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Culture and Public Goods: The Case of Religion and the Voluntary Provision of Environmental Quality

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Abstract

Using data from approximately 13,000 individuals in 14 different OECD regions, we find that culture, as expressed by religious beliefs, generates public goods contributions. We characterize individuals into systems of religious beliefs using latent class analysis and find that some types of beliefs influence pro-environment behaviors and attitudes, even after controlling for religious affiliation, political views and activism, and socio-demographic characteristics. We find a role for beliefs that is separate from social capital accumulated via membership in church groups and church attendance. Finally, we make a methodological contribution by showing that the use of latent class analysis to describe systems of beliefs yields more meaningful interpretations than the standard approach of dummy variables for specific beliefs.

Key words: Latent Class Models; Public Goods; Culture; Religion

1 Introduction

Although much is understood about the role of formal institutions such as markets and codified rules in coordinating economic agents, policymakers and social scientists are becoming aware of the importance of informal institutions for the understanding of heterogeneous economic behaviors and the design and implementation of successful economic policies. In the last few years, the economics literature has exploded with theoretical and empirical investigations linking informal institutions to the functioning of the economic system at the individual and the aggregate levels. This literature has shown that incorporating culture, social norms, and measures of human interactions into economic theory and empirics increases our understanding of how the impact of economic fundamentals depend on the type and strength of informal institutions [14, 18, 19].

This paper furthers this line of thinking by investigating how religiosity, a critical part of an individual's culture, influences contributions to a public good. We examine how religiosity affects conservation efforts and attitudes toward the protection of the natural environment. Using a sample of approximately 13,000 individuals in 14 OECD regions, we find that there is substantial heterogeneity in the types of religious beliefs individuals hold. We present evidence that decomposes the influence of religiosity into an effect attributable to religious beliefs and an effect attributable to the social capital associated with participation in religious activities. We find that an individual's belief system influences economic behavior even after controlling for religious affiliation and participation, political views and activism, and socio-demographic characteristics. Our findings and methods emphasize that it is the combination of beliefs that affects behavior, not any one particular belief or having more religious beliefs.

In order to isolate the influence of religious beliefs from the effects attributable to religious affiliation and social capital related to religious participation, we treat religious beliefs as a multi-dimensional construct and apply latent class analysis to create a typology of belief systems. Then we estimate the likelihood of engaging in pro-environment behaviors and having pro-environment attitudes using the posterior probabilities of latent class membership as predictors. We show that the latent class approach to measure heterogeneity in religious beliefs provides different and richer interpretations of the results than those based on standard approaches used in the literature. Furthermore, because we use latent class analysis to

characterize belief systems, our approach to identifying the separate effects of religious beliefs and religious participation on public goods contributions is more convincing.

It is a well-established result that people contribute to public goods more than expected given incentives to free-ride. Volunteerism and charitable giving are common, and laboratory experiments provide consistent evidence that preferences can include a concern for others. Ferraro, Rondeau, and Poe [12] discuss results of an experiment in which participants' willingness to pay for a public environmental good depends on altruism and fair contributions. A person's own sense of social responsibility, of doing what is morally right, can also influence contributions to public goods. Brekke, Kverndokk, and Nyborg [6] find that pro-recycling policies might in fact reduce recycling rates if monetary incentives undermine an individual's moral motivation to contribute to the greater good. In the context of stated preferences, Spash [29] has found that ethical principles can be as important as standard socio-demographic variables in explaining willingness to pay for environmental goods.

Because religious values are part of an individual's system of values and norms, we can then expect that religiosity and religious beliefs influence efforts to contribute to public goods. Indeed, the idea that religion is related to economic outcomes has long philosophical roots. In the *Wealth of Nations* and *Theory of Moral Sentiments*, Adam Smith viewed religion as a way to enhance one's human capital. As discussed in Anderson [1], Smith observed two ways in which religion could affect economic behavior. First, belonging to a religious group generates social capital and group membership signals merit to potential employers. Second, religious beliefs provide a system of "internalized monitoring" that encourages individuals to behave in ways that benefit society. In line with Smith's observation, Torgler [31] finds that religiosity, as measured by involvement in a church group and having a religious education, is positively and strongly correlated with tax morale.

Religiosity can be particularly relevant in understanding attitudes and behaviors toward the protection of the natural environment. Religious traditions and movements include world views, ethical precepts, and spiritual elements that shape perceptions about the natural environment and can act as guiding principles regarding how our acts and choices affect nature.[1] Within the framework of discrete choice models, a person's religious beliefs and how those beliefs inform her relationship with the natural environment can generate differences in utility across alternatives. This is the approach we adopt when we model the decision to undertake pro-

environment behavior and state pro-environment attitudes. We assume that changes in religious beliefs influence the utility of recycling and not recycling, for example, and expect that pro-environment behaviors and attitudes generate greater utility for individuals with a more nature-centered system of beliefs.

In addition, church and community groups or more informal social networks formed by religious affiliation might encourage contributions to the public good either directly through their activities or indirectly through a sense of connectedness created by these memberships.[2] Consistent with these arguments, Chermak and Krause [8] examine the determinants of consumption of a common-pool resource in an experimental setting and find that identification with non-mainstream Christian religions is a significant and positive predictor of sustainable consumption patterns. Lowry [20] finds that religious affiliation influences the demand for membership in environmental organizations.

Many other researchers have now adopted the view that religion can influence economic choices and outcomes and include some control for religion in empirical analyses [10, 11, 14, 22]. Recent work has also focused on the relationship between culture or human capital and the development of growth-promoting institutions [15, 13, 30]. Finally, social scientists have extensively studied philanthropic behavior such as making charitable donations or volunteering and found that religious people are more likely to make monetary donations and volunteer their time to church-related and non-church related activities [7, 27].

We contribute to this line of research by investigating how religiosity influences efforts to protect the public good of environmental quality and by examining the autonomous roles of beliefs and participation in a large sample of individuals in OECD countries. Our research also highlights the importance of treating culture as a complex multi-dimensional construct. We argue that latent class analysis is an appropriate and insightful method to account for heterogeneous preferences and provide empirical evidence that shows that this measurement of religiosity leads to more accurate and nuanced conclusions than the use of ad hoc indicators. The results show that there is substantial variability in belief systems and that different belief systems matter in different ways. These findings increase our general understanding of the importance of non-economic factors in explaining economic behavior and, in particular, of the types of individuals who are more likely to engage in pro-environment behaviors and have pro-environment attitudes.

In this way, this research can shed light on how cultural factors might influence efforts to implement conservation policies and sustainable development programs.

The rest of the paper proceeds as follows: Section 2 introduces the method that we use to construct a typology of religious beliefs, Section 3 presents the results of the latent class analysis, and Section 4 presents the data and results of the models estimating the likelihood of pro-environment behaviors and attitudes. Section 5 concludes.

2. Methodology: Latent Class Models of Religious Beliefs

We employ latent class analysis to examine the associations between religious beliefs and to identify classes of people by their sets of beliefs. Compared to the ad hoc choice of a single belief and to entering multiple beliefs simultaneously (a practice that assumes the effect of a particular belief is independent of the effects of other beliefs), latent class analysis allows us to take into account the fact that religious beliefs are related and interact with each other. Although latent class analysis (LCA) has been applied to several social issues [3, 25], it is still a fairly novel methodology in the economics literature [5, 9, 26] that on theoretical and practical grounds is a promising approach to the study of social and cultural capital.

We use eight dichotomous variables from the World Values Survey (WVS): belief in God, Heaven, Hell, the Devil, the soul, life after death, and sin, and importance of religion in one's life. There are $2^8 = 256$ possible unique response patterns of these variables. In a sample of 12,896 individuals from OECD countries for whom we have responses to all eight indicators, we observe 188 response patterns.[3] This large number of observed unique responses suggests that there is substantial heterogeneity in the sample and that it might be unrealistic to presume that one or two measures of religious beliefs can properly characterize and differentiate among respondents. If we were to consider each observed response pattern a unique type of religiosity, then we would need to include 187 dummy variables in regression models. Importantly, people may differ in their degree of certainty about their beliefs and about what they mean when they say that they hold certain beliefs. For example, Bishop [4] analyzed trends in polls regarding belief in God in America and concluded that although a very high percentage of individuals claim to believe in God, it is unclear whether individuals believe in a similar God or believe with the same degree of certainty.

