sustainability

MDPI

Article

Willingness to Pay for Improved Air Quality and Influencing Factors among Manufacturing Workers in Nanchang, China

Rong Liu [1,†], Xiaojun Liu [2,†], Bingbing Pan [1], Hui Zhu [1], Zhaokang Yuan [1,*] and Yuanan Lu [1,2,3,*]

1 Jiangxi Province Key Laboratory of Preventive Medicine, Nanchang University, Nanchang 330000, China; Iran11@163.com (R.L.); Panbing@126.com (B.P.); ncuzhuhui@126.com (H.Z.)
2 Global Health Institute, Wuhan University, 115# Donghu Road, Wuhan 430071, China; 15579183560@163.com
3 Department of Public Health Sciences, University of Hawaii at Mānoa, Honolulu, HI 96822, USA
* Correspondence: 13576935811@126.com (Z.Y.); Yuanan@hawaii.edu (Y.L.); Tel.: +86-135-7693-5811 (Z.Y.); +1-808-956-2702 (Y.L.)
† These authors contributed equally to this work.

Received: 8 April 2018; Accepted: 15 May 2018; Published: 17 May 2018



Abstract: (1) Background: Air quality apt to deteriorate in decades in China, people are seeking improvement measures. To assess the willingness to pay (WTP) for improved air quality among manufacturing workers and associated factors influencing their WTP. (2) Methods: A cross-sectional questionnaire survey was conducted in combination with contingent valuation in Nanchang between September and October of 2015. A face-to-face interview was conducted to obtain basic demographic information from manufacturing workers and to understand their WTP for air quality improvement. (3) Results: A total of 600 effective questionnaires were collected in this study and showed that more than half of the respondents (53%) expressed their WTP for improved air quality. Multivariable logistic regression analysis revealed that the main factors associated with manufacturing workers' WTP were their residence areas, education level, annual household income and travel experience. (4) Conclusions: These findings have provided (a) important information of the concern and desire for air pollution control through their WTP from manufacturing workers, (b) baseline information for the policy-maker and local government for their development of more effective policy in air pollution prevention and control and (c) the need for more study for WTP among different population groups in future.

Keywords: willingness to pay (WTP); workers; descriptive analysis

1. Introduction

With the rapid development of world economics, prominent air pollution has become more serious today and increased adverse impact on human health has been reported due to the excessive emissions from industrial and other resources [1–3]. A previous report indicated that air pollution has negative impact on chronic diseases of cardiovascular system and respiratory system and also accelerate the occurrence of chronic diseases [4]. China is accounted for 17% of the total amount of death around the world due to air pollution [5].To address this problem, Chinese government has taken many corresponding measures including the development and enforcing a New Air Quality Standards and endorsed more funding (about $14.7 billion) [6]. However, the air pollution has remained to be a notable and challenging issue in China and the amount of government money invested is still very

limited [7]. All these suggest that for the better air quality, funding from other sources is needed in addition of governmental funds.

In order to assess the public' enthusiasm regarding improvement of environmental condition, the conception of Willingness to pay (WTP) is introduced [8]. WTP is an intention when respondents are asked to state whether they are willing to pay for non-market product. In early stage, WTP has been widely used in economic markets to develop an optimal pricing strategy for companies, so the respondents are usually selected consumers [9]. Then, some researchers have started to apply WTP in environment market for clean air and water [10]. The respondents were not limited to consumers, also applied to other groups. The main purpose of WTP was applied to bridge the gap between environment and social economics. Many studies about WTP related air quality have been conducted through around the world, such as the United States, Bangkok, Mexico and some northern Europe countries using Contingent Valuation Method (CVM) to asses it [11–13]. Kumar conducted a research in India and showed that health status could significantly affect the WTP of respondents [14]. In China, some investigations have been conducted to understand the associations of demographics and residents' WTP [15], including several recent studies in Nanchang [16,17]. A recent questionnaire survey study has shown that over 95% of students from Nanchang University believed that the involvement of funding and action and also the responsibility and obligation of every citizen are indispensable to improve air quality [18]. These studies have shown that respondents hold strong support from our public for improving local air quality. Nanchang is the Capital of Jiangxi province, with the estimated population of 5.29 million [19]. From 2003 to 2013, annual average growth rate for Industrial Waste Air Emission was 13.10%, for General Industrial Solid Wastes Produced was 3.48% and for Hazardous Wastes from industrial was 27.56%, the annual average growth rate of industrial sulphur dioxide emission was 2.17% [20]. It turned out that pollutant from industrial in Nanchang had increased rapidly over a decade. A previous study also showed that industrial facilities were one of the main sources of air pollution [21]. In addition, many occupational diseases have recently been reported relating to poor air [22–24]. The workers, especially manufacturing workers, being long exposed to dusts and harmful gases, are especially vulnerable to damaging effects of air pollution [25]. Some workers are improperly protected while doing their routine work and lots of workers even do not know the importance of proper protection and how to protect themselves. In this study, manufacturing workers, include both physical and technical workers, such as assembly and processing workers, production operators and warehouse operators. However, little is currently known about workers' WTP for improved air quality in China. The proportion of manufacturing workers is more than half of all workers in Nanchang. This study is directed to understand the attitude of manufacturing workers toward their WTP for improving air quality. It may help us to know the attitude as the whole workers group. Manufacturing workers were chosen as the object for this study basing on the understanding that the manufactory industry constitutes an important air pollution source [26], while manufacturing workers are also the ones who are directly suffering polluted air and serious health risk.

