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## Personality traits and village cadre adoption of rural environmental protection measures: a case study from China

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Strengthening rural environmental protection measures is a requirement for improving agricultural production conditions, protecting rural living environments and ensuring public health in rural areas. Village cadres (leaders of the village) play a key role as decision makers. To provide insight into the effect of village cadre personality traits (Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism) on the adoption of rural environmental protection measures, we use data from a questionnaire survey of village cadres in Liaoning Province in China in 2017. According to our results, 88.9% of villages adopt environmental protection measures. Specifically, we find that village cadres with a higher level of agreeableness and neuroticism are more likely to adopt environmental protection measures. Our findings suggest that considering personality traits in the selection criteria for village cadres will be beneficial for the execution of village projects.

**Keywords:** personality traits; village cadres; environmental protection measures; adoption behavior

### 1. Introduction

In recent decades, economic growth and socioeconomic changes have improved the urban environment in China, but rural environments still face great challenges. First, rural household garbage is piled up at random. This garbage takes a long time to degrade. For example, cigarette butts take 1–5 years to degrade, and plastic takes 100–200 years. Additionally, this garbage releases carcinogens into the atmosphere due to decomposition and breeds pathogenic micro-organisms (Huang 2014). Second, rural domestic sewage is dumped at will, polluting groundwater resources. Third, some small factories are not located in industrial parks but are transferred to rural areas to discharge waste water, gas and residues (Deng 2015). This waste pollutes the soil and accelerates the deterioration of the rural environment. These environmental problems lead to a decline in the quality of life for rural residents and even damage their health.

The main reason for this phenomenon is that the supply of rural environmental public goods is insufficient. As the representative of village organizations, village cadre decisions about adoption will affect the supply of rural environmental public goods in China (Li and Liu 2016). Many scholars have carried out in-depth research

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on village cadre decisions about adoption which have mainly focused on social, economic, attitudinal and education-extension factors (Dadoukolaei *et al.* 2008; Li *et al.* 2011). Therefore, it is important to understand what factors drive village cadre decisions on the adoption of rural environmental protection measures. In this paper, “rural environmental protection measure” refers to the employment of environmental protection personnel in the village. The employment of rural environmental protection personnel and the number of people employed are determined by the village cadres according to the size of the village and the number of households (Huang 2014).

For village cadres, hiring environmental protection personnel can be seen as a public good investment, and the attitude of village cadres is different when they face investment risks. Empirical studies have suggested that personality traits may be an important factor in investment decisions (Akhtar, Thyagaraj, and Das 2018; Lodi-Smith and Roberts 2007), and investigated the effect of personality on several outcomes such as education (De Raad and Schouwenburg 1996; Eysenck 1996), job performance (Barrick and Mount 1991; Salgado 1997), health (Friedman 2000; Cloninger and Zohar 2011), life satisfaction (Sato *et al.* 2018; Joshanloo and Afshari 2011), financial investment and consumption (Prinz *et al.* 2014; Landis and Gladstone 2017; Gerber *et al.* 2011), energy technology adoption (He and Veronesi 2017), waste management behaviors (Swami *et al.* 2011), environmental concerns (Hirsh 2010), sustainable tourism choices (Passafaro *et al.* 2015), and environmental behaviors (Brick and Lewis 2016). Based on our reading of the literature, there are no studies using data that report the impact of differences in the personality traits of village cadres on the adoption of rural environmental protection measures.

The overall goal of this paper is to provide empirical evidence of the relationship between personality traits of village cadres and the adoption of rural environmental protection measures. The analysis uses a questionnaire survey of village cadres in Liaoning Province in China and an internationally recognized scale of personality traits to examine personality traits among village cadres. The ultimate objective is to build a repository of information on personality traits among village cadres in China that can be used as a decision-making tool to help top leaders target their investments.

The rest of the paper will be organized as follows: the next section reviews the literature on the Big Five personality traits and their effects on investing or adopting new policies and proposes some hypotheses to be tested empirically. The following section describes the survey and the data used in the analysis. The following section presents the estimation results. The final section is a discussion and conclusion.

## 2. Conceptual framework and hypotheses

To measure personality traits, we use the Big Five, which is a widely recognized framework with five core dimensions (Costa and McCrae 1992): Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism.