Our strategy is to consider a person's religious belief system an unobserved latent variable and to treat religious beliefs as indicators (with errors) of that unobserved latent construct. Because latent class models are probability-based, the analysis accounts for errors in the responses and for the uncertainty of classification. In our application, we are able to reduce the 188 observed response patterns down to ten distinct latent classes that separate out groups of individuals with different belief systems. From these results, we compute posterior probabilities of class membership and include these probabilities in models estimating the likelihood of engaging in pro-environment behaviors and expressing pro-environment values. In this manner, we examine whether different belief systems have different effects on public goods contributions.

We use 8 dichotomous questions from the WVS, so there are 256 possible response patterns.[4] The latent class model assumes the observed contingency table is a mixture of tables generated by a number of unobserved distinct classes. Estimation is based on the idea that the probability of obtaining a specific response pattern is the average probability of the response pattern given each class, weighted by the prior probability of class membership (Magidson and Vermunt, 2003). Let i = 1,…, I, denote the respondents. For each individual we observe the response to a set of eight questions denoted k =1,…,8. Then, $Y_{ik} = 1$ if the individual responds "yes" to question k, and $Y_{ik} = 0$ otherwise. The response pattern of an individual is represented by the vector, Y_i. Under a generalized finite-mixture model, we assume a finite number of latent religious systems denoted s = 1,…, S. The discrete latent variable X represents the religious system class. Then: $P(Y_i) = \sum_{s=1}^{S} P(X_i = s) \times \prod_{k=1}^{8} P(Y_{ik} \mid X_i = s)$.

The conditional probability that an individual in latent class s responds "yes" to indicator k is modeled as a logit equation: $P(Y_{ik} = 1 \mid X_i = s) = \frac{\exp(\beta_{ks})}{1 + \exp(\beta_{ks})}$, where β_{ks} is a free parameter.

Latent class analysis determines the smallest number of latent classes that account for the observed relationships among response variables. We start by assuming only one class – mutual independence among response variables – and then increase the number of classes if the independence model does not fit the data adequately. To determine the number of latent classes among the models that fit the data, we use the Bayesian information criterion (BIC) based on the model's log-likelihood. The models are fitted using Maximum Likelihood methods and the

results yield the conditional response probabilities for each belief. These conditional probabilities are then used to compare and define the classes. Using Bayes rule, we calculate posterior membership probabilities that are used in regression analysis.

3 Results for Latent Class Models

In this section we describe the data we use to characterize religious beliefs, justify our selection of a latent class model, and describe the resulting classes. We use data from the third wave of the WVS, conducted during 1995-1997. Although there is a more recent wave of the WVS available, the third wave is the only time the survey asks several questions about pro-environment behaviors which will become critical for the second part of our analysis. We focus our analysis on individuals in OECD countries. When we incorporate individuals from non-OECD countries into the analysis, there is too much heterogeneity in the sample and we are unable to find a global maximum of the likelihood function for those models that fit the data. Our difficulty in classifying individuals from many different cultures underscores the importance of treating beliefs as a complex, multi-dimensional construct.[5] Even though we focus on individuals in countries that are homogenous in many respects, it is important to note that there is substantial within-country variation of religious beliefs. Although a more diverse set of countries would contain even greater variation, we believe that our investigation provides an example of a useful approach to measure heterogeneous preferences and their effects on contributions to a public good.

The WVS, wave 3, contains questions about belief in God, Heaven, Hell, the Devil, the soul, life after death, and sin. We include how important religion is in the person's life in order to identify individuals who claim to hold some beliefs but are not engaged with those beliefs. We use a sample of 12,896 individuals for whom we observe responses to all eight indicators. Table 1 presents summary statistics for the indicators. Twenty-seven percent of the respondents say that religion is very important to them. The median number of beliefs people hold is 4; 2 and 7 beliefs are the 25- and 75-percentile, respectively, and the range goes from zero to all seven beliefs. The most common belief is the belief in God and the belief that people have a soul, 77 and 76 percent of the respondents, respectively. The two least common beliefs are belief in Hell and belief in the Devil. Pearson's Chi-square tests strongly reject the null hypotheses of no

association between each pair of beliefs and there is a substantial degree of heterogeneity in how these seven beliefs are combined.[6]

We observe 188 unique response patterns in our sample. This heterogeneity in belief patterns is also present within religious affiliations. Among the 5,686 respondents who identify themselves as Catholic we observe 147 unique patterns, among 3,578 Protestants we observe 126 unique patterns, and 124 unique patterns among the 2,741 respondents who do not subscribe to any affiliation. Therefore, the purpose of this first stage is to characterize individuals according to their belief systems only. In the second stage of our analysis, when we estimate probit models of the likelihood of pro-environment behaviors and attitudes, we control for religious affiliation, membership in a religious group, and attendance at services. In this way, we are able to investigate whether religious beliefs have an autonomous effect on behavior after controlling for affiliation and social capital accumulated through participation. If we were to include the additional religious controls in the latent class analysis, we would be generating groupings based on a different latent variable that would be something other than belief systems.

Table 2 presents goodness-of-fit statistics for latent class models.[7]Although a six-class model has the lowest BIC, the bootstrap p-value of the Pearson statistic indicates that the six-class model does not fit the data. Among the models that fit the data (based on the bootstrap p-value of the Pearson statistic), the ten class model has the lowest BIC.[8] It is possible that the Pearson statistic is penalizing the estimation too much for outliers as class 9 and 10 are rather small. Nonetheless, we choose to present the main results using the 10-class model rather than overrule the results of the test for model fit. We note, however, that the probability structure of the 6-class model can be fairly easily mapped into a subset of the 10-class model and that we obtain qualitatively similar conclusions when we use those six classes. The probabilities of holding each belief conditional on class membership for the 10-class model are presented in Table 3. We calculate class sizes using modal probability assignment, that is, each individual is assigned to the latent class for which she has the largest posterior probability.

Class 1 contains 33 percent of the sample and has very high response probabilities to all eight indicators. In contrast, Class 2, with 15 percent of the sample, could be described as the "secular class," with low response probabilities for each indicator. Class 3 is the next largest class, with 14 percent of the sample. Individuals in this class are characterized by high probabilities for all beliefs except Hell and the Devil. Individuals in Class 6 have relatively low

probabilities for all beliefs except belief in the soul. Individuals in Class 7 are similar to individuals in Class 6, but their belief in the soul is accompanied by high probabilities of belief in God or an afterlife. Individuals in Class 4 have a high probability for belief in God, but low probabilities for all other beliefs, while individuals in Class 5 have high probabilities of believing in God, life after death, and the soul and moderate probabilities for belief in heaven and sin. Although the individuals in classes 9 and 10 are also distinguished by the patterns of beliefs they hold, these individuals are a small part of our sample.

The results in Table 3 emphasize the complexity of religious beliefs. For example, individuals in classes 1, 3, 4, 5, 7, 8 and 9 all have a high probability of claiming a belief in God. However, as the pattern of responses to the remaining beliefs reveals, believing in God can be accompanied by a wide range of other religious beliefs. In the next section, we show that incorporating this complexity into models that predict pro-environment behaviors and attitudes allows for meaningfully different and richer conclusions about how beliefs affect behavior.

The distribution of religious affiliation and socio-economic characteristics across latent classes shows that we cannot use these characteristics to explain completely religious beliefs. For example, although the majority of individuals in Class 1 are Catholic, religious affiliation is not synonymous with the belief systems individuals hold since there are Catholics across all latent classes. In addition, there is substantial heterogeneity in class membership within and across countries. The ten classes are present in all regions. The proportion of individuals in the "secular class," ranges from 40 percent in Japan to 3 percent in the United States. We also calculated an index of class heterogeneity that measures the likelihood that two randomly selected individuals are classified in different classes. The index ranges from .49 in the United States to .84 in Norway and Germany.

