To fully understand the role of acquaintance society and ascertain the group's values and behavior, it is necessary to delve into the underlying assumptions that are often unconscious but which determine how group members perceive, think, and feel (Schwartz and Cieciuch, 2022). Therefore, in the following part, we review studies dealing with environmental and social psychology to identify the determinants of face-concepts and social norms in WTP for KW recycling in rural China and justify our modeling choices.

Face-concepts, as internal psychology, are ubiquitous in all social interactions of rural acquaintance societies and are one of the main factors for someone to obtain moral reputation, status, and prestige (Chen and Lunt, 2021). Following the theory of universal politeness (Haugh and Bargiela-Chiappini, 2010), scholars and researchers in the social field have tried to use the concept of face as a key concept in the analysis of social and individual behavior. Qiao *et al.* (2022) reveal that the concept of face in rural China is essentially associated with the respectable identity and status of individual actors. Many face-concept phenomena can be explained and understood in terms of human characteristics. The concept of the face can be divided into (1) moral face – a person's dignity and integrity, (2) image face – a person's facade to impress others, and (3) power face – a person's

social power and connection (Kinnison, 2017). For example, a face-concept can make Chinese students put more effort into the image face to gain the upper hand or to act in a way that prevents others from getting ahead of them (Hodkinson and Poropat, 2014). Based on a survey of 416 tourists, Gao *et al.* (2017) confirmed that the face-concept has a positive effect on gift selection effort, brand orientation, and purchase cost due to power face. Following this line of thought, the face-concept contains positive public relations and self-image and may play a very important role in WTP for KW recycling in rural China.

In contrast to the face-concepts in internal psychology, social norms are defined as a set of informal rules and standards from the surroundings that regulate the behavior of social members, which can assist individuals in determining what is acceptable or unacceptable social behavior (Wang *et al.*, 2023). Moreover, social norms are regarded as a key rural etiquette and customs component in explaining behavior at the social and psychological levels and refer to beliefs supporting conformity to common behaviors (Eom and Kim, 2015). Individuals are either active or reluctant to participate in waste management because of the different environmental beliefs in different countries (Barr *et al.*, 2003). Social norms make an important distinction between descriptive (how people usually behave) and injunctive norms (what people are morally obligated to do) (de Groot *et al.*, 2021). Studies have confirmed that social norms directly affect recycling behavior in collectivist societies (Sorkun, 2018). In traditional Chinese villages, villagers mainly socialize with family, neighbors, and village cadres, and social norms are transmitted as the prevalent beliefs and behaviors among different interest groups (Farrow *et al.*, 2017). Therefore, we focused on the impact of descriptive norms on WTP for rural KW recycling.

Environmental Policy and Environmental Protection Education

Studies have shown that policies significantly influence public participation in recycling activities (Wu *et al.*, 2021): First, it can be associated with intention. Policies can stimulate residents' enthusiasm to participate in pro-environment behaviors by strengthening the public's awareness of waste management. Second, residents' behaviors are driven by the coercive power of the government, which requires residents to act appropriately in environmental governance. For instance, Xiao *et al.* (2017) argue that residents who are better informed by the government about pro-environment policies are more likely to participate in sustainable waste management.

In addition to policy, environmental literature more consistently reports the relationship among pro-environment intention, behaviors, and knowledge of waste management. For instance, Wang *et al.* (2020) indicated that waste classification knowledge indirectly influences residents' waste classification intentions through attitudes and perceived behavioral control. A study in

Ibadan, Nigeria, suggests that improving knowledge of community waste management can encourage community members to carry out pro-environmental activities (Hammed *et al.*, 2018). Similarly, Xiao *et al.* (2017) suggested that improving knowledge of community waste management can encourage community members to sort waste at the source for recycling in China. Environmental protection education is one of the main ways to acquire environmental knowledge in China (Wang *et al.*, 2020).

