

Linear Econometric Estimations of the Effects of Religious Beliefs on Pro-environmental Behaviors

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Abstract

Environmental protection has become a public concern as the economy grows, especially in developing countries. Previous studies have examined determinants of individual pro-environmental behaviors. Using data from a nationwide survey carried out in mainland China in 2013, we intend to estimate the effects of religious beliefs on individual pro-environmental behaviors. We employ a linear econometric model and apply an Ordinary Least Square estimator to estimate the model. We use five measures to represent pro-environmental behaviors and distinguish between plain and strong religious beliefs. Estimation results show that, in general, holding any religious belief has a significant impact on all types of pro-environmental behaviors. Moreover, strong religious beliefs have greater impacts on different types of pro-environmental behaviors. Policy implications of the paper could be that people with religious beliefs should not be the target of programs aiming at promoting individual pro-environmental behaviors.

Keywords: *pro-environmental behaviors, econometric model, religious beliefs*

I. Introduction

Environmental protection has become an important issue nowadays as the economy grows, especially in developing countries. As the largest developing country of the world, China has been facing environmental problems during the past decades. Individual pro-environmental behaviors have important implications for environmental protection. Previous studies have examined determinants of individual pro-environmental behaviors. As pointed out by previous studies, main factors affecting pro-environmental behaviors contain factors such as demographic characteristics and psychological traits.

Some studies have focused on socio-economic and demographic characteristics of individuals. Meyer (2016) found that years of education, gender, and ethnicity have an impact on pro-environmental behaviors among college students [1], Casaló and Escario (2018) noticed that education and age are positively correlated with pro-environmental behaviors [2], Rajapaksa et al. (2018) noted a positive influence of education on pro-environmental behaviors, including an indirect effect through understanding more environmental knowledge [3].

Some studies have looked into the effects of environmental attitudes and concerns on pro-environmental behaviors. Takahashi and Selfa (2015) found that environmental attitudes are the most important factors in deciding pro-environmental behaviors [4]. Bronfman et al. (2015) noted that environmental concerns and knowing the aftermaths of not protecting the environment are important factors in determining people's pro-environmental behaviors [5]. Vicente-Molina et al. (2018) suggested that students with higher levels of pro-environmental attitudes are more prone to engage in pro-environmental behaviors [6]. Balundé et al. (2019) noticed that general environmental concerns positively influenced behaviors such as recycling [7].

Several researchers have studied the effect of the use of public media on pro-environmental behaviors. Huang (2016) discovered that exposure to global warming reports has positive effects on three types of pro-environmental behavior,

namely accommodating, promotional, and proactive behavior [8].

Existing studies are about both developed and developing countries. As to developed countries, Takahashi and Selfa (2015) and Meyer (2016) studied the case of the U.S., whilst Casaló and Escario (2018) and Vicente-Molina et al. (2018) focused on the case of Spain [4][1][2][6]. With respect to developing countries, Rajapaksa et al. (2018), Bronfman et al. (2015), and Huang (2016) examined India, Chile, and Taiwan, respectively [3][5][8].

As far as we know, no study has investigated the impacts of religious beliefs on individual pro-environmental behaviors. The paper contributes to the current literature by estimating the effects of religious beliefs on individual pro-environmental behaviors. We adopt a linear econometric model. Pro-environmental behaviors are measured using five individual activities and we distinguish between plain and strong religious beliefs.

The data we use in this paper come from a survey which has been conducted in mainland China in 2013. Estimation results show that, in general, holding any religious belief has a significant impact on individual pro-environmental behaviors. The result holds for the five measures of pro-environmental behaviors that we employ in this paper. Moreover, strong religious beliefs have greater effects on all types of pro-environmental behaviors.

The rest of the paper is arranged as below. Section 2 presents the data and basic statistics of relevant variables. Section 3 provides the econometric model and reports estimation results. Section 4 gives conclusions.

II. Data

2.1 The CGSS Survey

We use data from the China General Social Survey (CGSS). The data of CGSS are publicly accessible. Since 2003, CGSS has continually carried out surveys of over 10,000 households in mainland China, involving almost all provinces. CGSS has gathered data at several strata, namely community, household, and individual. The surveys include information about demographic characteristics, education, jobs, income, social activities, household characteristics, etc. For data availability of the current study, we use the data from the 2013 survey. We talk about the survey as CGSS 2013 in the following of the paper.

Respondents of the CGSS are people who are 16 years old or above. There are originally 11,438 respondents from CGSS 2013. We focus on both rural and urban residents. After dropping observations with missing values in the variables we concern in the paper, we have 8,870 individuals kept in the final estimation sample. We refer to this sample as the benchmark sample henceforth.

