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Valuing the Environment: Happiness and Willingness-to-pay

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Abstract:

This paper examines the impacts of subjective and objective measures of environmental quality on happiness and willingness to pay higher prices in China. We find that a higher level of happiness is associated with better air quality, but not necessarily with better water quality. The government can encourage willingness to pay for the former, but can only substitute it for the latter. Although perceived environmental quality is important for willingness-to-pay, it plays little role in rating happiness. However, a more highly perceived government effort increases both people's life satisfaction and willingness-to-pay.

Keywords: China; happiness; willingness-to-pay; environmental issues

JEL classification: Q53 O13

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1. Introduction

China has become a world leader in air and water pollution, resulting in rising public dissatisfaction with environmental issues and governance. Nonetheless, there are only a few studies on China that examine the relationship between happiness and environmental surroundings (Smyth et al., 2008, Smyth et al., 2011) and between environmental satisfaction and air pollution in mining areas (Li et al., 2014, Shi, 2015).

Some major gaps remain in the literature. The existing studies mainly use objective local environmental indicators, neglect rural residents (Yu, 2014), or do not give attention to the fact that the central government has failed to control local implementation of the environmental agenda (Economy, 2014).

Using both subjective and objective indicators of environmental quality and governance, this paper examines relationships between these indicators with happiness and willingness to pay high prices for environmentally friendly products (hereafter ‘willingness-to-pay’ for short).

2. Data

This study uses the 2010 wave from the nationally representative Chinese General Social Survey (CGSS) to estimate the following function using ordinary least square (OLS) regression:

$$\text{Happiness or Willingness-to-pay} = f(X; S \text{ or } O; \varepsilon)$$

where the dependent variable is the respondent’s happiness or his/her willingness-to-pay on a 5-point Likert-scale (from lowest to highest). X is a vector of personal, provincial and regional control variables.¹

S is a vector of subjective indicators related to the answers on a 5-point Likert-scale (from lowest to highest) to the following questions:

- How much are you concerned with environmental issues?
- How severe are the environmental issues?
- How well did the central government do in addressing environmental issues in the past five years?
- How well did the provincial government do in addressing environmental issues in the past five years?

These self-reported indicators measure the respondents’ perceptions on the level of pollution and governance. However, these measures may not

¹ These variables include respondents’ age, age squared, education, gender, marital status, religion, wage, number of houses owned, physical and mental health status, regions and provincial GDP per capita. Wage and provincial GDP per capita have been transformed into CPI-weighted purchasing power measures by taking the natural logarithm of the respective variable to the provincial CPI ratio.

necessarily correspond to the actual levels. Therefore, we test the alternative specification with O being a vector of objective indicators that include the actual and treated levels for both industrial wastewater and air emissions (all measured in natural logarithm).² We use these measures to approximate the actual level of pollution and the government's and firms' efforts in protecting the environment.

3. Results

Happiness

Table 1 presents the results of subjective (Panel A) and objective (Panel B) indicators on happiness for full, rural and urban samples.³ Models 1-3 in Panel A show that perceived severity of environmental issues has no significant correlation with happiness regardless of the sample used. Among the full sample (Model 1), higher happiness is associated with a higher evaluation of the provincial government's effort in addressing environmental issues. This is also true for rural residents (Model 3), but for the urban residents, higher happiness is associated with the central government's effort (Model 2). One potential reason for the difference is that the central government has stronger influence among urban residents, while provincial governments have stronger influence among rural residents.

Models 4-6 in Panel B show neither total wastewater nor the treated wastewater affects happiness regardless of the sample used. Among the full sample (Model 4), a one per cent increase in industrial air emission reduces happiness by 0.08 points; however, the negative impact of air emission can be fully mitigated by treating an additional one per cent of air emission. This effect is stronger for the rural residents (Model 6), for whom an additional one per cent of the air treatment will increase happiness by 0.11 points.

² Data on waste water and air emissions is compiled from the 2010 Chinese Statistical Yearbook. Industrial air emission consists of sulphur dioxides, smoke and dust.

³ In happiness specifications, those who are younger, married, female, physically and/or mentally healthier, better educated, wealthier, have a higher wage, and live in the northern and western regions are happier. In the willingness-to-pay specifications, those who are better educated, younger, wealthier, less physically sound, have better mental health and are religious are more willing to pay a higher price to improve environment quality. These results are consistent with findings in existing studies in China.