The government has implemented environmental policies and environmental protection education for rural household waste classification in some of our research areas. To fully understand the determinants of face-concepts and social norms on rural households' WTP for KW recycling, it is essential to consider the practical influence of policy and knowledge.

Gender Differences in Chinese Traditional Rural Family

Society generally retains the assumption that men are masculine and associated with professional roles, while women are feminine and associated with family roles (Yun *et al.*, 2020). Those with a masculine role are seen as self-promoting, controlling, and dominant, whereas those with a feminine role are seen as caring, helpful and selfless (Stuhlmacher and Poitras, 2010). Moreover, in traditional Chinese rural society, a woman's role in the family scenario is to care for her husband and children. They are more concerned about family hygiene and home health (Yun *et al.*, 2020). Women are the main participants in household work and the main producers and disposers of KW in rural China. Therefore, we decided to consider gender differences in WTP for rural KW recycling to understand better households' willingness to adopt pro-environment intentions and behaviors in the traditional social context.

DATA AND METHODOLOGY

Our survey focused on rural households' socioeconomic characteristics, attitudes, and WTP for kitchen-waste recycling. The results of the survey were analyzed to identify more effective rural KW recycling. A generalized ordered logit (GOL) model was established, and the regression analysis of households' WTP was carried out to explore the key influence of face-concepts and social norms in Chinese rural acquaintance society. This model used both qualitative and quantitative variables, and Section 3.1 explicitly explains this. To further understand the status quo, we held informal discussions with local cadres and waste transfer workers in every village.

Questionnaire Design

The questionnaire included four sections. The first one explored local household KW policy and propaganda and investigated the general local household KW situation. The second section was about attitudes (face-concept, social norms) toward KW management. The third section explored WTP for KW recycling. The last section

covered socioeconomic and demographic data.

A questionnaire survey was conducted in the Guanzhong area, Shaanxi Province, which is located in the hinterland of northwest China. The Guanzhong area is in central Shaanxi Province and includes five cities and one district. Xi'an, Weinan, Xianyang, and Baoji are the four most populous cities in Shaanxi Province, and Yangling District is the Demonstration Zone of China's Agricultural High-Tech Industry. This region covers an area of 55,623 square kilometers, with a permanent population of 24,481,500, accounting for 63.35% of the total population of Shaanxi Province, and 80% of the agricultural population of Shaanxi Province (NBSC, 2019). Hence, conducting a survey in the Guanzhong area to understand the influence of face-concept and social norms on farmers' WTP for KW recycling in combination with acquaintance background is appropriate and necessary.

The iterative bid method was used to acquire the WTP data for rural KW recycling. In the questionnaire, the respondent was given an initial bid (β_i) and asked if he/she would pay that price for KW recycling, taking full account of their household income and expenses. In the follow-up questions, a higher bid (β_h) is presented to residents who accept the initial bid, and a lower bid (β_l) is presented to the residents who reject the initial bid. Generally, three potential costs ($\beta_i, \beta_h, \beta_l$) were provided to respondents to derive the utility of improved environmental quality resulting from KW recycling. From the responses, all the answers with a positive WTP (Y) were classified into the following indicators (Johnston *et al.*,

2017):

$Y=1$, if $WTP < \beta_l$, the response is "no – no"

$Y=2$, if $\beta_l \leq WTP < \beta_i$, the response is "no – yes"

$Y=3$, if $\beta_i \leq WTP < \beta_h$, the response is "yes – no"

$Y=4$, if $\beta_h \leq WTP < \beta_{+\infty}$, the response is "yes – yes"

Finally, respondents with a negative WTP ($Y=1$) were asked the reason for their refusal.