The distribution of church attendance within classes is also worth mentioning. Almost 50 percent of the individuals in the “strong believers” class report attending church once a week or more and approximately 12 percent of these “strong believers” never attend church. Frequent attendance is not trivial in Class 3 (36 percent of the individuals). Interestingly, 40 percent of the people assigned to Class 3 and 38 percent of those in Class 7 report going to church once a month or on holidays. We also estimate OLS models of each posterior probability on socio-demographic controls, other religious controls, and country dummies. The R-squared ranges from .37 (for the probability of being assigned to Class 1) to .03 (for the probability of being

assigned to Class 9 and Class 10). In sum, these statistics suggest that although socio-economic factors are related to the type of belief system a person holds, a large combination of factors cannot totally explain the variability in posterior probabilities. Thus, it is reasonable to expect that the posterior probabilities of latent class membership can have an autonomous role even after controlling for religious affiliation and participation and socio-economic variables.[9]

4. Pro-Environment Behaviors and Attitudes

In this section, we examine the determinants of pro-environment behaviors and attitudes. We analyze the individual's problem in the framework of discrete choice models. We assume that the individual recycles, for example, if the utility when she recycles is greater than the utility when she does not recycle. The individual's socio-demographic characteristics create differences in utility over each pair of alternatives, and the type of belief system the individual holds (as determined by the posterior probabilities from the latent class model) also influences her utility depending on whether she undertakes the behavior or not. As we argued in the introduction, a person's religious beliefs are potentially related to her norms of moral conduct and to how she thinks she ought to relate to the natural environment. Thus, we hypothesize that recycling generates a larger utility gain for a person with a nature-centered spirituality than for the person who does not share such belief.[10] Finally, by assuming the researcher observes the choice with error and the errors are normally distributed, we can analyze the choice of behavior in the context of a random utility model estimated via probit models. For individual *i* in country *j*,

(1) $$P(ENVIRON_{ij}=1)=\Phi(\beta_0+\beta_1 BELIEF_{ij}+\beta_2 RELIGIOUS_{ij}+\beta_3 X_{ij}+\alpha_j)\ ,$$

where ENVIRON is one of the pro-environment behaviors or attitudes, BELIEF is a vector of probabilities of membership in each latent class for that individual, RELIGIOUS is a vector of several other behaviors/characteristics that are associated with religiosity, and X is a vector of socio-demographic controls.[11] α is a vector of region dummies that controls for omitted region characteristics. We calculate cluster-adjusted robust standard errors that account for within-region correlation and heterocedasticity. Below, we describe in more detail the data we use to estimate equation 1 and then present our results.

4.1 Data

Measures of pro-environment behavior and attitudes

The third wave of the WVS contains questions about activities that individuals have undertaken in the past 12 months "out of concern for the environment." These activities are: choosing household products that "you think are better for the environment," (PRODUCT), deciding "for environmental reasons to reuse or recycle something rather than throw it away" (RECYCLE), "reduced water consumption" (WATER), "attended a meeting or signed a letter of petition aimed at protecting the environment" (MEETING), and "contributed to an environmental organization (CONTRIBUTE). Each of these variables is coded as 1 if individuals have done the activity in the last 12 months, 0 otherwise.

These activities differ in their potential effects on environmental quality and can have different monetary as well as symbolic implications for households. Individuals may engage in some of the behaviors because of self-interest as well as normative reasons. For example, although the WVS specifically asks individuals if they have engaged in pro-environment behaviors out of concern for the environment, household expenses can be reduced by conserving water and health reasons might drive people to buy environmentally-friendly products. In addition, contributing to an environmental organization or attending a meeting or signing a petition are behaviors that are likely influenced by the individual's trust in environmental organizations. On the other hand, the individual can gain utility from recycling or buying specific products without trusting the environmental movement.[12] We should expect larger effects of religious beliefs when moral principals are the main determinant of the behavior, however, the empirical observations of these effects are clouded by the wording of the question. For these reasons, we do not expect our measures of religiosity and other socio-economic factors will have the same point estimates across all pro-environment behaviors.

We also examine individual attitudes toward environmental protection with three more variables: TAX ("agree to an increase in taxes if the money were used to prevent environmental pollution"), PRICES ("would buy things at 20% higher prices if it helped to protect the environment") and, PROTECT. PROTECT is equal to 1 if the individual claims that the statement "Protecting the environment should be given priority, even if it causes slower economic growth and some lost jobs" is "closer to your point of view" than the statement "Economic growth and creating jobs should be the top priority, even if the environment suffers

to some extent." Like MEETING and CONTRIBUTE, these variables also are unspecific about the exact environmental actions that individuals might support. In addition, one well-known result of the environmental valuation literature is that attitudes and intentions do not necessarily imply behaviors. Nonetheless, we examine these expressions of pro-environment attitudes to investigate whether or not religious beliefs might help to advance changes in environmental practices and policies.

Before we discuss the control variables, we address the concern that, because we use survey data, there could be an omitted individual characteristic that causes survey respondents to respond affirmatively to questions about beliefs, attitudes, and behaviors (e.g., respondents may want to appear to be giving the "right" response.) To address this concern, we note three points. First, our latent class analysis identifies a typology of beliefs in which only one class ("strong believers") contains individuals who respond affirmatively to all religious beliefs. If an omitted variable were driving yeah-saying, we would find that the probability of being in the "strong believers" class would be strongly correlated with pro-environment behaviors and attitudes. This is not the case. As we demonstrate in what follows, being in classes characterized by responding positively to only a few questions about beliefs (e.g., God and the soul) increases the likelihood of engaging in pro-environment behaviors and attitudes. An advantage of the latent class approach to measuring heterogeneity in beliefs is that it identifies groups of individuals with complex and separate sets of beliefs (rather than believers versus secular individuals only). The fact that only some of these groups are related to greater efforts to protect the environment reduces the concern that yeah-saying drives our results.

Second, we estimate stacked probit models for the likelihood of engaging in pro-environment behaviors and having pro-environment attitudes. After controlling in this manner for unobservable individual characteristics that are constant across responses, we still find that the posterior probabilities of class membership are jointly significant and that there are differential effects across classes.

Finally, we also tried to validate the survey responses with external data. While it is difficult to find data that match up well with the self-reported behavior, we were able to find the percent of solid waste that is recycled at the country level. Then, using the sampling weights in the WVS, we calculated the percent of respondents that report engaging in recycling to get country averages. For the 9 countries in our sample for which we have this external information,

the percentage of individuals who claim to recycle is strongly correlated with the external measure of recycling rates (the correlation coefficient is .653, with a p-value of .056).[13] Taken together, these three points reduce the concern that an omitted individual characteristic and respondents' yeah-saying are driving our results.

Controls for Religion

In addition to the posterior probabilities of membership in each belief class derived from the latent class analysis, we control for religious affiliation and religious participation. There are good reasons to treat beliefs, affiliation, and participation separately. First, there are differences between nominal religious affiliation and theological involvement and conviction. Among individuals who report to be Protestant, for example, we might expect to find different levels of engagement with the theological principles of Protestantism as well as different degrees to which those principles shape a person's economic behavior. A second issue is that there can be substantial variability regarding values within specific traditions. For example, some individuals might choose to focus on a set of values of Christianity that promote an attitude of stewardship toward the biosphere while similarly convinced believers might ascribe to aspects of Christianity that encourage an attitude of dominance toward nature [2].[14]

Researchers have argued that some religious traditions include world views, rituals, and spiritual elements that can foster environmental protection, for example, Buddhism and Hinduism. The WVS classifies individuals into nine categories: Catholic, Protestant, Orthodox, Jewish, Muslim, Hindu, Buddhist, other affiliations, and no affiliation. Because we have very few observations for individuals who are Orthodox, Jewish, Hindu or Buddhist, we collapse the nine categories to six dummy variables: Catholic, Protestant, Muslim, other Judeo-Christian affiliations (Jewish and Orthodox), other affiliations, and no affiliation (the omitted category). Importantly, religious affiliation is not synonymous with the belief systems individuals hold. Although the majority of Catholics are found in the "strong believer" class, there are Catholics in all other 9 latent classes and none of the classes consist of individuals in only one affiliation. This explains why we are able to find a role for beliefs that is independent of nominal affiliation and indicates that researchers can usually exploit the heterogeneity of values within standard classifications of affiliation.