2.2 Variable Definitions

The dependent variables we are interested in refer to individual pro-environmental behaviors. We use five variables to reflect people's pro-environmental behaviors. The first variable is whether the individual regularly reused plastic bags during the previous year (*plastic*). The second variable is whether the individual donated for environmental protection during the previous year (*donation*). The third variable is whether the individual actively participated in environmental protection exercises arranged by non-governmental environmental protection organizations during the previous year (*activity*). The fourth variable is whether the individual planted trees or conserved a green area with his/her own money during the previous year (*trees*). The last variable is whether the individual actively participated in environmental complaints during the previous year (*complaint*).

The key independent variable we concern is the individual's religious belief. First, we construct a dummy to reflect whether the individual has any religious belief (*religion*). Second, we distinguish between plain and strong religious

beliefs. The variable *religion* reflects whether the individual has a plain religious belief. If the individual has a religious belief and engages in religious activities at least several times per year, then the individual is defined to have a strong religious belief. We create a dummy to represent this strong religious belief (*strong*).

In order to control for factors that both affect pro-environmental behaviors and religious beliefs of an individual, we include several control variables in regressions in the following of the paper. First, we include individual characteristics, such as gender, age, years of education, whether comes from a minority group, whether has been married, the number of kids under 18 years old, physical health condition, mental health condition, whether has medical insurance, whether has endowment insurance, whether works currently, and annual income. Second, we control for whether the individual lives in the rural. Finally, we control for fixed effects at the provincial level.

2.3 Descriptive Statistics

We summarize dependent and independent variables in Table 1. In Panel A, we present sample averages and standard deviations of the five dependent variables. In addition, we provide coefficients of correlation between each of the dependent variables and the key independent variable---*religion*. We can see that, except for the variable *activity*, all the dependent variables are significantly correlated with the variable of *religion*.

Table 1 Descriptive statistics.

Panel A: Dependent variables and coefficient of correlations					
	plastic	donation	activity	trees	complaint
	(1)	(2)	(3)	(4)	(5)
Mean	2.308	1.170	1.169	1.179	1.092
Std. Dev.	0.776	0.418	0.430	0.471	0.329
Correlations					
Religion	0.014 *	0.018 **	0.006	0.012 **	0.021 ***
Panel B: Control variables by pro-environmental behaviors					
	plastic		donation		
	No	Yes	No	Yes	
Religion	0.10	0.12	0.11	0.15	
Strong	0.05	0.07	0.06	0.07	
Male	0.52	0.47	0.50	0.47	
Age	51.48	51.97	51.76	49.91	
Years of Education	4.18	4.82	4.47	6.30	
Minority group	0.08	0.08	0.08	0.06	
Married	0.88	0.87	0.88	0.86	
Number of kids < 18	0.48	0.48	0.47	0.49	
Physical health	3.63	3.68	3.65	3.89	
Mental health	3.91	3.95	3.93	3.97	
Health insurance	0.90	0.91	0.90	0.91	
Endowment insurance	0.69	0.73	0.70	0.78	
Work currently	0.65	0.60	0.63	0.66	
Annual income	21.11	24.37	22.47	39.87	
Rural	0.49	0.34	0.42	0.13	
Number of observations	4,412	4,458	8,713	157	
Note: We use data from CGSS 2013. Sample means computed from the benchmark sample are reported in Panel A and Panel B.					

In Panel B, we give sample means of independent variables by two pro-environmental behaviors---whether the

individual regularly reused plastic bags and whether the individual donated for environmental protection during the previous year.

Looking at columns 1 and 2, we can see that people with plain or strong religious beliefs are more likely to reuse plastic bags. About other controls, females, the better educated, those with endowment insurance, those not working currently, those with more income, and people living in the urban are more likely to reuse plastic bags.

Looking at columns 3 and 4, we can observe that people with plain or strong religious beliefs are more likely to donate for environmental protection. Moreover, females, the younger, the better educated, those who are physically healthier, those with endowment insurance, those with more income, and people living in the urban are more likely to donate for environmental protection.

III. Method and ESTIMATION RESULTS

3.1 The Econometric MODEL

We employ the following linear model to estimate the effects of religious beliefs on individual pro-environmental behaviors.

$$Envir_i = \alpha_0 + \alpha_1 * Religion_i + \alpha' X_i + \varepsilon_i \quad (1)$$

where i denote an individual. $Envir$ is the variable of pro-environmental behaviors. As stated in previous section, we use five different measures for $Envir$. α_0 is the intercept. $Religion$ is a dummy which indicates whether the individual has any religious belief. $Religion$ also represents whether the individual has a relatively strong religious belief. α_1 is the coefficient of interest. X is the vector of other controls described in Panel B of Table 1 and α is the vector of coefficients associated with the controls. Finally, ε is the random error term. We assume that ε is uncorrelated with the regressors of Equation (1). We conduct estimations of Equation (1) using an ordinary least square (OLS) estimator.