Considering the geographical location, the level of economic development, and the population distribution, Weinan, Xianyang, and Baoji Cities, along with Yangling District, were randomly selected from the Guanzhong area. To improve the questionnaire quality and ensure its logic and authenticity, a pre-test was conducted in June 2019 with 60 local rural households, and the research data's reliability and validity were tested. Respondents were randomly recruited, and well-trained interviewers conducted face-to-face interviews on KW recycling in July and August 2019 to ensure data authenticity and rationality. After removing questionnaires with errors and missing key information, 592 valid questionnaires were obtained, with an effective rate of 98.67%. Informed consent was obtained from all participants before they entered the study. Table 1 presents the summary statistics of the variables.

The following two points received special attention: First, the initial bid was identified by fees for waste recycling in pilot villages in the Guanzhong area (8 RMB per month), and respondents were asked to indicate their WTP for KW recycling. Given the WTP data codes, their WTP was scored according to a four-point scale ranging

Table 1. Descriptive Statistics of Variables (N = 592)

Variables	Description	Mean	SD
<i>Dependent variable</i>			
WTP	WTP of household's monthly kitchen waste management (1 = No-No; 2 = No-Yes; 3 = Yes-No; 4 = Yes-Yes)	2.05	0.046
<i>Explanatory variables</i>			
<i>Face-concept</i>			
Moral face	You are willing to be a pro-environment model. (A)	4.63	0.618
Image face	You care about others evaluation in the village. (A)	3.63	1.169
Power face	You have a high prestige in the village. (0 = No; 1 = Yes)	0.24	0.429
<i>Social norms</i>			
Family	If your family suggest you recycle kitchen waste, you'll definitely try it. (A)	4.45	0.674
Neighbors	If your neighbors suggest you recycle kitchen waste, you'll definitely try it. (A)	4.36	0.772
Village cadres	If village cadres suggest you recycle kitchen waste, you'll definitely try it. (A)	3.68	0.884
<i>Socio-economic variables</i>			
Age (years old)	Actual age	50.36	15.942
Gender	0 = Female; 1 = Male	0.48	0.500
Education	0 = Primary school and below; 1 = Secondary school; 2 = High school and above	1.02	0.724
Income last year (RMB)	1 = Less than 10, 000; 2 = 10, 000–20, 000; 3 = 20, 000–30, 000; 4 = 30, 000–40, 000; 5 = More than 40, 000	1.95	1.573
Sorting policy	Is the village a pilot area for waste sorting policy? (0 = No; 1 = Yes)	0.51	0.500
Environmental education	Have you experienced environmental protection education? (0 = No; 1 = Yes)	0.11	0.320

Notes: USD 1 = 6.45 RMB. "A" means "1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree".

Table 2. Respondents Profile (N = 592)

Variables	Category	Freq.	%	Variables	Category	Freq.	%
Age (years old)	Below 30	91	15.4	Sorting policy	Yes	301	50.8
	30 – 50	175	29.6		No	291	49.2
	50 – 70	284	48.0	Environmental education	Yes	59	10.0
	Over 70	42	7.1		No	533	90.0
Gender	Female	306	51.7	Income last year (RMB)	Less than 10,000	164	27.7
	Male	286	48.3		10,000 – 20,000	91	15.4
Education	Primary school and below	150	25.5		20,000 – 30,000	109	18.4
	Secondary school	288	48.0		30,000 – 40,000	65	11.0
	High school and above	157	26.5		More than 40,000	163	27.5

from one to four ($\beta_i = 4$ RMB; $\beta_i = 8$ RMB; $\beta_n = 12$ RMB). Second, in the trial survey we found that the degree of prestige is difficult to measure depending on respondents' answers. Therefore, we replaced it with "You have a high prestige in the village (0 = No; 1 = Yes)" in the formal survey.