We also control for religious practice. Putnam [27, page 67] writes: "Connectedness, not merely faith, is responsible for the beneficence of church people." To control for connectedness,

in the second set of models we include dummy variables that indicate the frequency of attendance at religious services (CHURCHGOER1-CHURCHGOER3). Individuals who are active members of church groups may be even more engaged than those who simply attend church regularly and we therefore include a dummy variable that equals 1 if the respondent participates actively in church-organized activities (ACTIVE). Individuals who trust their church might behave differently than those who do not, independent of their attendance and activism. To control for this aspect of social capital, we include TRUSTCHURCH, which is equal to 1 if respondents say that they trust the Church a great deal or quite a lot. By including these variables in addition to beliefs, we isolate the effects of an individual's religious beliefs from the effects of group association that might accompany religious participation.

Finally, to differentiate the effects of religious social capital from general social capital, we include variables that measure general trust in others, TRUST, and, in several specifications, general group association, GROUPS. TRUST is equal to 1 if individuals agree that "most people can be trusted." GROUPS is the number of non-environmental and non-religious groups in which respondents are active members (e.g., sports clubs, literary clubs, professional groups). Both TRUST and GROUPS have been widely used in the social capital literature [13, 19].

Socio-Demographic Controls

A person's religion can be related to her political views and attitudes toward civic behavior. Pyle [28] finds that religious conservatism is related to economic conservatism. In order to control for the effects of political views on pro-environment behaviors we include three variables that measure attitudes toward free riding, political identification, and political engagement. We control for political preferences with an index that indicates a respondent's self-placement in the left-right political spectrum, RIGHT. RIGHT takes on the value of "1" if the person places herself in the extreme left and the value of "10" if the person places herself in the extreme right.[15] This variable might have a negative coefficient since the pro-environment movement is often identified with left-leaning political agendas. Political activism may also be related to religious values and environmental action. We construct an index of political engagement by adding 1 if the individual has ever (i) signed a petition, (ii) joined in boycotts, (iii) attended lawful demonstrations, (iv) joined unofficial strikes, and (v) occupied buildings or factories. The index POLITICAL can take on the values 0 to 5.

Attitudes towards free-riding behavior may also affect an individual's decision to make public goods contributions. We follow Knack and Keefer [19] who formulate an indicator of social responsibility by adding responses to questions regarding whether certain free-riding behaviors can ever be justified. Respondents to the WVS rate on a scale of 1 to 10 whether the following free-riding behaviors can ever be justified: (i) "Claiming government benefits to which you are not entitled;" (ii) "Avoiding a fare on public transport;" (iii) "Cheating on taxes if you have a chance;" (iv) "Someone accepting a bribe in the course of their duties," and (v) "Buying something you knew was stolen." We code the variable so that a response of ten corresponds to the individual saying that the behavior can never be justified. Thus, CIVIC can take on values of 10 to 50, with 50 being associated with the highest levels of civic cooperation.

We also include income groupings of the individual as explanatory variables as many have suggested a relationship between income and pro-environment behavior [17]. The income variable in the WVS is problematic when one pools individuals from many countries because it is a categorical measure of the ranking of individuals in the income distribution of their own country. Individuals in the lowest income group in one country, for example, may have a different income level than individuals in that same income group in another country. In this case, the country-specific effect would be picking up effects due to the individual's income as well as country-wide characteristics. We address this issue in two ways. First, by including socio-demographic factors that are correlated with income (age and age squared, gender, and dummy variables for education levels) we control for the lack of cross-country comparability of the income measures. Second, as in Israel and Levinson [17], we include the income grouping dummy, an interaction of the income dummy and the country's 1995 per capita GDP, and per capita GDP (included via a country-specific fixed effect).

Table 1 presents summary statistics for the main variables used in our analysis. The average age of individuals in our sample is 43, slightly over half of the sample is female, and respondents to the survey placed themselves in the middle of the political spectrum. Recycling and using environmentally-friendly products are the most common behaviors (75 percent and 67 percent respectively). Contributing to environmental organizations is less common (18 percent of the sample). A large part of our sample is Catholic (45 percent), while the second most common religion is Protestantism (28 percent). A notable portion of the respondents (21 percent) do not claim an affiliation with any organized religion. In the next section, we use the data described in

Table 1 in conjunction with the results of our latent class analysis to examine the determinants of pro-environment behavior and attitudes.

4.2 Results

Table 4 presents the main results.[16] The table reports marginal effects and p-values in parentheses computed from cluster-adjusted and robust standard errors. First, we discuss the results for socio-demographic controls. Although we find some evidence that older people are more likely to recycle, purchase environment-friendly products, and conserve water at a decreasing rate, age is not related to making contributions to environmental groups, attending meetings and is negatively related to the stated willingness to pay taxes to protect the environment. CIVIC has a statistically significant effect on recycling, buying environment-friendly products, and conserving water. Given the high value of the mean of CIVIC, the positive coefficient probably captures the fact that individuals who are not civic-minded are also considerably less likely to provide public goods. CIVIC has also a positive significant effect on the pro-environment attitudes. Being female and more politically active (POLITICAL) are associated with greater probabilities of engaging in pro-environment behaviors and attitudes, while not completing university-level education and leaning toward the right on the political spectrum are associated with lower probabilities. Income enters the estimations somewhat sporadically. Low income is associated with lower probability of recycling and being willing to pay higher prices. Individuals in the second income grouping have a higher probability of conserving water relative to those in the highest income group, possibly because of the monetary benefits that may be associated with water conservation. These controls have very similar effects in all other specifications we discuss later and we do not continue to report them in the text.

The models in Table 4 also include religious affiliation and participation. Consistent with the literature, we do not find strong effects of affiliation on the likelihoods of engaging in pro-environment behaviors and attitudes as the coefficients on denominations enter the estimations only sporadically. Being Catholic is associated with lower probabilities of attending an environmental meeting, agreeing to pay higher prices or a willingness to protect the environment over economic growth, while being Protestant lowers the probability of conserving water, attending a meeting or willingness to pay higher prices. Interestingly, attendance at religious services has the most consistent positive and significant effect on both behaviors and attitudes for those who attend church once a month or only on holidays (CHURCHGOER2), and not those

who attend most frequently. As we have indicated before, there are more individuals in classes 3 and 7 who report attending church for holiday services or once a month than there are individuals who report attending once a week and never. Thus, a looser connection to organized religion as measured by infrequent but somewhat regular attendance at religious services may be related to religious beliefs that do not match up entirely with the institutionalized doctrine. Consistent with the argument in Putnam [27], we find some evidence that involvement in religious groups influences pro-environment behavior. Individuals who are active in church groups are more likely to recycle, to attend meetings, and to be willing to pay higher prices. Trust in the Church has a similarly weak effect on pro-environment behavior and attitudes, entering significantly in only 3 of the 8 estimations. Finally, we note that the coefficients on socio-economic and religious controls are similar in sign, significance and magnitude when we exclude the set of posterior probabilities for the religious beliefs classes from the models. This suggests that the belief systems can have an effect on behavior that is independent of the variables typically used to measure religiosity.

The probabilities of latent class membership enter significantly in several ways in these specifications. Note that the posterior probabilities add to 1 for each individual, so we omit Class 2 to avoid perfect collinearity. By omitting Class 2, we test the null hypothesis that increasing the probability that an individual is classified in a class other than the "secular class" has no effect on the likelihood of engaging in pro-environment behaviors and attitudes.

High probabilities of membership in class 3 are associated with higher probabilities of purchasing environmentally friendly products, recycling, conserving water, and two of the three pro-environment attitudes (with the coefficient on TAX, being almost significant with a p-value of .12). Having a high probability of being in Class 7 is also associated with an increased probability of several behaviors (recycling, attending a meeting, and conserving water) and attitudes (PROTECT and TAX). Similarly, membership in Class 6 is also associated with these pro-environment behaviors and attitudes (PRODUCT, RECYLCING, PROTECT, TAX). Membership in class 1, 4, 5, and 9 also generates some statistically significant coefficients, but we do not emphasize their interpretation here because a consistent pattern does not emerge.