The other objective of this study is to analyze potential factors affecting manufacturing workers for their WTP. Findings from this study may provide clues for further research and baseline information for local government to develop more effective and practical approaches to improve current air pollution and public health in future.

2. Materials and Methods

2.1. Study Site

Nanchang City is located between 28°35′–28°55′N latitudes and 115°38′–116°0′E longitudes, situated in central China. In recent years, a substantial amount of infrastructure improvement has been taken in Nanchang such as ongoing subway construction and establishment of new industrial areas. With rapid economic development, air pollution has been deteriorating in recent years, especially since the year of 2013 [27].

2.2. Sampling Method

Stratified cluster sampling method was applied in this survey study and 6 districts in Nanchang were divided into high-, middle- and low-level income groups basing on the annual average income (two districts per group). Then one district was randomly selected from each group. One larger industrial area was selected from each district including Wanli industrial area from Wanli district (low-income district), Changnan industrial area from Qingyunpu district (middle-level district) and Changdong industrial area from Qingshanhu district (high-income district). Based on the previous study of air quality carried out in Nanchang [7], a sample size of 690 was targeted and 230 manufacturing workers were randomly selected from each selected industrial area. Since the in-person interviews were considered as preferable to mail or telephone surveys to achieve contingent values [28] and also considering different educational level of manufacturing workers, a face-to-face interview method was carried out in this study. With the assistance from the industrial managers, the interview was conducted between September and October in 2015. The survey study was carried out by the trained and qualified graduate students of Nanchang University and thus the quality of data collection and avoidance of any response bias were ascertained.

2.3. Questionnaire

We used contingent valuation method to evaluate WTP in this study. Respondents need to take air quality as hypothetical goods and consider their preferences to decide whether they are willing to pay for improved air quality. The content of questionnaire was based on the previous study [29] with modifications according to the advice and suggestion from public health experts and the results of a pre-test survey with a sample size of 30. In this questionnaire, all respondents were required to provide following information: age, gender, educational level, household register, average annual household income (AAHI) (some modifications based on previous study); Travel experience: it includes both national and international travel experience. Self-reported health status: it's a gross assessment of one's physical condition by themselves, not from professionally clinical examination (good-very healthy, general-not currently sick, poor-currently sick); The respondents' WTP for improved air quality by asking "Are you willing to pay a certain amount of money every month to improve the current ambient air quality to a level such as nature reserves, scenic spots, etc."

2.4. Statistical Analysis

EpiData3.1 (EpiData Association, Odense, Denmark, http://epidata.dk) was employed to set up the database and survey data were entered using double entry verification method and logical verification to ensure the accuracy. Statistical package IBM SPSS 19.0 (IBM Corporation, Chicago, IL, USA, http://www-01.ibm.com/software/analytics/SPSS/) was applied to analyze data. Chi-square tests were applied for demographic factors including respondents' gender, household register, age, educational level, AAHI and health statues. Multivariate logistic regression was used to assess the relationship between the respondents' social demographics and their WTP. The outcome in logistic regression analysis is often coded as 0 or 1, where 1 indicates that the outcome of interest is present and 0 specifies that the outcome of interest is absent.

Logistic regression model:

$$Y_i = Ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots \beta_n X_n \quad (1)$$

P, as the dependent variable is the probability of 1, β_0 is a constant, β_n is the regression coefficient, X_n is the influence factors of the willingness to pay. The detailed assignment was shown in Table 1.

Table 1. Possible factors associated with willingness to pay (WTP) and their assignment.