Generalized Ordered Model

To explore the predictors of WTP for rural KW recycling, the GOL model was applied. This model is an improvement of the ordered logit model, which addresses the requirement that the ordered logit model includes the assumption of proportional advantage and overcomes the defect that the multi-disorder logit model which obscures the sequence information of the dependent variables (Williams 2006). The specific form of the model is as follows.

$$P(Y_i > j) = g(X_i, \beta_j) = \frac{\exp(\alpha_j + X_i \beta_j)}{1 + \exp(\alpha_j + X_i \beta_j)} \quad (1)$$

In the formula, Y_i represents the options that the i interviewee is willing to pay for KW management, which is 1... Each value of M ($M = 4$), j is 1, 2..., $M-1$, X_i are the influencing factors, which mainly include face-concepts, social norms, general environmental policy, self-reported past pro-environmental training, and socioeconomic and demographic variables, and Y_i is the probability of different values, which are, respectively:

$$P(Y_i = 1) = 1 - g(X_i, \beta_j) \quad (2)$$

$$P(Y_i = j) = g(X_i, \beta_{j-1}) - g(X_i, \beta_j) \quad (3)$$

$$P(Y_i = M) = g(X_i, \beta_{M-1}) \quad (4)$$

The dependent variable was the order of the four categories: $M = 4$. When $j = 1$, the dependent variable *category 1* is compared with *categories 2, 3, and 4*; when $j = 2$, the dependent variables *category 1* and *2* are compared with *categories 3 and 4*; when $j = 3$, the dependent variable *category 1, 2 and 3* are compared with *category 4*.

RESULTS AND DISCUSSION

Sample Description of Households

Descriptive statistics regarding the socioeconomic

characteristics for the study samples are shown in Table 2. The predominance of respondents aged 51–70 years (48%) indicates that the main participants in KW recycling were older people, which is consistent with the situation of empty nesters in rural China (Wei *et al.*, 2023). The gender distribution is relatively equal. The largest proportion of respondents (48%) had secondary school qualifications. Additionally, more than half of them (50.8%) lived in a village where a waste sorting policy was implemented. Most respondents (90.0%) were untrained in waste management. About 27.7% of respondents' household income was no more than 10,000 RMB, followed by more than 40,000 RMB (27.5%). The mean annual income was 40,473.82 RMB, and per capita disposable income was 11,202.28 RMB. Our survey data was similar to that of the 2018 Shaanxi Provincial Statistical Yearbook (NBSC, 2019).

WTP Responses

Employing Honu's (2007) formula, respondents' average WTP (Table 3) can be derived by multiplying the percentage of the classes in the third column and the average WTP for each class. This results in an average WTP of 4.12 RMB after summing up the average columns.

Studies have shown that even if respondents show their WTP, there may still be a tendency toward a protest response (Brouwer and Martín-Ortega, 2012). Table 3 also reveals that out of the 592 respondents, about 40% gave a negative WTP for KW recycling. According to the reasons for their reluctance to pay, these non-active respondents are divided into valid negative WTP and protest negative WTP, as in (Xu *et al.*, 2020). We refer to the CVM studies of respondents with zero WTP; protest negative WTP responses are excluded from further analysis (Johnson and Geisendorf, 2022). In the following regression, only valid negative WTP respondents were included (520 samples were used for a total of 87.8% of the total valid samples).

Generalized Ordered Logit Results

Table 4 shows the results for the two models. Considering the differences in waste management policies and environmental protection education in different

Table 3. Frequency of Positive WTP, Valid Negative WTP, and Protest Negative WTP (N=592)

Reasons	Freq.	%
Positive WTP	354	59.7
Yes–Yes	75	12.7
Yes–No	105	17.7
No–Yes	174	29.4
Valid negative WTP (No–No)	166	28.1
The quantity of kitchen waste in your family is too little.	43	7.3
You have no extra income, otherwise you would pay.	44	7.4
You would like to dispose kitchen waste by yourself.	35	5.9
You would rather do waste management in other ways.	44	7.4
Protest negative WTP (No–No)	72	12.2
This is the responsibility of the government.	53	9.0
It is believed little pollution by kitchen waste.	6	1.0
Others.	13	2.2

Table 4. Estimation Results (N=520)