The table presents the effects of increasing the posterior probability of each latent class by 1 percent on the likelihood of pro-environment behaviors and attitudes, everything else equal. However, changing the probability of one class by 1 percent would necessarily affect the

posterior probabilities of being assigned to all the other classes. A more meaningful way to discuss the effect of belonging to a given class is to compare a "typical" person in each class relative to a "typical" individual in the "secular class." A typical person in our sample is female, 43 years old, in the second lowest grouping of the income distribution of her country, with high school education, Catholic who is not an active member of a church group and who never attends church services, with median levels of CIVIC, POLITICAL, and RIGHT, and who does not believe other people can be trusted. A typical person who belongs to Class 3 with a probability of 1 has estimated probabilities of buying environmentally friendly products, recycling, reducing waster usage, and stating a preference for environmental protection over economic growth that are 8 percent, 10 percent, 4 percent, and 7 percent higher, respectively, than the probabilities of the same individual who belongs to Class 2 with probability of 1. A typical person who belongs to Class 6 with a probability of 1 has an estimated probability of agreeing to pay higher taxes that is 6 percent higher than the probabilities of the same individual who belongs to Class 2 with probability of 1.[17] To put the magnitude of these effects in perspective, everything else equal, women are almost 13 percent more likely to purchase environment-friendly products than men are, and almost 5 percent more likely to recycle. Trust and self-placement in the political spectrum have smaller marginal effects on behaviors than class membership based on religious beliefs does. Everything else equal, a person who claims others can be trusted is 2 percent more likely to buy environment-friendly products and 3 percent more likely to contribute to environmental groups. Similarly, everything else equal, a person in the extreme right is 9 percent less likely to purchase environment-friendly products and 7 percent less likely to contribute than a person in the extreme left.

What do the belief systems with the largest effects on pro-environment behavior have in common? Classes 3, 6, and 7 have relatively high probabilities of believing in the soul, varying probabilities for belief in God, belief in sin, belief in an afterlife, and the importance of religion in their lives, and low probabilities for believing in Hell and the Devil. Thus, the increased probability of pro-environment behaviors and attitudes may be traced to a belief system built around a more spiritual connection to the natural environment rather than through a promise of reward and punishment. It is also important to note that it is the system of beliefs that seems to generate pro-environment behavior, not any one specific belief. For example, individuals in Class 1 have a high probability of belief in the soul, but behave differently than individuals in

classes 3, 6 and 7. The probability of being in Class 1 enters significantly only in one model in Table 4, water conservation and, even in that case, the coefficient on the probability of being in Class 1 is smaller than the coefficients on the probabilities of being in classes 3 and 7.[18]

Overall, these results indicate that the type of religious beliefs a person holds explains economic behavior, independent of religious affiliation and religious participation. A potential caveat to the conclusions above is that the religious affiliation dummies might not capture the effect of membership in specific denominations within affiliations. For example, within a Protestant affiliation, Methodists and Baptists can have different propensities to hold the eight beliefs we analyze. If it were also the case that belonging to a Methodist church but not a Baptist church increased the probability of engaging in pro-environment activities, then we would be unable to uncover an effect of affiliation with our methods above, even though one existed. Instead, we could wrongly assign an effect to beliefs that should be attributed to participating in institutionalized religion. In this case, if data on more narrowly defined denominations were available and there were enough observations to estimate the effects, we might find that the church to which the individual belongs does matter and not the beliefs. Unfortunately, these data do not exist in the WVS.

We are still able to address this issue, however, by estimating the models in Table 4, but restricting the sample to those individuals who do not attend church once a week or more (CHURCHGOER1 = 0).[19] It is unlikely that belonging to a church will affect behavior if individuals do not regularly attend the church. If the posterior probabilities of class membership are still significant in this restricted sample, then we have additional evidence to suggest that personal religious beliefs are important in determining pro-environment behavior independent of the effects of institutionalized religion. We present the results for the coefficients on the classes in Table 5. The estimates of the posterior probabilities are remarkably similar to the estimates from the full sample. Furthermore, in terms of statistical inference we derive the same overall conclusion: higher probability of membership in latent classes 3, 6, and 7 are related to increased likelihood of engaging in pro-environment behaviors and attitudes.

We also estimated the models in Table 4 for the sample of individuals who are not affiliated with any religion. Remarkably, even in this smaller and more homogenous sample some types of religious beliefs are statistically associated with behaviors and attitudes. Higher probability of membership in Class 6 is positively related to RECYCLE, PROTECTION, and

TAX (p-values equal to .002, .03, and .08, respectively). Higher probability of membership in Class 7 is positively related to CONTRIBUTION and PROTECTION (p-values equal to .01 and .04, respectively).[20]

The results discussed above find a role for religious beliefs in influencing pro-environment behavior and attitudes, but the positive and significant coefficients on ACTIVE in a few of the estimations suggest a separate role for religious social capital in influencing behavior as well. In an attempt to learn if this effect is attributable to group association specific to religious activities or if it is more broadly attributable to general social capital, we estimate equation 1, adding an additional control variable, GROUPS, which is the number of civic or social organizations in which an individual is an active member, excluding church and environmental groups. We note that this exercise would also help to control for omitted characteristics of the individuals that are related to joining social groups and also to engaging in pro-environment activities. Although we do not report the detailed results here, we find that the coefficients on GROUPS is positive and strongly significant in explaining the five pro-environment behaviors and two of the three pro-environment attitudes, indicating that pro-social characteristics are related to these public goods contributions. Interestingly, we find that the marginal effects of the church vs. secular groups are similar. In other words, our results suggest that belonging to a church group has similar positive effects on pro-environment behavior as belonging to other kinds of secular civic organizations.[21]

4.3 Comparison to other approaches

We have argued that characterizing religious beliefs via latent class analysis is a more appropriate method to measure this complex set of values and provides results that yield richer and more sophisticated conclusions than the standard dummy variable approach. In this section we demonstrate this point by comparing our results to those obtained with the typical approach of characterizing religious beliefs by including dummy variables for each belief. As mentioned earlier, this approach has been used extensively in the literature, but we argue that in terms of the substantive insights to be derived from the analysis it has important limitations because it does not allow us to take into account combinations and interactions of the individual beliefs.

Table 6 presents coefficients on the individual beliefs using the dummy variable approach. In none of the estimations does a belief in God enter significantly and none of the individual beliefs enter significantly in explaining TAX or PRICES. Focusing on the results for

PRODUCT and RECYCLE, we would conclude that believing in Heaven is negatively correlated with pro-environment behavior, but believing in an afterlife is positively correlated. Similarly, a belief in Hell has a negative association, but belief in sin has a positive association. Our earlier results, however, suggest that these conclusions are misleading and possibly a result of collinearity. For example, in contrast to these results, we find that individuals with high probabilities of being in Class 3 have a very high probability of stating a belief in God and higher probabilities of using environmentally-friendly products and recycling. Furthermore, individuals in Class 3 have a relatively high probability of believing in Heaven, even though the dummy variable approach finds a negative relationship between belief in Heaven and pro-environment behaviors. Finally, individuals in Class 6 are also likely to engage in these pro-environment behaviors and have high probabilities for believing in the soul, yet belief in the soul enters into the estimations in Table 6 only twice. While the fit statistics for the dummy variable model vs. the latent class model indicate that both models may do a comparable job in predicting behavior, we believe that the latent class models are more appropriate for understanding behavior. Using the characterization from the latent class approach, we find that only some combinations of beliefs generate higher likelihood of these outcomes relative to non-believers.

We also experimented with an index of beliefs that increases by one for each belief the respondent holds. In this type of investigation, we are asking whether more religious beliefs are associated with pro-environment behaviors and attitudes, not whether types of beliefs are. Although we do not report the detailed results in the paper, when we use the belief index in estimations like those in Table 6, we find that it enters significantly in only one estimation (for RECYCLE), indicating that there is not evidence that the number of beliefs is what matters.