Personality refers to individual differences in relatively stable patterns of thought, feeling, and behavior. In particular, a widely used and well-established framework to model the personality of an individual is the Big Five personality model. This model suggests that there are five basic factors capturing an individual's personality structure: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (Costa and McCrae 1992; McCrae and John 1992). Costa and McCrae argue that

the Big Five model covers all kinds of specific personality traits and can be used in different countries, cultures and language environments (Costa and McCrae 1992).

Previous research shows that the personality traits of individuals are relatively stable over time (McCrae and John 1992). The stability of personality traits is an important premise for the relationship between individual personality traits and economic behavior and performance.

Risk preference is an important factor affecting individual decision-making in economics (Li and Zhang 2015). While Zukerman has shown that risk preferences are related to the factor of “feeling seeking” in personality traits (Zuckerman 1994). This paper analyses the influence of village cadre personality traits on adoption of rural environmental protection measures using risk preference theory. Risk preference reflects risk attitude when faced with uncertainty in the future, and includes risk avoidance, risk neutrality and pursuit of risks. Below, we analyze how the five personality traits influence the adoption of rural environmental protection measures based on risk preferences.

- (1) Openness to experience. Openness to experience reflects the tendency of individuals to try new things. According to the existing research conclusions, openness to experience of personality traits has a significant positive impact on venture investment (Li and Zhang 2015). Individuals with higher openness to experience are more likely to pursue risks and to develop new projects. Therefore, village cadres with high openness to experience scores will be more likely to adopt rural environmental protection measures.
- (2) Conscientiousness. Conscientiousness reflects willingness to work hard. Individuals with higher conscientiousness scores are less likely to pursue risks (Nicholson *et al.* 2005). Hilbig *et al.* (2013) and Markowitz *et al.* (2012) have shown that conscientiousness is positively associated with environmental concern. It shows that the stronger the conscientiousness of village cadres, the less attention they will pay to risks. Instead, they will focus on the development of new projects. Therefore, village cadres with high conscientiousness will be more likely to adopt rural environmental protection measures.
- (3) Extraversion. Individuals high in extraversion are more likely to pursue risks (Nicholson *et al.* 2005). In addition, individuals with high extraversion are better at leadership roles (Li and Zhang 2015). The more extraverted the village cadre, the more information resources they will get, thus reducing the risk in decision-making. Therefore, village cadres who are extraverted will adopt rural environmental protection measures.
- (4) Agreeableness. Agreeable people are more likely to care about others. According to existing research, individuals low in agreeableness are self-centered and more willing to pursue risks (Borghans *et al.* 2009; Deck *et al.* 2008). However, village cadres who are agreeable will consider the development of their village and may hope to improve the appearance of the village by carrying out new projects. This agreeableness will weaken the attention of village cadres to the risks of new projects. Therefore, village cadres with high agreeableness will be more likely to adopt rural environmental protection measures.
- (5) Neuroticism. Neuroticism mainly describes whether individuals are emotionally stable. Borghans *et al.* 2009 and Deck *et al.* shown that individuals with higher neuroticism are less likely to pursue risks (Borghans *et al.* 2009; Deck *et al.* 2008). Therefore, the more neurotic the village cadre,

the more likely they will be to avoid the risk of uncertainties in results and not carry out new projects. Therefore, village cadres with neuroticism will be less likely to adopt rural environmental protection measures. We summarize our hypotheses as follows:

H1. Conscientiousness has a significant positive effect on rural environmental protection measure adoption by village cadres. A conscientious village official is efficient and organized, so he or she may be more likely to hire full-time environmental workers in order to ensure community cleanliness.

H2. Extraversion has a significant positive effect on rural environmental protection measure adoption by village cadres. Extraverted individuals are better at interacting with others, so an extraverted village official may interact more with village residents and fellow government officials, making them realize the need for environmental workers in the village.

H3. Agreeableness has a significant positive effect on rural environmental protection measure adoption by village cadres. Agreeable individuals care for others and village cadres who are more agreeable may put the interests of their village first and pay more attention to the development of their village than they pay to their own personal needs, so they may be more likely to hire full-time environmental workers.

H4. Neuroticism has a significant negative effect on rural environmental protection measure adoption by village cadres. Neuroticism describes whether individuals are emotionally stable. Neurotic individuals tend to be pessimistic and have many negative emotions. Thus, village cadres with higher neuroticism are more likely to experience negative emotions such as anger, anxiety and depression, which may affect their enthusiasm towards their work and surroundings, making them less likely to hire full-time environmental workers.