Variables	GOL 1			GOL 2		
	1 & 2,3,4	1,2 & 3,4	1,2,3 & 4	1 & 2,3,4	1,2 & 3,4	1,2,3 & 4
Face-concept						
Moral face	0.345**	0.170	–0.265	0.324**	0.161	–0.298
Image face	0.191**	0.031	0.147	0.197**	0.036	0.152
Power face	0.150	0.577**	0.704**	0.176	0.631**	0.730**
Social norms						
Family	–0.243	–0.392	–0.674	–0.257	–0.440	–0.761*
Neighbors	0.187	0.613**	0.822*	0.213	0.670**	0.892**
Village cadres	0.340***	0.122	–0.046	0.338***	0.127	–0.039
Socio-economic variables						
Age	–0.036***	–0.040***	–0.057***	–0.035***	–0.040***	–0.058***
Education	–0.085	–0.074	–0.361	–0.079	–0.076	–0.357
Income	0.180***	0.151**	0.255**	0.186***	0.161**	0.268***
Gender	0.399*	–0.088	0.220	0.390*	–0.100	0.168
Sorting Policy				0.419**	0.099	0.244
Environmental education				–0.386	–0.393	–0.731
Log likelihood		–610.193			–605.394	
Pseudo R^2		0.097			0.103	

Notes: They were estimated using “gologit2” in Stata (Williams 2006); the “Collin-based” tests in Stata suggested no multicollinearity problems (mean VIF = 1.72); numbers in parenthesis are standard errors; *, **, and *** significant at the 10%, 5%, and 1%, respectively.

cities/districts, the following two variables, “Is the village a pilot area for waste sorting policy” and “Have you experienced environmental protection education?” may have had a strong influence on the model results. Before estimating GOL 2, a regression without considering the above two variables was performed in GOL 1. We found that the models with different GOL yielded very similar results and therefore confirmed the robustness of the GOL 2 model. The specification test results are presented in Table 4.

The statistical significance of the face-concept high-

lights the importance of the *moral*, *image*, and *power* faces. Respondents self-labeled as having a higher *moral face* were more likely to have a higher WTP for KW recycling. Therefore, a resident with a higher dignity and integrity level significantly increases the probability of a higher WTP for KW recycling. The effect of the *image face* can be explained in the same manner. It has a positive impact on the probability of a high WTP. Furthermore, respondents who reported having a higher social power and relationship status were more likely to be on a relatively higher WTP level, and the effect was

slightly increased for *category 4*.

The results also show that the respondents' WTP for KW recycling is strongly associated with social norms. In this regard, this study's findings are consistent with those of Czajkowski *et al.* (2019), who elaborated on social norms as one of the determinants of household recycling. The main hypothesis is that the payment levels are significantly influenced by the suggestions of *family*, *neighbors*, and *village cadres*. In particular, the weak significance of negative coefficient estimates of *family* indicates that a higher acceptance of family members' suggestions decreases the likelihood of having a high WTP. Individuals do not accept proposals from family members to pay for KW recycling, which suggests that they may be more concerned about the fairness of payment, the effectiveness of governance, and the loss of disposable income for their household caused by the payment.

For the degree of acceptance of the neighbors' suggestion, the significant positive estimates suggest that a higher degree of *neighbor* suggestion acceptance is associated with *category 3* or *category 4* of WTP, with the effect being increased for the high level. This result is well documented in a study estimating how decision-making is influenced when residents have such a strong desire for conformity. If they believe their neighbors are doing the same, they are more likely to change their ways (Wu *et al.*, 2022).

Moreover, higher social norms from *village cadres* positively affected the likelihood of residents' WTP. Residents who have a good relationship with the cadres choose a higher WTP. These findings align with those of Li *et al.* (2022), who also found that good public-government relations are more likely to meet recycling requirements.

Furthermore, older respondents were less likely to be in *categories 2, 3, or 4* of WTP, while high-income residents chose the opposite. The probability of being in a low WTP category increases with male respondents and sorting policy groups. However, these two variables did not significantly determine the likelihood of being in *categories 2, 3, or 4*.