Before concluding, we should note that another method to summarize the indicators of beliefs to avoid collinearity is to employ factor analysis (FA) or principal components analysis (PCA). Latent class analysis has several advantages over FA and PCA in this context. First, because latent class analysis is grounded in a probability framework, we are able to calculate goodness-of-fit statistics that justify our model selection in a less arbitrary way than typically employed in FA and PCA. Second, use of FA and PCA requires us to assume that the observed indicators and the unobserved underlying factors are continuous and normally distributed. These methods can generate standardized scores but cannot generate types of beliefs. In our case, we

assume that the answers to a series of yes or no questions are in fact dichotomous variables that, taken together, can characterize a belief system that is categorical rather than continuous.

5 Conclusions

Our results have demonstrated that culture in the form of religious beliefs does affect economic behavior. We have characterized the types of belief systems people hold using latent class analysis and find that individuals who have belief systems that could be characterized as being more spiritual, incorporating a belief of the soul but not necessarily a belief in God, are more likely to engage in pro-environment activities and have pro-environment attitudes. Importantly, our results show that only some combinations of beliefs generate higher likelihood of these outcomes relative to non-believers.

The results also indicate that religious beliefs explain environmental action in addition to the effects of socio-demographic factors such as political identification, income, and education. Furthermore, we find a separate role for social capital associated with active membership in a church organization, however, we find no evidence that the impact of this kind of social capital differs from the effect of social capital accumulated through association with secular civic organizations.

These results have policy and methodological implications. As in Chermak and Krause [8], we demonstrate that there is individual heterogeneity in the characteristics that affect pro-environment behavior and attitudes. Therefore, policy may need to intervene to establish pro-environment outcomes rather than rely on the values of individuals to create action. This research also raises interesting questions regarding the measurement and use of social and cultural values. Researchers must be careful with untested assumptions regarding how one or more indicators of culture can summarize the heterogeneity in the population. Our results indicate that there is substantial variability in religious beliefs, even in a sample of relatively homogenous OECD regions, and that applying a methodology to separate out heterogeneous populations provides results that are substantively richer than relying on standard approaches.

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Table 1: Descriptive Statistics

Variable	Observations	Mean	Std. Dev.
Religious Indicators			
GOD (=1 if believe in God)	12,896	.772	.420
LIFE (=1 if believe in life after death)	12,896	.587	.492
SOUL (=1 if believe people have a soul)	12,896	.757	.429
DEVIL (=1 if believe the Devil exists)	12,896	.410	.492
HELL (=1 if believe in hell)	12,896	.375	.484
HEAVEN (=1 if believe in heaven)	12,896	.565	.496
SIN (=1 if believe in sin)	12,896	.611	.488
IMPORTANT (= 1 if religion very important in one's life)	12,896	.272	.445
Pro-Environment Behaviors and Attitudes			
PRODUCT (=1 if use env. friendly products)	12,585	.674	.469
RECYCLE (=1 if recycle)	12,896	.753	.431
WATER (=1 if conserve water)	12,763	.624	.484
MEETING (=1 if attend environmental meeting)	12,733	.212	.409
CONTRIBUTE (=1 if contribute to env. group)	12,704	.182	.386
TAX (=1 if agree to pay higher taxes to protect env.)	12,554	.677	.468
PRICES (=1 if agree to pay higher prices to protect env.)	12,472	.556	.497
PROTECT (=1 if favor env. protection over economic growth)	12,080	.517	.500
Religious Controls			
ACTIVE (=1 if an active member of a church or religious organization)	12,873	.234	.424
CHURCHGOER1 (= 1 if attend services once a week or more, apart from weddings, funerals and christenings)	12,812	.237	.426
CHURCHGOER2 (=1 if attend services once a month or on holidays)	12,812	.320	.467

CHURCHGOER3 (=1 if attend services once a year)	12,812	.111	.314
TRUSTCHURCH (=1 if trust the Church a great deal or quite a lot)	12,786	.497	.500
Catholic	12,785	.445	.497
Protestant	12,785	.280	.449
Orthodox and Jewish	12,785	.011	.105
Muslim	12,785	.005	.071
Other Affiliation	12,785	.044	.207
Socio-Demographic Controls			
FEMALE	12,876	.504	.500
AGE	12,711	42.53	16.98
CIVIC [Median]	12,509	44.96 [48]	7.02
POLITICAL [Median]	11,548	1.02 [1]	1.12
RIGHT (political self-placement, = 1 if extreme left, =10 if extreme right) [Median]	11,208	5.16 [5]	2.07
TRUST (=1 if say other people can be trusted)	12,545	.378	.485
GROUPS	12,811	.716	1.01
Income1 (=1 if lowest income group)	10,874	.190	.392
Income2 (=1 if second income group)	10,874	.296	.456
Income3 (=1 if third income group)	10,874	.242	.428
Income4 (=1 if fourth income group)	10,874	.163	.370
Education1 (= 1 if high school not completed)	12,365	.143	.351
Education2 (= 1 if complete high school education)	12,365	.357	.479
Education3 (= 1 if complete secondary education)	12,365	.350	.477
GDP per capita (1995 dollars)	12,896	18,139	8,303

Table 2: Latent Class Models Fit Statistics (N = 12,896)

	LL	BIC(LL)	Npar	Bootstrap p-value of Pearson statistic (Std. Dev.)
1-Class	-5726.9713	114626.0539	11	<.001
2-Class	-4608.2044	92349.7023	20	<.001
3-Class	-44777.0066	89828.4887	29	<.001
4-Class	-44465.6831	89291.0238	38	<.001
5-Class	-44347.1442	89139.1279	47	<.001
6-Class	-44275.8407	89081.7030	56	<.001
7-Class	-44239.7271	89094.6579	65	<.001
8-Class	-44197.6602	89095.7062	74	<.001
9-Class	-44179.7950	89145.1578	83	.024 (.0068)
10-Class	**-44163.3115**	**89197.3728**	**92**	**.126 (.015)**
11-Class	-44148.4325	89252.7970	101	.11 (.014)
12-Class	-44139.2028	89319.5197	110	.68 (.021)
13-Class	-4413.2082	89386.7124	119	.654 (.021)

Table 3: Probability Structure of Ten-Class Model (N = 12,896)

	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8	Class 9	Class 10
	.325	.151	.137	.11	.086	.069	.048	.049	.015	.009
Indicators										
God	.9983	.1107	.9999	.9085	.8849	.1023	.8451	.9125	.9992	.6945
After	.9558	.0139	.8384	.0051	.9943	.1944	.9881	.0436	.3300	.4786
Soul	.9956	.0421	.9683	.4829	.9589	.9947	.8468	.7842	.6063	.3727
Devil	.9514	.0084	.2318	.0604	.2808	.0042	.0492	.4191	.6412	.4198
Hell	.9374	.0005	.1747	.0093	.2070	.0019	.0010	.2547	.1898	.9527
Heaven	.9924	.0060	.8507	.2037	.5893	.0297	.0820	.6318	.7888	.3978
Sin	.9916	.0819	.7690	.3051	.5700	.2289	.0543	.9047	.9989	.4611
Important	.5317	.0094	.3977	.1060	.0005	.0077	.1108	.0057	.8504	.3073

Class 1: “Strong believers,” very high response probabilities on all indicators

Class 2: Secular class, all response probabilities are very low

Class 3: Very high probabilities except for belief in Hell and the Devil

Class 4: Very high probability of believing in God

Class 5: Very high probabilities of believing in God, life after death, and the soul; medium probabilities of believing in heaven and sin

Class 6: Very high probability of believing in the soul

Class 7: Very high or high probabilities of believing in God, life after death, and the soul

Class 8: High probabilities of believing in God and sin. High probability of believing in the soul, devil, and heaven

Class 9: Very high and high probabilities except for belief in hell and life after death

Class 10: Very high probability of believing in Hell; high probabilities of believing in God