Factors	Variables	Assignment	Control Group
X_1	Gender	Female = 0, Male = 1	Female = 0
X_2	Household Register	Local = 0, Extern = 1	Local = 0
X_3, X_4, X_5	Age	30~39: $X_3 = 1$, $X_4 = 0$, $X_5 = 0$ 40~49: $X_3 = 0$, $X_4 = 1$, $X_5 = 0$ 50~60: $X_3 = 0$, $X_4 = 0$, $X_5 = 1$	18~29: $X_3 = 0$, $X_4 = 0$, $X_5 = 0$
X_6, X_7	Education Level	College: $X_6 = 1$, $X_7 = 0$ Master: $X_6 = 0$, $X_7 = 1$	≤High school: $X_6 = 0$, $X_7 = 0$
X_8, X_9	Annual Household Per Capita Income	25,000–49,999: $X_8 = 0$, $X_9 = 1$ ≥50,000: $X_8 = 1$, $X_9 = 0$	≤24,999: $X_8 = 0$, $X_9 = 0$
X_{10}, X_{11}	Health Status	General: $X_{10} = 1$, $X_{11} = 0$ Good: $X_{10} = 0$, $X_{11} = 1$	Poor: $X_{10} = 0$, $X_{11} = 0$
X_{12}, X_{13}	Travel experience	National: $X_{12} = 1$, $X_{13} = 0$ International: $X_{12} = 0$, $X_{13} = 1$	No: $X_{12} = 0$, $X_{13} = 0$
Y	WTP	Yes = 1, No = 0	No = 0

Two-sided *p*-values of less than 5% were considered to be statistically significant. B the rate of change in Y (the dependent variables) as X changes; Crude odds ratios (OR) represents the effect of a predictor X on the likelihood that Y will occur. And 95% confidence interval (CI) were obtained from multivariate logistic regression analysis.

3. Results

3.1. Sample Characteristics

The study was conducted on a total of 690 subjects but 600 questionnaires were completed and valid (response rate 87%). These collected questionnaires after excluding unqualified ones (showing identical answer for all questions or missing answers extensively) were organized, numbered and enrolled for data analysis. As shown in Table 2, local residence and males constitutes a high proportion of respondents, accounting for 83.0% and 60.5%, respectively. The age of these manufacturing workers ranges from 18 to 60 and majority respondents lie between years 18 and 49 (87.7%). Nearly 70% of respondents had the AAHI to be RMB 25,000 or more. The large majority of manufacturing workers reported that they were in good health status (78.3%). And more than 70% of participants had national travel experience including nationally and 12% participants had international travel experience. A total of 320 manufacturing workers showed their willing to pay for improving air quality in this study, which account for 53.3%.

Table 2. Demographic information of the survey participants (n = 600).

Demographics		Frequency	Percentage
Gender	Male	363	60.50
	Female	237	39.50
Household Register	Local	498	83.00
	External	102	17.00
Age	18–29	162	27.00
	30–39	197	32.83
	40–49	167	27.83
	50–60	74	12.33

Table 2. *Cont.*

Demographics		Frequency	Percentage
Education Level	≤High school	434	72.33
	College (BS)	157	26.17
	≥Master (MS)	9	1.50
Annual Household Per Capita Income (RMB)	≤24,999	184	30.67
	25,000–49,999	213	35.50
	≥50,000	203	33.83
Health Status	Good	433	72.17
	General	126	21.00
	Poor	41	6.83
Travel Experience	No	100	16.67
	Yes, national	426	71.00
	Yes, international	74	12.33
Willing to pay (WTP)	Yes	320	53.33
	No	280	46.67

3.2. Analysis of Manufacturing Workers' Attitude

Chi-square test was conducted to examine the distribution of independent variables for WTP and revealed that WTP were significantly associated with respondents' age ($\chi^2 = 10.871$, $p < 0.05$), educational level ($\chi^2 = 7.949$, $p < 0.05$), AAHI ($\chi^2 = 40.250$, $p < 0.001$) and travel experiences ($\chi^2 = 12.525$, $p \leq 0.001$) as shown in Table 3.

Table 3. Chi-square test for the demographic factors associated with respondents' WTP (n = 600).

Demographics	χ^2	*p*-Value
Gender	0.593	0.441
Household Register	0.919	0.338
Age [a]	10.871	0.012
Education Level [b]	7.949	0.019
Annual Household Per Capita Income [c]	40.250	<0.001
Health Status	3.958	0.138
Travel Experience	12.525	0.002

Note: Linear Chi-square test: [a] $\chi^2 = 0.215$, $p = 0.643$; [b] $\chi^2 = 7.849$, $p = 0.005$; [c] $\chi^2 = 21.118$, $p < 0.001$.