H5. Openness to experience has a significant positive effect on rural environmental protection measure adoption by village cadres. Openness refers to the propensity to try new activities and experiences. Village cadres who are open to experience are likely to be more willing to try new technologies and carry out new projects, so they are more likely to hire full-time environmental workers.

### 3. Data

Data were collected using in-person interviews with village cadres from Liaoning Province, China from August to October 2017. In the survey, we adopted a stratified random sampling method. The specific sampling process is as follows: (1) we chose 13 cities in Liaoning Province; (2) we selected 59 counties (districts, county-level cities) from the 13 cities randomly; (3) we selected 228 towns (streets) from the 59 counties randomly; (4) 271 village cadres were randomly selected from the 228 towns (streets). The villages surveyed are widely distributed and representative of the province, as they cover all types of villages in Liaoning Province. The 15 people on our team asked respondents to answer every question in the questionnaire. In the analysis, no observations were dropped. In the final sample, 241 villages have employed environmental protection personnel and 30 villages have not.

Table 1. Sample characteristics.

Variable		Observations	Share (%)
Gender	Male	233	85.98
	Female	38	14.02
Age (years)	18–44	71	26.20
	45–59	166	61.25
	60 or over	34	12.55
Education	Primary school or below	7	2.58
	Junior high school	116	42.80
	High school or technical secondary school	80	29.52
	Undergraduate or junior college	65	23.99
	Postgraduate and above	3	1.11
Length of residence (years)	0–15	14	5.17
	16–30	25	9.23
	31–45	70	25.83
	46–60	140	51.66
	61 or over	22	8.12
Length of service (years)	0–5	131	48.34
	6–10	62	22.88
	11–15	37	13.65
	16–20	24	8.86
	21 or over	17	6.27
Years in the party (years)	0–5	54	19.93
	6–10	55	20.30
	11–15	37	13.65
	16–20	52	19.19
	21 or over	73	26.94
Donation experience	1 = yes	184	67.90
	0 = no	87	32.10

The main household and individual characteristics of respondents are displayed in Table 1. The average respondent was 49 years old. Respondents had an average of eleven years of education. The proportion of respondents who were male is 86%. The average time of service as a village cadre was eight years. The average amount of time village cadres have resided in the village was 45 years. Respondents have an average party standing of fifteen years. The proportion of respondents who have had the experience of donating money in the last three years is 68%.

The original questionnaire on the Big Five personality traits developed by Costa and McCrae includes 240 items (Costa and McCrae 1992). In our survey, we used a short list of 15 items developed from the original survey in order to measure the Big Five factors (three items per factor [see [online supplemental data](#)]). The same 15 items have been used in the German Socio-Economic Panel study after considerable pre-testing, and have provided valid and reliable results (Boyce and Wood 2011; Hahn, Gottschling, and Spinath 2012; Dehne and Schupp 2007). This 15-item scale, which has been used in studies of China, has provided valid and reliable results (He and Veronesi 2017; Liu *et al.* 2017). The Chinese version of this 15-item scale also has been validated by academics (Li and Zhang 2015; Zhou and Kang 2019). Previous studies have confirmed that the Chinese version of the scale has good factor structure, acceptable internal consistency reliability, expected convergence, discriminant and standard related validity, indicating that the Chinese version of the scale is a reliable psychological assessment tool (Zhang *et al.* 2019; Luo *et al.* 2019). In addition, the results for reliability and

Table 2. Summary statistics.

	Full sample, <i>N</i> = 271		Non-adopters, <i>N</i> = 30		Adopters, <i>N</i> = 241		<i>T</i> statistic (3)–(5)
	Mean (1)	SD (2)	Mean (3)	SD (4)	Mean (5)	SD (6)	
Personality traits							
Conscientiousness	4.4	0.6	4.4	0.8	4.4	0.6	–0.6
Extraversion	4.1	0.8	4.1	1.0	4.0	0.8	0.1
Agreeableness	4.4	0.6	4.1	0.8	4.4	0.6	–2.1**
Neuroticism	2.2	0.9	1.7	0.7	2.2	0.9	–3.0***
Openness	3.8	0.9	3.5	1.0	3.8	0.9	–1.4
Personal characteristics							
Gender (1 = male, 0 = female)	86.0%	0.3	90.0%	0.3	85.5%	0.4	0.7
Years of education	11.1	2.8	10.7	2.9	11.2	2.8	–1.0
Age	49.3	9.2	51.9	10.0	49.0	9.1	1.6
Length of residence (years)	45.1	14.1	49.1	12.3	44.6	14.2	1.7
Length of service (years)	8.2	7.2	7.9	6.6	8.3	7.3	–0.3
Years in the party (years)	15.3	10.7	18.4	11.6	14.9	10.5	1.7
Donation experience (1 = yes, 0 = no)	67.9%	0.5	60.0%	0.5	68.9%	0.5	–1.0

Notes: \*\*Differences between adopters and non-adopters are significant at 5% level.