The marginal effects of the significant variables are reported in Table 5. The face-concept is a significant predictor of WTP. While a higher level of *moral face* is associated with a 7.5% reduction in the probability of being in *category 1*, it tends to increase the probability of *category 3* for KW recycling by 5.8%. Moreover, a higher *image face* increases the probability of *category 1* or *category 2* by -4.6% and 3.8%, respectively. However, the viability of *power face* has significant marginal effects only for *category 4* of WTP. Residents with a higher *power face* were 7.7% more likely to have a high WTP.

The opposite signs of the marginal effects of *family* indicate that the probability of a resident being in *category 4* decreases by 6.8% when the resident's family is higher. Conversely, the probability of a resident being in *category 4* increased by 7.9% when the neighborhood norm was higher. The negative signs of the marginal effects indicate that social norms from *village cadres* reduce the probability of *category 1* by 7.8%, whereas it increases the probability of *category 2* WTP by 5.3%. Compared with non-policy areas, areas with waste reduced the probability of *category 1* by 9.7% but increased the probability of *category 2* by 7.7%. Residents with environmental protection education are 5.2% less likely to be in *category 4* of the WTP. As noted by Bertoldo and Castro (2019), the recent introduction of regulations related to household waste man-

Table 5. Average Marginal Effects (N = 520)

Variables	1	2	3	4
Face-concept				
Moral face	-0.075**	0.043	0.058**	-0.027
Image face	-0.046**	0.038**	-0.006	0.014
Power face	-0.040	-0.093	0.057	0.077*
Social norms				
Family	0.059	0.028	-0.019	-0.068*
Neighbors	-0.049	-0.083	0.053	0.079**
Village cadres	-0.078***	0.053**	0.028	-0.003
Socio-economic variables				
Age	0.008***	0.000	-0.003**	0.005***
Education	0.018	-0.003	0.017	-0.032
Income	-0.043***	0.011	0.008	0.024***
Gender	-0.090*	0.110**	-0.035	0.015
Sorting Policy	-0.097**	0.077*	-0.002	0.022
Environmental education	0.092	-0.020	-0.020	-0.052**

Notes: Sample average marginal effects were based on GOL (see Table 4) and estimated using "mfx2" in Stata (Williams 2006); numbers in parenthesis are standard errors; *, **, and *** significant at the 10%, 5%, and 1%, respectively.

agement impacts the extent to which pro-environmental behaviors are internalized and implemented.

The Difference between Males and Females in WTP

This study also confirmed men's and women's different WTP responses. Table 6 shows the results of the GOL model to compare the coefficients of the gender and dependent variables.

For women, a *moral face* positively influenced *category 1* of WTP. Moreover, this variable decreases the probability of *category 4* WTP for men. In this regard, the findings could be explained by women having higher levels of socialization, other-orientation, and social responsibility (Grillos, 2018). In addition, *image face* has a similar positive effect on *category 1* WTP for both genders. Note that the variable *power face* only positively influences women's relatively high WTP.

Furthermore, village cadres only positively influence the intermediate WTP category for men. For women, the probability of being in *category 1* increases with *village cadres* and decreases with a high WTP. These findings seem to reveal a new way of promoting women's participation in KW recycling.

CONCLUSION AND RECOMMENDATION

The prospect of increasing KW volumes in rural areas and concurrently growing concerns about environmental pollution in developing countries demands improved collection and recycling programs. Households are responsible for most KW and will play a key role in addressing these concerns. This research aimed to inform policies designed to address mounting concerns related to KW by elucidating the impact of the

face-concept and social norms on WTP for rural KW recycling in the context of acquaintance societies.