3.3. Analysis of Influencing Factors for WTP

Multivariate logistic regression analysis was conducted to determine if the social demographics are associated with manufacturing workers' attitude of WTP. As shown in Table 4, these demographic variables including household registration, age, annual household per capita income, educational level and travel experience have significant effect on their WTP of the manufacturing workers ($p < 0.05$). In particular the workers with local residence registration showed more intention of WTP than those registered as a resident in other cities (OR = 1.65). The respondents' WTP is positively associated with their educational level, especially much higher education background groups. Comparing to respondents holding high school education or lower, the odds ratios of WTP for those respondents with bachelor's degree and master degree are 1.490 and 6.708, respectively. In addition, the AAHI was strongly positively correlated with the WTP. Furthermore, participants with international travel experience are less willing to pay for air quality improvement as compared to those who had no traveling experience.

Table 4. Multivariate logistic regression analysis for the demographic factors associated with respondents' WTP (n = 600).

Demographics		β	OR	OR 95%CI	*p*-Value
Gender	Female *		1		
	Male	0.092	1.096	0.755–1.593	0.629
Household Register	Local *		1		
	External	0.500	1.649	1.033–2.632	0.036
Age	18–29 *		1		
	30–39	−0.032	0.969	0.605–1.552	0.897
	40–49	−0.472	0.624	0.370–1.050	0.076
	50–60	0.467	1.594	0.795–3.179	0.189
Education Level	High school *		1		
	College (BS)	0.400	1.490	1.098–2.266	0.026
	≥Master (MS)	1.903	6.708	1.210–37.191	0.029
Annual Household Per Capita Income	≤24,999 *		1		
	25,000–49,999	0.031	1.032	0.671–1.586	0.887
	≥50,000	−1.174	0.309	0.185–0.515	<0.001
Health Status	Poor *		1		
	General	0.576	0.562	0.260–1.219	0.145
	Good	0.778	0.544	0.248–1.195	0.130
Travel Experience	No *		1		
	Yes. National	−0.147	0.863	0.538–1.385	0.542
	Yes. International	−0.968	0.380	0.191–0.757	0.006

Note: * Control Group.

4. Discussion

The air quality has dominated public concern for past a few years in Nanchang. Main energy structure of the city is coal dominated which could lead to heavy air pollution, especially in industrial area [30]. The rate of good air quality declined from 95.1% in 2009 to 86.5% in 2016 [31]. The government has started to take measures since last decades [30]. Therefore, control of air pollution and improvement of air quality has been a long-term battle and unreached goal [32]. In past decades, Chinese policy has been emphasized much more on its economic growth but relatively less on environmental issues. Until recent years, environmental problems have recently emerged and focused primarily in air pollution and its related health impact [33–35]. The findings of air pollution from these recent studies have attracted more attention from local public and government's attitude and accelerated their intention in air quality improvement [36–38]. The CVM was chosen for this study since it is the most widely applicable method to express effective assessment values of the environment goods [39–42]. Environmental resource, as an intangible good, does not have a market price, so it is usually measured basing on people's WTP to expressed the economic values of the environment [43–46]. Actually, this method of measurement contains several different formats including open-ended, biding games and dichotomous choices, which is considered the best way to reflect the authentic thoughts of the participants' WTP [47]. Given that previous studies have been mainly focused on residents, parents and caretakers [17,29,37], this study is designed to understand the perception of WTP from manufacturing workers. Being an urban population group in cities engaged in industry process, which are linked to large air pollutants [48,49], manufacturing workers' attitude to current air pollution could be particularly interested and important. Although Chinese government introduced relevant measures, the reduction of air pollution would curb economic development to a certain extent, then people's attitude is necessary [50].

In this study, we focused on the manufacturing workers to analyze factors that affected their willingness to pay from out-of-pocket payment to improve air quality. Nearly 88% of respondents in this study were between 18–49 years old and they are at the most robust years of a person's

life. In Chi-square test, the respondents' age is a statistically significant factor affecting their WTP. A previous study conducted in China demonstrated that respondents' age has a negative relationship with the probability of positive WTP [51].

In addition, our findings indicated that manufacturing workers' annual income is significantly linked with their WTP. People whose AAHI $\geq$ 50,000 have 0.309 odds of unwilling to pay compared to odds of $\leq$24,999. These findings are consistent with the reports from other research groups showing that these two factors have a positive effect on their WTP [45,52]. A survey study conducted in Sweden also showed that the respondents' WTP is significantly related to their income and education [53]. People with low AAHI are generally less willing to pay more for improving air quality since they are under highly financial pressure of making a living for their families and they have not time to thinking about air quality issue of considering improvement of air quality is not their priority. A recent study has assessed the value of WTP for smog mitigation and concluded that lower income people are more likely to expect the government or the pollutant firms rather than the public to take the responsibility for pollution control [54].