3.2 Estimation Results

3.2.1 Effects of Plain Religious Beliefs on Pro-Environmental Behaviors

Estimation results of Equation (1) using an OLS estimator are reported in Table 2. In this section, the independent variable of interest is whether the individual has any religious belief (*religion*).

In column 1, we report estimation results where the dependent variable is whether the individual regularly reused plastic bags (*plastic*). In column 2, we present results where the dependent variable is whether the individual donated for environmental protection (*donation*). In column 3, the results are for the case where the dependent variable is whether the individual actively participated in environmental protection exercises arranged by non-governmental organizations (*activity*). In column 4, the results are for the case where the dependent variable is whether the individual planted trees or conserved a green area with his/her own money (*trees*). In column 5, we reports results where the dependent variable is whether the individual actively participated in environmental complaints (*complaint*).

Table 2 Effects of plain religious beliefs on pro-environmental behaviors.

	plastic	donation	activity	trees	complaint
	(1)	(2)	(3)	(4)	(5)
Religious beliefs	0.043 **	0.051 ***	0.028 **	0.031 **	0.037 ***
	(0.020)	(0.014)	(0.013)	(0.015)	(0.011)

Male	-0.125 *** (0.017)	-0.015 * (0.008)	-0.004 (0.010)	0.031 *** (0.011)	0.008 (0.007)
Age	0.003 *** (0.001)	-0.001 ** (0.000)	0.000 (0.000)	0.000 (0.001)	-0.001 * (0.000)
Years of Education	0.028 *** (0.004)	0.024 *** (0.002)	0.027 *** (0.002)	0.006 ** (0.002)	0.010 *** (0.002)
Minority group	0.006 (0.030)	-0.021 (0.016)	0.000 (0.016)	-0.006 (0.019)	-0.024 (0.029)
Married	0.027 (0.026)	-0.013 (0.014)	0.003 (0.014)	0.017 (0.016)	0.004 (0.011)
Number of kids < 18	0.039 *** (0.015)	-0.013 (0.008)	-0.004 (0.008)	0.012 (0.009)	-0.009 (0.006)
Physical health	0.025 *** (0.009)	0.014 *** (0.005)	0.014 *** (0.005)	0.007 (0.006)	0.008 ** (0.004)
Mental health	0.019 ** (0.009)	0.011 ** (0.005)	0.001 (0.005)	0.012 ** (0.006)	0.018 *** (0.004)
Health insurance	0.001 (0.030)	-0.008 (0.016)	-0.012 (0.016)	-0.009 (0.018)	-0.018 (0.013)
Endowment insurance	0.010 (0.019)	0.022 ** (0.010)	0.013 (0.011)	0.032 *** (0.012)	0.004 (0.008)
Work currently	-0.030 (0.020)	0.019 * (0.011)	0.023 ** (0.011)	0.050 *** (0.012)	-0.001 (0.008)
Annual income	0.000 (0.003)	0.008 *** (0.001)	0.007 *** (0.001)	0.003 * (0.002)	0.006 *** (0.001)
Rural	-0.194 *** (0.019)	-0.083 *** (0.010)	-0.054 *** (0.010)	0.075 *** (0.012)	-0.034 *** (0.008)
Number of observations	8,870	8,870	8,870	8,870	8,870
Note: Estimation results of Equation (1) are presented in the Table. Coefficient estimates and standard errors in parentheses are reported. ***, **, and * mean significance at 1%, 5%, and 10% level, respectively.					

Looking at column 1, we can see that people with religious beliefs are more likely to reuse plastic bags. As to other controls, females, the older, the better educated, those who have more number of young kids, those who have better physical and mental health conditions, and those living in the urban are more likely to reuse plastic bags.

From column 2, we observe that people with religious beliefs are more likely to donate for environmental protection. Moreover, females, the younger, the better educated, those who have better physical and mental health conditions, those with endowment insurance, those currently working, those with higher incomes, and those living in the urban are more likely to donate for environmental protection.

Estimation results in column 3 show that people with religious beliefs are more likely to participate in environmental protection exercises arranged by non-governmental organizations. In addition, the better educated, those who have better physical health conditions, those currently working, those with higher incomes, and those living in the urban are more likely to participate in those exercises.

From column 4, we see that people with religious beliefs are more likely to plant trees or conserve a green area with their own money. About other control variables, males, the better educated, those who have better mental health conditions, those with endowment insurance, those currently working, those with higher incomes, and those living in the rural are more likely to plant trees or conserve a green area.