\*\*\*Differences between adopters and non-adopters are significant at 1% level.

validity (KMO value) were 0.69 and 0.68, which indicated that this 15-item scale had good reliability and validity. Individuals with a higher standardized score on neuroticism, extraversion, openness, agreeableness, and conscientiousness are more neurotic, extraverted, open, agreeable, and conscientious, respectively.

Following John, Donahue, and Kentle (1991) and Costa and McCrae (1992), we asked respondents to rate their agreement on a 5-point Likert scale (1 “strongly disagree”, 5 “strongly agree”) for each item. We obtained raw scores for the Big Five factors by averaging the scores of corresponding items.

As shown in Table 2, village cadres who adopt environmental protection measures have, on average, more years of education, younger age, more years of service, more donation experience, a stronger sense of responsibility and are more agreeable and open to experience. Unexpectedly, the village cadres who do not adopt environmental protection measures have longer residence time in the village, more years in the party, higher extraversion and lower neuroticism.

Figure 1 displays the distributions of scores for each personality factor by adoption status. The distributions of adopters are different from those of non-adopters. The t-test results showed that at the 1% level, there was a difference in the mean value of the neuroticism indicators between non-adopters and adopters (row 5, column 8); at a significance level of 5%, there was a difference in the mean value of the agreeableness indicators between non-adopters and adopters; at a significance level of 10% (row 4, column 8), there are also differences in the average residence time and party age between non-adopters and adopters (row 11 and row 13, column 8). There is no difference in other personality traits of village cadres between non-adopters and adopters.