The results of this study showed that the WTP among manufacturing workers are positively related to their educational level, which is consistent with the previous findings [15,55]. The participants with BS and MS degrees have 1.490 and 6.708 odds of unwilling to pay compared to odds of high school. Lower educational background may limit the interest of the workers to get more information about health, environment and government policy. It proved that high education had a significantly positive relationship with WTP for improved air quality, indicating educational level is an important factor in explaining WTP.

Among 600 respondents, 102 manufacturing workers are external residents and they have 1.649 odds of unwilling to pay compared to odds of local, the local residents are more willing to pay. This finding is in agreement with a recent report stating that WTP is closely related to respondents' resident location [16]. This is interesting and important since local residents regardless their occupations often have a family and have lived in the local community for a long time. Therefore, they care about more and have the desire for clean air and more health living environment. However, gender was also identified to be a factor affecting people's WTP in the report [7,15], which was not confirmed in this study. A possible explanation for this discrepancy finding may be partially due to the different nature of respondent occupations. In general, people with poor health status would have higher WTP [55] but this was not confirmed in this study. One possible explanation of this observation may be due to that health status is the feeling of a self-reported condition by participants at the survey time with no clinical testing data and reports and thus the poor health condition may be the result of many other illnesses but not necessarily due to poor air related respiratory and lung diseases [7,56].

It is also interesting to find that manufacturing workers with international travel experience are less willing to pay for air quality improvement in this study. This finding is not expected since it is generally believed that travelers have more experience of good air quality in other cities and countries and thus should have a more desire for better air quality environment [16,17]. One potential reason is that the responders think they have already paid a lot of taxes when compare with other countries or areas and believe that the government should play a leading role regarding citizens' action [54]. Also, the nature of low income and family economic condition in Nanchang may be another possible reason for the less WTP [27]. Therefore, more followed study is needed in the future to understand the negative connection between the travel experience and the WTP. This result implies that the national and international travelers may imply the nature of their financial capability but it cannot simply apply to manufacturing workers and other population groups.

In our study, more than 53% of manufacturing workers in Nanchang are willing to pay for better air. Previous studies conducted in Nanchang regarding air quality improvement showed the high WTP rate (>78.5%) from local residents but low rate (<45%) from government employees [16,29]. These findings also revealed the dispute attitude on the same issue (air quality) from different population groups. In particular, local residents such as caretakers and children parents are prone to give

concern on air quality because they considered their children's health to be paramount. However, manufacturing workers are a group of population who often need to work hard to make a living rather than thinking about the air quality issue. Altogether, findings from this study and previous ones strongly suggest that different approaches be taken for different population groups in term of air pollution control and improvement in futures.

5. Limitations

This survey was conducted on the basis of CVM but the questionnaires did not ask for the exact amount of money to be paid from the participants and thus we did not analyze the actual amount of money for WTP in this study. And also, the variables didn't include detailed parenting status. In addition, the survey participants were limited to manufacturing workers in Nanchang but did not include other kinds of workers such as constructional and environmental workers in other areas and these workers are particularly suffering the risk of air pollution. Thirdly, we didn't apply sample weight in statistically analysis for regarding it was a stratified cluster sampling. One reason is that the respondent workers were selected based on factory names but the total number and the composition structure of the entire industrial workers were not known. Other reason includes the high fluidity of the workers and this could also be a challenge to calculate sampling weight. Therefore, application of the findings from this study to other regions needs to be done cautiously.

The future study should be conducted by avoiding the limitations stated above. For example, the research should focus on investigating how much the respondents would like to pay since this is crucial for policy makers and the biding way in auction is also one of the approaches. The detailed backgrounds and other kinds of vocations of the respondents can lead to more reliable and scientific results. Moreover, more scientific statistical analysis methods should be applied in further study.

6. Conclusions

In this study, we have revealed that over 50% of manufacturing workers in Nanchang are willing to pay for improving air quality. In addition, manufacturing workers' educational level, AAHI and travel experience are important factors influencing their WTP. These findings might place the interesting ground of WTP from manufacturing workers for other population groups and encourage for more in-depth study in future with larger number of participant workers in different regions. This new information could be useful to local government in their consideration of fund-raising approaches and also in the development of more enhanced and practical policy and strategy for the prevention and control of the air pollution in Nanchang.

Author Contributions: R.L. and Y.L. wrote the paper; B.P. and H.Z. performed the survey, X.L. and Z.Y. designed the questionnaire and analyzed the data.