Looking at column 5, we observe that people with religious beliefs are more likely to actively participate in environmental complaints. As to other controls, the younger, the better educated, those who have better physical and mental health conditions, those with higher incomes, and those living in the urban are more likely to actively

participate in environmental complaints.

3.2.2 Effects of Strong Religious Beliefs on Pro-Environmental Behaviors

Estimation results of Equation (1) using an OLS estimator are reported in Table 3. In this section, the independent variable of interest is whether the individual has a relatively strong religious belief (*strong*).

Table 3 Effects of strong religious beliefs on pro-environmental behaviors.

	plastic	donation	activity	trees	complaint
	(1)	(2)	(3)	(4)	(5)
Strong religious beliefs	0.085** (0.035)	0.056*** (0.018)	0.041** (0.019)	0.050** (0.021)	0.048*** (0.015)
Male	-0.119*** (0.017)	-0.013 (0.009)	0.002 (0.009)	0.032*** (0.011)	0.008 (0.007)
Age	0.003*** (0.001)	-0.001* (0.000)	0.000 (0.000)	0.000 (0.001)	-0.001* (0.000)
Years of Education	0.032*** (0.004)	0.025*** (0.002)	0.029*** (0.002)	0.007*** (0.002)	0.010*** (0.002)
Minority group	0.006 (0.030)	-0.017 (0.016)	0.001 (0.016)	0.000 (0.018)	-0.021* (0.013)
Married	0.030 (0.026)	-0.013 (0.014)	0.005 (0.014)	0.016 (0.016)	0.004 (0.011)
Number of kids < 18	0.039*** (0.015)	-0.012 (0.008)	-0.004 (0.008)	0.013 (0.009)	-0.008 (0.006)
Physical health	0.026*** (0.009)	0.014*** (0.005)	0.014*** (0.005)	0.007 (0.006)	0.008** (0.004)
Mental health	0.020** (0.010)	0.011** (0.005)	0.000 (0.005)	0.012** (0.006)	0.017*** (0.004)
Health insurance	0.002 (0.030)	-0.006 (0.016)	-0.008 (0.016)	-0.009 (0.018)	-0.017 (0.013)
Endowment insurance	0.010 (0.019)	0.022** (0.010)	0.013 (0.011)	0.031*** (0.012)	0.004 (0.008)
Work currently	-0.033* (0.020)	0.019* (0.011)	0.022** (0.011)	0.050*** (0.012)	-0.001 (0.009)
Annual income	0.000 (0.003)	0.008*** (0.001)	0.007*** (0.001)	0.004** (0.002)	0.006*** (0.001)
Rural	-0.192*** (0.019)	-0.084*** (0.010)	-0.055*** (0.010)	0.074*** (0.012)	-0.035*** (0.008)
Number of observations	8,870	8,870	8,870	8,870	8,870
Note: Estimation results of Equation (1) are presented in the Table. Coefficient estimates and standard errors in parentheses are reported. ***, **, and * denote significance at 1%, 5%, and 10% level, respectively.					

As we can see, people with strong religious beliefs are significantly more likely to practice the five types of pro-environmental behaviors compared to those who do not have a strong religious belief.

Compared to the effects of a plain religious belief as shown in Table 2, the impacts of a strong religious belief are larger for each of the five types of pro-environmental behaviors. For example, the estimated effect of a plain religious belief on reusing plastic bags is 0.043 (shown in column 1 of Table 2), whilst the estimated effect of a strong religious belief on reusing plastic bags is 0.085 (shown in column 1 of Table 3).

IV. Conclusions

Environmental protection has become an important issue with the growth of the economy, especially in developing countries. Individual pro-environmental behaviors have important implications for environmental protection. Using data from a nationwide survey carried out in mainland China in 2013, we intend to estimate the effects of religious beliefs on individual pro-environmental behaviors.

We construct a linear econometric model and use five measures to reflect individual pro-environmental behaviors during the year prior to the interview. The five measures are whether the individual regularly reused plastic bags, donated for environmental protection, actively participated in environmental protection exercises arranged by non-governmental organizations, planted trees or conserved a green area with his/her own money, and actively participated in environmental complaints or not. Besides, we distinguish between plain religious belief and strong religious belief.

Estimation results from the linear econometric model show that, in general, holding any religious belief has a positive significant influence on pro-environmental behaviors. The result holds for each of the five measures of individual pro-environmental behaviors. In addition, strong religious beliefs have greater effects on all types of pro-environmental behaviors.

Policy implications of the paper could be that people with religious beliefs should not be the target of programs aiming at promoting individual pro-environmental behaviors, as people with religious beliefs already have higher probabilities of implementing pro-environmental behaviors.

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