Table 1: Results for the happiness equation

Model	Panel A: Subjective indicators			Panel B: Objective indicators		
	(1) Full	(2) Urban	(3) Rural	(4) Full	(5) Urban	(6) Rural
Severity of environmental issues	0.01 [0.44]	0.02 [0.72]	-0.00 [-0.04]			
Central government's effort	0.02 [1.21]	0.05* [1.69]	-0.00 [-0.08]			
Provincial government's effort	0.04** [2.41]	0.03 [1.31]	0.07** [2.48]			
Industrial wastewater				0.15 [0.82]	-0.27 [-1.20]	-0.25 [-0.53]
Treated industrial wastewater				-0.09 [-0.53]	0.35 [1.61]	0.24 [0.53]
Industrial air emission				-0.08** [-2.04]	-0.08 [-1.42]	-0.06 [-0.90]
Treated industrial air emission				0.08*** [3.00]	0.02 [0.59]	0.11*** [2.76]
Observations	2062	1120	863	8512	3999	4153
Adjusted R-square	0.176	0.163	0.191	0.171	0.185	0.161

Note: All specifications are controlled for education, age, age-square, wage, physical health, mental health, marital status, number of house owned, gender, religion, provincial GDP per capita and region.
t statistics in brackets; * p < 0.10, ** p < 0.05, *** p < 0.01

Willingness-to-pay

Table 2 presents the results on willingness-to-pay. Regardless of the sample, respondents who are more concerned with environmental issues are willing to pay more for environmentally friendly products. Except for the urban residents (Model 2), those residents perceive more severe environment issues also have a higher willingness-to-pay.

Among the full sample (Model 1), respondents are also willing to pay more if they perceive a higher level of effort from the central and/or provincial governments. Similar to happiness, the central government has a significant impact on urban residents, while the provincial governments play an important role for rural residents. A one-unit increase in perceived national government effort increases urban residents' willingness-to-pay by 0.14 points (Model 2), while a one-unit increase in perceived effort by a provincial government increases rural residents' willingness-to-pay by 0.12 points (Model 3).

Among the full sample (Model 4), a one per cent increase in wastewater increases willingness-to-pay by 0.95 points. However, such an increase in willingness-to-pay can be largely offset by increasing treated wastewater by one per cent. A one per cent increase in industrial air emission lowers willingness-to-pay by 0.31 points. Nonetheless, a one per cent increase in treated air emission increases willingness-to-pay by 0.19 points. One possible explanation for this divergence in impact between water and air is that people believe that

governments and firms should take primary responsibility for reducing water pollution, while they are willing to bear some of the costs of air treatment through increased prices.

Model 6 shows that rural residents lower their willingness-to-pay if air emission is higher. One potential reason is that industrial air emission is mainly produced by urban industries, so rural residents do not have any incentive to pay extra for products that are mainly enjoyed by urban residents. Another possible explanation is that rural residents are less likely to suffer from air pollution, and this would also reduce the incentive to pay extra. The results indicate that the government can only partially mitigate the negative impact of air emission on willingness-to-pay by increasing treated air waste by one per cent.

Table 2: Results for the willingness-to-pay equation

Model	Panel A: Subjective indicators			Panel B: Objective indicators		
	(1) full	(2) Urban	(3) Rural	(4) full	(5) Urban	(6) Rural
Concerned with environment issues	0.31*** [11.33]	0.32*** [8.44]	0.29*** [7.08]	0.36*** [15.35]	0.38*** [10.93]	0.33*** [10.02]
Severity of environmental issues	0.09*** [3.33]	0.05 [1.33]	0.12*** [3.06]			
Central government's effort	0.07*** [2.67]	0.14*** [3.76]	0.01 [0.13]			
Provincial government's effort	0.05** [2.07]	-0.02 [-0.63]	0.12*** [2.93]			
Industrial wastewater				0.95* [1.69]	0.52 [0.77]	1.60 [1.13]
Treated industrial wastewater				-0.91* [-1.71]	-0.50 [-0.77]	-1.54 [-1.17]
Industrial air emission				-0.31*** [-3.23]	-0.13 [-0.94]	-0.50*** [-3.02]
Treated industrial air emission				0.19*** [2.69]	0.07 [0.64]	0.28** [2.56]
Observations	1956	1067	814	2347	1195	1054
Adjusted R-square	0.155	0.156	0.141	0.164	0.154	0.149

Note: All specifications are controlled for education, age, age-square, wage, physical and mental health, marriage, number of house, gender, religion, provincial GDP per capita, and region.
t statistics in brackets; * p < 0.10, ** p < 0.05, *** p < 0.01

4. Conclusion and policy implications

We find that perception of a higher severity of environmental issues does not significantly impact on happiness, but it does increase people's willingness-to-pay. On both happiness and willingness-to-pay, the central government has a greater impact among urban residents, while provincial governments have greater impact among rural residents.

Industrial air emission lowers happiness while industrial wastewater plays no role. People are willing to pay more for mitigating the effects of industrial

wastewater, but are only willing to pay more to mitigate industrial air emission if the government has put a greater effort into doing so.

Our results indicate that policy makers can raise people's happiness by improving air quality. This also encourages private contributions, in particular those from rural areas. In contrast, the decision on improving water quality would be best left to private choices. The perception of governments' efforts is crucial in determining happiness and willingness-to-pay. Thus it is very important for policy makers to try to align perceptions with actual effort, both at the central and provincial level.

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