Acknowledgments: This work was conducted as the Nanchang University-University of Hawaii International Public Health Partnership and supported by Nanchang University through the Ganjiang Chair Professorship to Yuanan Lu.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Warlenius, R.; Pierce, G.; Ramasar, V. Reversing the arrow of arrears: The concept of "ecological debt" and its value for environmental justice. *Glob. Environ. Chang.* **2015**, *30*, 21–30. [CrossRef]
2. Xiang, N.; Xu, F.; Sha, J. Simulation Analysis of China's Energy and Industrial Structure Adjustment Potential to Achieve a Low-carbon Economy by 2020. *Sustainability* **2013**, *5*, 5081–5099. [CrossRef]
3. Levin, S.A. *Encyclopedia of Biodiversity*, 2nd ed.; Academic Press: Cambridge, MA, USA, 2013; pp. 136–147.
4. Lin, Y.; Zou, J.; Yang, W.; Li, C. A Review of Recent Advances in Research on PM 2.5 in China. *Int. J. Environ. Res. Publ. Health* **2018**, *15*, 438. [CrossRef] [PubMed]
5. Berkeley Earth. Available online: http://berkeleyearth.org/deaths-per-gigawatt-year/ (accessed on 27 March 2017).

6. "The 12th Five-Year" Planning of Air Pollution Control in Key Areas. Available online: http://www.zhb.gov.cn/xxgk/ (accessed on 22 May 2016).
7. Liu, X.; Zhu, H.; Hu, Y.; Feng, S.; Chu, Y.; Wu, Y.; Yuan, Z.; Lu, Y. Public's health risk awareness on urban air pollution in Chinese megacities: The cases of Shanghai, Wuhan and Nanchang. *Int. J. Environ. Res. Publ. Health* **2016**, *13*, 845. [CrossRef] [PubMed]
8. Varian, H.R. *Microeconomic Analysis*; W. W. Norton & Company: New York, NY, USA, 1984; Volume 5, pp. 1–28.
9. Breidert, C.; Hahsler, M.; Reutterer, T. A Review of Methods for Measuring Willingness-to-Pay. *Inno Mark.* **2006**, *3*, 8–32.
10. Carson, R.; Mitchell, R. The Value of clean water: The public's willingness to pay for boatable, fishable, and swimmable quality water. *Water Resour. Res.* **1993**, *29*, 2445–2454. [CrossRef]
11. Vassanadumrongdee, S.; Matsuoka, S. Risk Perceptions and Value of a Statistical Life for Air Pollution and Traffic Accidents: Evidence from Bangkok, Thailand. *J. Risk Uncertain.* **2005**, *30*, 261–287. [CrossRef]
12. Chalak, A.; Hecht, J.; Reid, S.; Abiad, M.G. Willingness-to-pay for greenhouse gas reductions: A bayesian investigation of distributional patterns. *Environ. Sci. Policy* **2012**, *20*, 147–157. [CrossRef]
13. Filippini, M.; Martínez-Cruz, A.L. Impact of environmental and social attitudes, and family concerns on willingness to pay for improved air quality: A contingent valuation application in Mexico city. *Lat. Am. Econ. Rev.* **2016**, *25*, 7. [CrossRef]
14. Kumar, S.; Rao, D.N. Valuing the beneficts of air pollution abatement using a health production function a case study of panipat thermal power station, India. *Environ. Res. Econ.* **2001**, *20*, 91–102. [CrossRef]
15. Sun, C.; Yuan, X.; Yao, X. Social acceptance towards the air pollution in China: Evidence from public's willingness to pay for smog mitigation. *Energy Policy* **2016**, *92*, 313–324. [CrossRef]