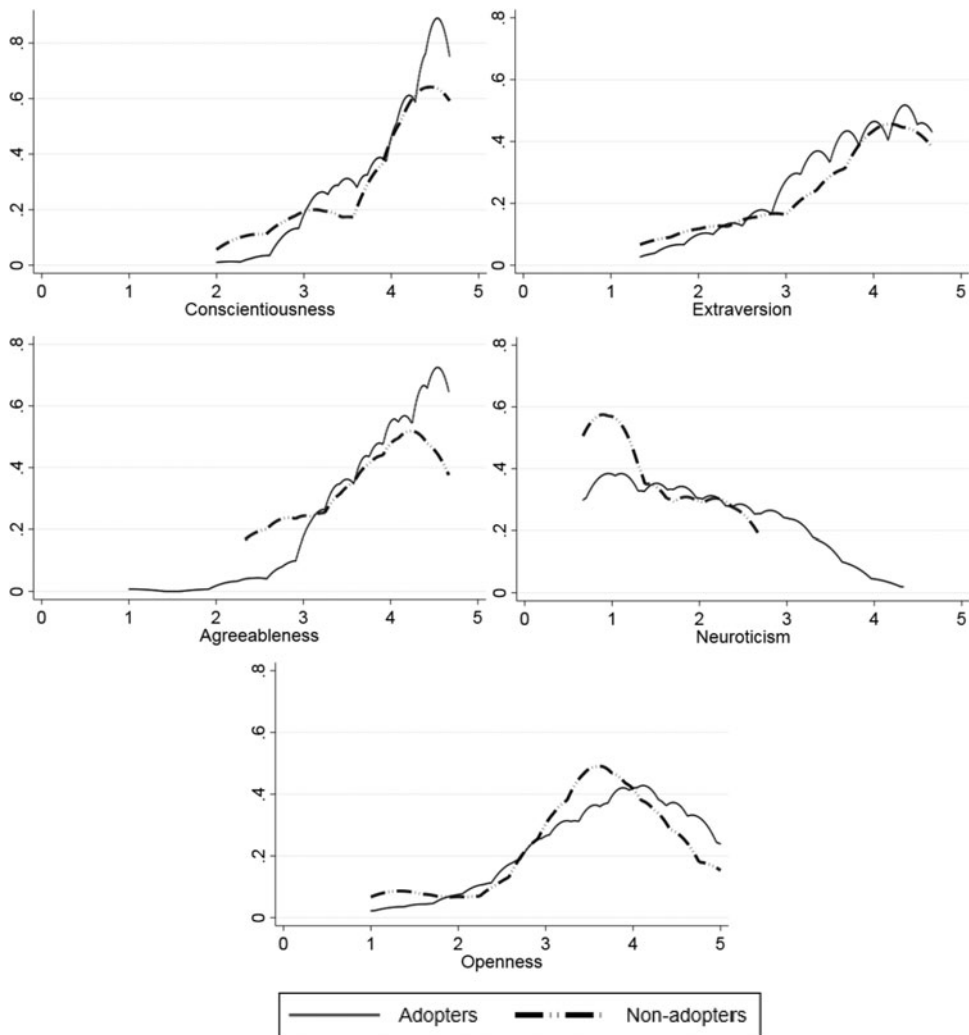


Figure 1. Distribution (Kernel density) of scores of personality factors by adoption status.

## 4. Empirical model and results

### 4.1. Statistical methods

A logistic regression model is usually used to estimate the nonlinear relationship between classified dependent variables and a series of continuous independent variables or classified independent variables. In this paper, the dependent variable in the regression model is whether or not the village has employed environmental protection personnel. In the sample, 241 villages have employed environmental protection personnel (represented by a value of 1) and the remaining 30 villages have no environmental protection personnel (represented by a value of 0). When a large number of observed values are concentrated at both ends of the distribution, a logistic regression model is very suitable for analysis. Therefore, we analyze the effects of personality traits of village cadres on their rural environmental protection measure adoption using the following logistic regression model:



Table 3. Logistic regression results.

	(1)	(2)	(3)	(4)
Conscientiousness	0.0 (0.4)	0.1 (0.4)	0.2 (0.4)	0.2 (0.4)
Extraversion	-0.1 (0.3)	-0.1 (0.3)	-0.1 (0.3)	-0.1 (0.3)
Agreeableness	0.6** (0.3)	0.6* (0.3)	0.5* (0.3)	0.5* (0.3)
Neuroticism	0.8*** (0.3)	0.8*** (0.3)	0.8*** (0.3)	0.7*** (0.3)
Openness to experience	0.3 (0.2)	0.3 (0.2)	0.2 (0.2)	0.2 (0.2)
Control variables	No	No	Yes	Yes
City fixed effects	No	Yes	No	Yes
_cons	-3.0* (1.7)	-2.8 (1.8)	-0.8 (3.9)	-1.2 (4.3)
Observations	271	271	271	271

Notes: Data source: questionnaire survey. The standard error is in parentheses. Control variables: gender, education, age, length of residence in the village, length of service, years of party membership, donation experience and village size.

\*Significant at 10% level.

\*\*Significant at 5% level.

\*\*\*Significant at 1% level.

$$P_i = \frac{e^{\alpha + \sum \beta_k X_{ki}}}{1 + e^{\alpha + \sum \beta_k X_{ki}}}$$

where  $P_i$  is the probability that the village  $i$  has employed environmental protection personnel, and it is a nonlinear function composed of  $k$  explanatory variables  $X_i$ . In the model, the ratio of  $P_i$  (the probability of hiring environmental protection personnel in the village) to  $(1 - P_i)$  (the probability of not hiring environmental protection personnel in the village) is defined as the occurrence ratio of hiring environmental protection personnel. Take the natural logarithm for this occurrence ratio, and the model form can be obtained:

$$\ln\left(\frac{P_i}{1 - P_i}\right) = \alpha + \sum \beta_k X_{ki}$$

Therefore, the specific expression of the logistic regression model is as follows:

$$\ln\left[\frac{P(Y)}{1 - P(Y)}\right] = \beta_0 + \sum_1^2 \beta_i^A XA_i + \sum_1^1 \beta_i^B XB_i$$

where  $XA_i$  is a vector of dummy variables representing the Big Five personality traits;  $XB_i$  is a vector of variables, cadres such as gender, years of schooling, age, length of residence in the village, length of service, years of party membership, donation experience and village size, that could affect the likelihood of rural environmental protection measure adoption among village cadres.  $\beta_0$  is the intercept of the regression equation, and other  $\beta$  s represent the regression coefficient.