Table 4: Probit Models Marginal Effects (omitted class is secular)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PRODUCT	RECYCLE	WATER	CONTRIBUTE	MEETING	PROTECT	TAX	PRICES
Class 1	.0122 (.621)	.0296 (.182)	.0413*(.093)	-.0102 (.585)	-.0198 (.225)	.0005 (.980)	.0068 (.828)	-.0065 (.824)
Class 3	.0729** .003)	.0745**(.001)	.1047**(.035)	.0036(.850)	-.0017(.956)	.0739**(.011)	.0686 (.118)	.0732**(.049)
Class 4	.0326 (.143)	.0219 (.375)	.0565*(.074)	.0302 (.375)	-.0121(.568)	.0212 (.381)	.0183 (.638)	.0025 (.954)
Class 5	.0555**(.041)	.0531 (.135)	-.0471 (.299)	.0258 (.349)	-.0118 (.788)	.0458 (.300)	-.0105 (.822)	.0596* (.066)
Class 6	.0687*(.079)	.0791**(.004)	.0110 (.699)	.0121 (.627)	-.0039 (.880)	.0662**(.020)	.0684*(.071)	.0305 (.414)
Class 7	.0668 (.155)	.0734**(.005)	.1254**(.000)	.0427 (.179)	.0877**(.002)	.0874**(.001)	.0798**(.049)	.0561 (.191)
Class 8	-.0248 (.527)	.0591 (.142)	.0070 (.812)	.0103 (.697)	.0087 (.841)	.0079 (.837)	.0156 (.723)	.0444 (.421)
Class 9	-.0838 (.360)	-.0747 (.174)	.0975*(.087)	.0848**(.005)	-.0972 (.313)	.0428 (.450)	.0355 (.644)	-.0521 (.544)
Class 10	-.0433 (.479)	-.0323 (.624)	-.0008 (.992)	.0497 (.607)	.0549 (.360)	.0467 (.121)	.0412 (.626)	.1150 (.234)
ACTIVE	.0147 (.310)	.0332**(.000)	.0000 (1.000)	.0109 (.291)	.0532**(.008)	.0143 (.414)	.0275 (.259)	.0373*(.080)
CHURCHGOER1	.0201 (.253)	.0478**(.042)	.0091 (.659)	.0296 (.148)	.0195 (.433)	.0446*(.084)	.0071 (.728)	.0249 (.368)
CHURCHGOER2	.0426**(.000)	.0229*(.069)	.0142*(.073)	.0543**(.004)	.0280**(.005)	.0057 (.707)	.0323**(.020)	.0494**(.007)
CHURCHGOER3	.0233 (.109)	.0118 (.570)	.0247 (.326)	.0314**(.024)	-.0018 (.932)	.0010 (.946)	.0425**(.004)	.0399 (.135)
TRUSTCHURCH	.0173*(.058)	-.0190*(.099)	.0066 (.660)	.0050 (.605)	-.0141 (.359)	.0052 (.741)	.0214*(.053)	.0134 (.407)

Table 4, Continued: Probit Models Marginal Effects (omitted class is secular)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PRODUCT	RECYCLE	WATER	CONTRIBUTE	MEETING	PROTECT	TAX	PRICES
Catholic	-.0155 (.487)	-.0343*(.071)	-.0252 (.512)	.0010 (.958)	-.0265*(.068)	-.0502*(.053)	-.0033 (.833)	-.054**(.006)
Protestant	-.0051 (.784)	-.0068 (.724)	-.0651*(.053)	-.0084 (.564)	-.0311**(.017)	-.0235 (.246)	-.0343 (.117)	-.048**(.043)
Muslim	.0711 (.222)	-.0965 (.144)	.1248**(.029)	.0480 (.267)	.1083 (.261)	.1648**(.004)	-.0159 (.804)	.0955 (.212)
Orth. & Jewish	-.0010 (.993)	.0343 (.667)	-.0672 (.331)	.0547**(.047)	-.0170 (.629)	.0206 (.809)	-.0367 (.485)	-.0239 (.436)
Other Affil.	-.0088 (.705)	-.066**(.003)	.0094 (.782)	-.0069 (.806)	.0038 (.901)	-.104**(.001)	-.0085 (.777)	.0050 (.918)
AGE	.0079**(.000)	.0036**(.027)	.0066**(.002)	.0014 (.530)	.0003 (.866)	-.0041 (.150)	-.006**(.006)	-.0031 (.287)
AGE *AGE	-.000**(.000)	-.000**(.009)	-.000**(.041)	-.0000 (.679)	-.0000 (.416)	.0000 (.680)	.0001**(.020)	.0000 (.513)
FEMALE	.1272**(.000)	.0453**(.001)	.0850**(.000)	.0188 (.116)	.0266**(.005)	.0181 (.157)	.0382**(.001)	.0559**(.000)
CIVIC	.0050**(.000)	.0030**(.000)	.0063**(.000)	.0006 (.466)	.0001 (.946)	.0029*(.051)	.0042**(.012)	.0024*(.066)
POLITICAL	.0618**(.000)	.0371**(.000)	.0231**(.005)	.0460**(.000)	.0792**(.000)	.0374**(.000)	.0354**(.000)	.0351**(.000)
RIGHT	-.009**(.000)	-.007**(.014)	-.0042 (.303)	-.0069**(.014)	-.0110**(.002)	-.014**(.001)	-.012**(.010)	-.012**(.002)
TRUST	.0170**(.034)	.0013 (.897)	-.0040 (.757)	.0322**(.000)	.0254**(.003)	.0796**(.000)	.0500**(.000)	.0407**(.001)

Table 4, Continued: Probit Models Marginal Effects (omitted class is secular)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PRODUCT	RECYCLE	WATER	CONTRIBUTE	MEETING	PROTECT	TAX	PRICES
Education1	-.168**(.000)	-.148**(.000)	-.1069**(.009)	-.0627**(.003)	-.1089**(.000)	-.113**(.000)	-.098**(.001)	-.128**(.000)
Education2	-.071**(.000)	-.055**(.006)	-.0417 (.151)	-.0611**(.001)	-.0926**(.000)	-.102**(.000)	-.078**(.001)	-.068**(.001)
Education3	-.0233 (.245)	-.035**(.025)	-.0285 (.207)	-.0279*(.080)	-.0607**(.000)	-.070**(.000)	-.062**(.006)	-.051**(.028)
Income1	-.0452 (.300)	-.138**(.000)	.0961 (.135)	-.0910*(.072)	.0482 (.266)	.0218 (.858)	-.1496 (.168)	-.129**(.003)
Income2	-.0194 (.563)	-.0581 (.135)	.1116**(.043)	-.0546 (.299)	-.0170 (.746)	.0944 (.344)	-.0778 (.489)	-.0098 (.849)
Income3	-.0010 (.979)	-.075**(.049)	.0846 (.178)	-.0604 (.141)	-.0358 (.522)	.1357 (.115)	-.0582 (.605)	-.0359 (.426)
Income4	-.0394 (.431)	-.105**(.036)	.0120 (.820)	-.0425 (.435)	.0097 (.885)	.0892 (.288)	-.0468 (.479)	-.0894 (.167)
LogPseudolikelihood	-4147.9404	-3654.8987	-4649.5172	-3711.6199	-3794.7121	-5096.9142	-4664.9561	-5107.1934
Pseudo R-squared	.1352	.1320	.1274	.0836	.1178	.0586	.0564	.0683
BIC	8403.711	7417.803	9406.951	7531.107	7697.315	10301.42	9437.771	10322.21
Observations	7989	8107	8047	8014	8030	7833	8008	7987

Robust p-values in parentheses; * significant at 10%; ** significant at 5%; the models include country dummy variables and the interaction with income dummies and per capita GDP.