16. Liu, X.; Wu, Y.; Hu, Y.; Lu, Y. Government employees' perception of urban air pollution and willingness to pay for improved quality: A cross-sectional survey study in Nanchang, China. *Environ. Sci. Pollut. Res. Int.* **2016**, *23*, 22183–22189. [CrossRef] [PubMed]
17. Liao, X.; Tu, H.; Maddock, J.E.; Fan, S.; Lan, G.L.; Wu, Y. Residents' perception of air quality, pollution sources, and air pollution control in Nanchang, China. *Atmos. Pollut. Res.* **2015**, *6*, 835–841. [CrossRef]
18. Lan, G.; Yuan, Z.; Maddock, J.; Cook, A.; Chu, Y.; Pan, B. Public perception of air pollution and health effects in Nanchang, China. *Air Qual. Atmos. Health* **2016**, *9*, 1–9. [CrossRef]
19. Statistics Bureau of Nanchang. Available online: http://www.nctj.gov.cn/NodePage.aspx?NodeID=8 (accessed on 27 April 2018).
20. Statistics Bureau of Jiangxi. *Jiangxi Statistical Yearbook (2004–2014)*; China Statistics Press: Beijing, China, 2014.
21. Clarke, K.; Kwon, H.; Choi, S. Fast and reliable source identification of criteria air pollutants in an industrial city. *Atmos. Environ.* **2014**, *95*, 239–248. [CrossRef]
22. Ajmani, G.S.; Suh, H.H.; Pinto, J.M. Effects of Ambient Air Pollution Exposure on Olfaction: A Review. *Environ. Health Perspect.* **2016**, *124*, 1683–1693. [CrossRef] [PubMed]
23. Gou, Y.; Hsu, Y.; Chao, H.; Que, D.; Tayo, L.; Lin, C. Pollution characteristics and diurnal variations in polybrominated diphenyl ethers in indoor and outdoor air from vehicle dismantler factories in southern Taiwan. *Aerosol Air Qual. Res.* **2016**, *16*, 1931–1941. [CrossRef]
24. Olujimi, O.O.; Ana, G.R.E.E.; Ogunseye, O.O.; Fabunmi, V.T. Air quality index from charcoal production sites, carboxyheamoglobin and lung function among. *Springerplus* **2016**, *5*, 1546. [CrossRef] [PubMed]
25. Ciarrocca, M.; Tomei, G.; Fiaschetti, M.; Caciari, T.; Cetica, C.; Andreozzi, G. Assessment of occupational exposure to benzene, toluene and xylenes in urban and rural female workers. *Chemosphere* **2012**, *87*, 813–819. [CrossRef] [PubMed]
26. Hao, J.; Li, G. Air Pollution Caused by Industries. *Pointed Sources Pollut. Local Eff. Control* **2015**, *1*, 442–516.
27. Statistics Bureau of Jiangxi. *Jiangxi Statistical Yearbook (2010–2017)*; China Statistics Press: Beijing, China, 2017.
28. Arrow, K. Report of the NOAA panel on contingent valuation. *Fed. Regist.* **1993**, *58*, 48–56.
29. Zhang, L.; Yuan, Z.; Maddock, J.E.; Zhang, P.; Jiang, Z.; Lee, T. Air quality and environmental protection concerns among residents in Nanchang, China. *Air Qual. Atmos. Health* **2014**, *7*, 441–448. [CrossRef]
30. Li, Y.; Lin, F.; Wu, Y.; Pan, B.; Lan, G.; Yuan, Z. Survey Analysis of Occupational Impact on Perception of Air Pollution and Its Health Effect. *J. Environ. Pollut. Hum. Health* **2016**, *4*, 9–15.
31. Nanchang Environmental Protection Bureau. Nanchang Environment Bulletin. 2016. Available online: http://fda.nc.gov.cn/id_2c9081385ccdbbf1015cec8597ef4529/news.shtml (accessed on 21 April 2018).