#### 4.2. Results

Table 3 reports the marginal effects of personality traits and control variables on environmental protection measure adoption. Due to potential omitted variable bias, we recognize that our results should be interpreted as correlations and not given a causal interpretation. Column 1 presents a model that includes only the Big Five personality traits as independent variables. We find that both agreeableness and neuroticism have a positive effect (significant at the 5 and 1% level, respectively) on environmental protection measure adoption by village cadres. Each additional point of agreeableness is associated with a 60% increase in adoption, while each additional point increase of neuroticism is associated with an 80% increase in adoption. The effects of conscientiousness, extraversion and openness are not significant drivers of environmental protection measure adoption in our results.

We also perform a sensitivity analysis by controlling for individual characteristics and city fixed effects which fix the impact of urban economic development in column 4 of Table 3. We still find that agreeable and neurotic village cadres are more likely to adopt environmental protection measures. Each additional point of agreeableness is associated with a 50% increase in adoption, while each additional point of neuroticism is associated with a 70% increase in adoption. We do not find any significant effect for individual non-personality trait characteristics on the adoption decisions by village cadres.

Village cadres with higher agreeableness are considerate, friendly, generous, helpful and willing to give up their own interests for others. Therefore, they are more likely to consider the interests of the village and carry out projects to promote development. Therefore, they are more likely to hire environmental protection personnel in their villages. Highly neurotic individuals tend to have psychological stress, unrealistic thoughts, excessive demands and impulses and are more likely to experience negative emotions such as anger, anxiety and depression. Highly neurotic village cadres may be more sensitive to situations in the village and more likely to respond to projects. So, they are more likely to hire environmental protection personnel in their villages.

#### 5. Discussion

Using the data from a questionnaire survey of village cadres in Liaoning Province, China in 2017, we found that 88.9% of villages had adopted environmental protection measures. According to the Big Five personality scale, we also found that village cadres with higher levels of agreeableness and neuroticism are more likely to adopt environmental protection measures.

Although few previous studies have comprehensively examined the influence of personality traits on individual adoption of environmental protection measures, our conclusions are supported by the international literature. For example, a study conducted in New Zealand found that agreeableness has a significant positive impact on environmental engagement (Milfont and Sibley 2012). In addition, research conducted in Germany has found that neuroticism was positively related to environmental preservation (Wiseman and Bogner 2003).

We find that openness is not related to individual adoption of environmental protection measures. This stands in contrast to other studies conducted in China and other developing countries that have found that individuals with a higher level of openness to experience are more likely to adopt new measures (He and Veronesi 2017). However, evidence suggests that this finding could be related to the subjects included in our sample. When

making decisions, individuals only need to consider their own interests, while village cadres need to consider the interests of all villagers, which will affect their decision.

Interestingly, we found that our sample was unbalanced for gender. It is a fact that there are more male village cadres in rural China (Yu and Peter 2014), and our data reflects this reality. A possible explanation of this phenomenon is that, under the influence of traditional culture, rural communities have obvious gender bias against women, regard village public affairs as the responsibility of men, hinder social participation by women, and reduce the proportion of female village cadres. Gender was used as a control variable in regression to avoid omitting the main variable and to control the influence of gender. In addition, we added a heterogeneity analysis of male and female to scrape the influence of gender, which means we verified the effect of personality on the adoption of rural environmental protection measures, even in the same gender sample.

This study has a number of strengths. First, we use data from a large-scale survey that can be considered representative of Liaoning Province. Second, this paper is innovative in its topic by analyzing the influence of personality traits on public product supply decision-making. Additionally, we use the standard Big Five personality scale, which is generally accepted in the academic community, to measure the personality traits of village cadres.

Even with its strengths, our study also suffers from several limitations. First, we used data from a single province, but national data would be more representative. Second, we studied the correlation between the personality traits of village cadres and the adoption of rural environmental protection measures, but did not study the causal effect between them.

## 6. Conclusion

This study investigates how village cadre personality traits affect the adoption of environmental protection measures. We used empirical data from in-person interviews of village cadres from Liaoning Province, China. These interviews were about environmental protection measure adoption. Estimates from a logistic regression model of personality traits on environmental protection measure adoption show that the main personality traits affecting village cadre adoption of environmental protection measures are agreeableness and neuroticism. Individuals with higher levels of agreeableness and neuroticism are more likely to adopt environmental protection measures. However, we do not find that openness, extraversion, or conscientiousness have significant effects, which suggests that the role played by personality traits on environmental protection measure adoption depends on the context of the measures.

## Disclosure statement

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## Supplemental data

Supplemental data for this article can be accessed [here](#).

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