This study empirically demonstrates the influence of face-concepts and social norms on rural households' WTP for KW recycling in China. Households paying more attention to the moral and image faces are likelier to have a low WTP. Conversely, those concerned about the power face are more likely to have a higher WTP. Neighbors have a significant positive effect on households paying for waste recycling. However, village cadres' advice has a greater impact on low-WTP households. However, households are often reluctant to accept family members' suggestions for a higher WTP. Therefore, contextual factors other than those included in this study may affect the WTP level.

Moreover, our empirical results show that some socioeconomic factors define people's WTP for KW recycling. For instance, income has a positive impact on WTP. Furthermore, different genders had different responses to WTP levels. However, females' face-concept and social norms are more influenced by expectations of being an environmental role model (moral face) and a greater focus on the image face, while males consider the power face in the village. In addition, waste policies and environmental protection education have an impact on households' WTP for waste recycling in rural China.

These findings should be taken into account when launching new municipal and governmental KW management programs. First, more information should be provided on the potential toxicity of KW and the potential impact of improper disposal on public health to environmental awareness and action among rural households. Second, village cadres strengthen moral and social

Table 6. Estimation Results for Gender (N = 520)

Variables	Male			Female		
	1 & 2,3,4	1,2 & 3,4	1,2,3 & 4	1 & 2,3,4	1,2 & 3,4	1,2,3 & 4
Face-concept						
Moral face	0.027	0.081	-0.571*	0.911***	0.325	-0.368
Image face	0.204*	0.011	0.315	0.230*	0.079	-0.030
Power face	-0.091	0.457	-0.077	0.651	0.702*	1.472***
Social norms						
Family	-0.089	-0.619	-0.913	-0.233	-0.422	-0.241
Neighbors	0.055	0.812	1.324*	0.103	0.713*	0.209
Village cadres	0.256	0.434**	0.385	0.452***	-0.068	-0.496*
Socio-economic variables						
Age	-0.030***	-0.046***	-0.067***	-0.039***	-0.029**	-0.057***
Education	0.049	-0.160	-0.498	-0.064	0.059	-0.464
Income	0.242**	0.170	0.379**	0.093	0.153	0.268*
Sorting Policy	0.655**	0.337	0.609	0.356	-0.026	-0.430
Environmental education	-0.665	-0.507	-0.231	-0.290	-0.249	-1.021
Log likelihood		-282.556			-303.284	
Pseudo R ²		0.128			0.127	

Notes: *, **, and *** significant at the 10%, 5%, and 1%, respectively.

norms to provide conditions for rural households' environmental behavior. Simultaneously, various evaluation activities and setting an environmental role model encourage a greater sense of environmental responsibility. It is important to use social influence to promote the recycling of KW.

However, the gap between men and women who state that they are willing to pay for KW recycling and their actual motivation to do so and experience with other pollution problems suggests that these measures are insufficient, at least in the short run. Special efforts should be made to improve KW recycling solutions for different households. Specifically, we need to develop gender-based measures. For instance, involving women in pro-environmental role model activities selected by the surrounding villagers while encouraging men to gain more prestige by participating in waste management.

Future research could further explore other barriers to gender-specific WTP for KW recycling, compare the effectiveness and costs of various KW recycling programs, and assess the feasibility of spiritual incentives, such as praise for villages that aim for green households.

AUTHOR CONTRIBUTIONS

H. Chen analyzed the data and wrote and modified the manuscript. Y. Li and X. Wang participated in the modification of the study. M. Yabe participated in the design of the study, modified the manuscript, supervised the work, and provided financial support. Y. Yuan designed the study, analyzed the data, modified the manuscript, supervised the work, and provided financial and data support. All authors assisted in the editing of the manuscript and approved the final version.

ACKNOWLEDGMENTS

This work was funded by the National Natural Science Foundation of China (72103164), Humanities and Social Sciences Youth Foundation, Ministry of Education of the People's Republic of China (20YJC790171), Chinese Universities Scientific Fund (2452023313), the Scientific Research Foundation for Talents of Shaanxi Province (F2020221010) and JSPS-CAS Joint Research Project (Grant No. JSPS-BP120207202).

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