32. China Daily. Available online: http://www.chinadaily.com.cn/china/fightairpollution/ (accessed on 28 June 2016).
33. Liu, Y.; Sun, J.; Gou, Y.; Sun, X.; Li, X.; Yuan, Z.; Xue, F. A Multicity Analysis of the Short-Term Effects of Air Pollution on the Chronic Obstructive Pulmonary Disease Hospital Admissions in Shandong, China. *Int. J. Environ. Res. Public Health* **2018**, *15*, 774. [CrossRef] [PubMed]
34. Fu, Z.; Guo, W.; Dang, Z.; Hu, Q.; Wu, F.; Feng, C. Refocusing on nonpriority toxic metals in the aquatic environment in China. *Environ. Sci. Technol.* **2017**, *51*, 3117–3118. [CrossRef] [PubMed]
35. Liu, J.; Diamond, J. China's environment in a globalizing world. *Nature* **2005**, *435*, 1179–1186. [CrossRef] [PubMed]
36. Gu, J.; Ma, W.; Wang, T.; Zhang, D.; Zhou, Q.; Liu, Z. Survey of knowledge, attitude and behavior related to PM 2.5 among 605 residents in Guangzhou city. South China. *J. Prev. Med.* **2013**, *39*, 6–10.
37. Wang, K.; Wu, J.; Wang, R.; Yang, Y.; Chen, R.; Maddock, J.E. Analysis of residents' willingness to pay to reduce air pollution to improve children's health in community and hospital settings in Shanghai, China. *Sci. Total Environ.* **2015**, *533*, 283–289. [CrossRef] [PubMed]
38. Qian, X.; Xu, G.; Li, L.; Shen, Y.; He, T.; Liang, Y. Knowledge and perceptions of air pollution in Ningbo, China. *BMC Publ. Health* **2016**, *16*, 1138. [CrossRef] [PubMed]
39. Yang, K.; Bai, M.; Li, Y. The feasibility of contingent valuation method in economic valuation of environment in china: A case study of the residents' willingness to pay in Beijing. *Adv. Earth Sci.* **2002**, *17*. [CrossRef]
40. Venkatachalam, L. The contingent valuation method: A review. *Environ. Impact Assess. Rev.* **2004**, *24*, 89–124. [CrossRef]
41. Halkos, G.; Matsiori, S. Exploring social attitude and willingness to pay for water resources conservation. *J. Behav. Exp. Econ.* **2014**, *49*, 54–62. [CrossRef]
42. Istamto, T.; Houthuijs, D.; Lebret, E. Willingness to pay to avoid health risks from road traffic-related air pollution and noise across five countries. *Sci. Total Environ.* **2014**, *497–498*, 420–429. [CrossRef] [PubMed]
43. Rowe, R.D.; D'Arge, R.C.; Brookshire, D.S. An experiment on the economic value of visibility. *J. Environ. Econ. Manag.* **1980**, *7*, 1–19. [CrossRef]
44. Mitchell, R.C.; Carson, R.T. *Using Surveys to Value Public Goods: The Contingent Valuation Method*; Resources for the Future: Washington, DC, USA, 1989.
45. Wang, Y.; Zhang, Y. Air quality assessment by contingent valuation in Ji'nan, China. *J. Environ. Manag.* **2009**, *90*, 1022–1029. [CrossRef] [PubMed]
46. Baker, R.; Bartczak, A.; Chilton, S.; Metcalf, H. Did people "buy" what was "sold"? A qualitative evaluation of a contingent valuation survey information set for gains in life expectancy. *J. Environ. Manag.* **2014**, *133*, 94–103. [CrossRef] [PubMed]
47. Grazhdani, D. Contingent Valuation of Residents' Attitudes and Willingness-to-Pay for Non-point Source Pollution Control: A Case Study in AL-Prespa, Southeastern Albania. *Environ. Manag.* **2015**, *56*, 81–93. [CrossRef] [PubMed]
48. Zhao, H.; Ma, W.; Dong, H.; Jiang, P. Analysis of Co-Effects on Air Pollutants and CO_2 Emissions Generated by End-of-Pipe Measures of Pollution Control in China's Coal-Fired Power Plants. *Sustainability* **2017**, *9*, 499. [CrossRef]
49. Liu, Y.; Wu, J.; Yu, D. Disentangling the Complex Effects of Socioeconomic, Climatic, and Urban Form Factors on Air Pollution: A Case Study of China. *Sustainability* **2018**, *10*, 776. [CrossRef]
50. Zhou, Q.; Helmut, Y.; Takeshi, M.; Yoshiro, H. Evaluation of Integrated Air Pollution and Climate Change Policies: Case Study in the Thermal Power Sector in Chongqing City, China. *Sustainability* **2017**, *9*, 1741. [CrossRef]
51. Wang, H.; Mullahy, J. Willingness to pay for reducing fatal risk by improving air quality: A contingent valuation study in Chongqing, China. *Sci. Total Environ.* **2006**, *367*, 50–57. [CrossRef] [PubMed]
52. Tushabe, H.; Kalema, J.; Byaruhanga, A.; Asasira, J.; Ssegawa, P.; Balmford, A. The economic value of air-pollution-related health risks in China. *Environ. Res. Econ.* **2006**, *33*, 399–423.
53. Carlsson, F.; JohanssonStenman, O. Willingness to pay for improved air quality in Sweden. *Appl. Econ.* **2000**, *32*, 661–669. [CrossRef]
54. Duan, H.; Yan, L.; Yan, L. Chinese Public's Willingness to Pay for CO_2 Emissions Reductions: A Case Study from Four Provinces/Cities. *Adv. Clim. Chang. Res.* **2014**, *5*, 100–110. [CrossRef]

55. Wang, R.; Yang, Y.; Chen, R.; Kan, H.; Wu, J.; Wang, K. Knowledge, attitudes, and practices (KAP) of the relationship between air pollution and children's respiratory health in Shanghai, China. *Int. J. Environ. Res. Public Health* **2015**, *12*, 1834–1848. [CrossRef] [PubMed]
56. Yan, W.; Zhang, Y. Analysis of residents' willingness to pay for air pollution related diseases in Qingdao. *J. Environ. Health* **2008**, *25*, 326–330.



© 2018 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).