Table 5: Probit Models Marginal Effects (omitted class is secular) for CHURCHGOER1 = 0

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PRODUCT	RECYCLE	WATER	CONTRIBUTE	MEETING	PROTECT	TAX	PRICES
Class 1	.0065 (.796)	.0164(.535)	.0423*(.086)	.0101(.586)	-.0151(.356)	-.0283*(.057)	-.0107(.730)	-.0171(.517)
Class 3	.0773**(.031)	.0531*(.066)	.0967*(.074)	.0156(.527)	.0157(.640)	.0718*(.056)	.0606(.192)	.0943**(.031)
Class 4	.0315(.172)	.0206(.453)	.0548(.113)	.0359(.320)	-.0007(.974)	.0262(.256)	.0178(.656)	-.0091(.829)
Class 5	.0627*(.058)	.0633(.117)	-.0542(.254)	.0168(.426)	-.0361(.460)	.0740*(.067)	-.0146(.764)	.0419(.239)
Class 6	.0671*(.071)	.0815**(.002)	.0178(.548)	.0106(.667)	-.0029(.909)	.0641**(.023)	.0679*(.085)	.0354(.369)
Class 7	.0744 (.122)	.0799**(.010)	.1262**(.001)	.0537**(.040)	.0997**(.001)	.0862**(.001)	.0837*(.050)	.0558 (.213)
Class 8	-.0284(.452)	.0467(.273)	.0162(.604)	-.0103(.766)	.0104(.828)	-.0053(.886)	-.0078(.831)	.0324(.531)
Class 9	-.1001(.415)	.0077(.872)	-.0554(.722)	.0872(.324)	-.0219(.849)	.1297(.208)	.0330(.725)	-.0454(.682)
Class 10	-.0370(.513)	.0349(.762)	-.0264(.825)	.1386*(.054)	.0677(.419)	.0555(.449)	.0652(.568)	.1901(.118)
LogPseudolikelihood	-317.2428	-2834.7988	-3618.0022	-2907.8563	-2942.4157	-3971.6334	-359.2174	-3984.1129
Pseudo R-squared	.1397	.1250	.1383	.0845	.1303	.0623	.0594	.0674
BIC	6445.329	5774.602	734.927	592.591	5989.733	8047.912	7285.329	8073.081
Observations	6229	6313	6270	6247	6259	6127	6255	6235

P-values based on robust standard errors in parentheses; * significant at 10%; ** significant at 5%; the models include country dummy variables, interaction with income dummies and per capita GDP, and the controls in Table 5.

Table 6: Probit Models Marginal Effects Using Dummy Variables to Control for Beliefs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PRODUCT	RECYCLE	WATER	MEETING	CONTRIBUTE	TAX	PRICES	PROTECT
GOD	.0022 (.879)	.0034 (.787)	.0366 (.116)	.0035 (.802)	.0143 (.454)	.0013 (.946)	-.0023 (.915)	.0020 (.894)
HELL	-.0511**(.012)	-.0240(.150)	.0123(.627)	.0025(.884)	.0078(.667)	-.0186(.452)	-.0367(.173)	-.0316(.263)
HEAVEN	-.0569**(.000)	-.0320**(.022)	-.0061(.797)	-.0268**(.012)	-.0215(.130)	.0021(.925)	-.0012(.946)	-.0418**(.016)
LIFE	.0499**(.002)	.0194(.135)	.0164(.365)	.0310**(.010)	-.0003(.981)	.0078(.640)	.0265(.137)	.0211*(.081)
SOUL	.0211(.173)	.0433**(.010)	-.0028(.892)	-.0108(.489)	.0057(.723)	.0287(.291)	.0246(.105)	.0469**(.009)
DEVIL	.0114(.326)	-.0005(.967)	-.0551**(.011)	-.0112(.448)	-.0061(.760)	-.0313(.101)	-.0272(.181)	-.0161(.526)
SIN	.0298**(.010)	.0234**(.001)	.0232(.258)	-.0024(.896)	-.0115(.338)	.0065(.686)	.0103(.609)	.0108(.639)
IMPORTANT	.0110(.464)	.0129(.338)	.0288*(.093)	-.0069(.696)	-.0104(.403)	.0125(.314)	.0226(.352)	.0482**(.000)
LogPseudolikelihood	-4139.3687	-3653.739	-4684.7041	-3796.9505	-3713.3328	-4665.0963	-5107.4832	-509.5634
Pseudo R-squared	.1370	.1323	.1276	.1173	.0832	.0564	.0682	.0598
BIC	8386.567	7415.484	9405.325	7701.792	7534.533	9438.051	10322.79	10288.72
Observations	7989	8107	8047	8030	8014	8008	7987	7833

P-values based on robust standard errors in parentheses; the models include country dummy variables, interaction with income dummies and per capita GDP, and the controls in Table 4. * significant at 10%; ** significant at 5%

Footnotes

1. Since White [32] hypothesized the Judeo-Christian tradition is responsible for current environmental problems, many empirical studies have tested this hypothesis with inconclusive results.

2. In theory, holding religious beliefs does not have to imply involvement with a group, however, as Iannaccone [16] points out, religious behavior almost always involves group association.

3. Seventeen patterns account for 75 percent of the observations while we need 39 patterns to account for 90 percent of the observations and 78 patterns for 95 percent of the observations.

4. There are three additional questions in the WVS that measure the importance of religion in one's life: if individuals consider themselves to be "religious," if the individual gets comfort and strength from religion, or if the individual believes there are clear guidelines for good and evil. When we incorporate those variables into the latent class analysis, we obtain a very similar class structure to the more parsimonious model (with one additional class) and qualitatively and quantitatively similar conclusions for the effects of religious beliefs on pro-environment behaviors and attitudes. Results of these estimations and any others discussed in the text but not reported in detail are available from the authors upon request.

5. The countries in our analysis are Australia, Germany, Finland, Japan, Mexico, Norway, Spain, Sweden and the U.S. The WVS reports data separately for East and West Germany as well as Andalusia, Basque Country, Galicia and Valencia because many of these regions may be culturally different than others in the same country (for example, these regions have their own language). We follow the WVS treatment of these regions and use separate dummy variables for these regions in the probit analysis described in Section 4.

6. The latent class model we describe above assumes that, conditional on class membership, responses to each indicator are independent. We relax this assumption by modeling local dependencies through the use of an interaction term between pairs of indicators [21]. We include local dependencies between beliefs in Hell and Heaven, Hell and the Devil, and Heaven and the Devil. Descriptive statistics show that responses to these indicators are highly correlated.

7. We use the sampling weights provided in the WVS for the estimation of the latent classes. Therefore, we do not use these weights again in the probit estimations.

8. To address the issue of local maxima we estimate several times each model using 10,000 starting values. The bootstrap p-values of the Pearson statistic are calculated using 500 replications.

9. It is possible to estimate latent class models that include socio-demographic characteristics as determinants of class membership. However, our goal in this paper is not to explain latent class membership but to investigate whether the type of belief system a person holds influences economic behavior after controlling for other relevant factors.

10. Choices also depend on the opportunity cost of the activity. Although we do not observe costs at the individual level, our models include variables (age, education, and income) that control for the opportunity cost of the activities. In addition, to the extent that part of the variability in costs is due to differences across countries, region dummies would further control for the costs of the behaviors.

11. Alternatively, we could use a series of dummy variables in which the class with the highest posterior probability for each individual is coded as 1 and the other classes are 0. Using posterior probabilities is

preferable because it allows us to exploit within-class heterogeneity since we do not have the same degree of certainty about how to classify each individual based on the individual's responses. The dummy variable approach yields identical qualitative results but the p values of some coefficients are higher. Nonetheless, the inference we draw still holds.

12. See Owen and Videras [24] for how trust in the environmental movement affects contributions to environmental organizations.

13. We use data from the OECD Environmental Data Compendium 2004. Data on recycling rates are for the latest available year (1999 through 2002).

14. Biel and Nilsson [2] argue that researchers who test the White hypothesis regarding the influence of Judeo-Christian religions on environmental problems arrive at contradictory results because specific religious affiliations include values that have different implications for individuals' attitudes and behavior toward the environment.

15. A more appropriate treatment of this index might be to create ten dummy variables. Given that the specifications are fairly complex, include several dummy variables already, and that we are not per se interested in the estimate of this control, we include the variable as a scale.

16. In comparing the number of observations in Table 1 to the number used in the estimations in Table 4, we lose observations. This is due to patterns of missing data that do not allow us to use all the observations for which we have information about religious beliefs. To gauge whether these missing observations were influencing our results, we imputed missing data with the average values for that variable in the sample and estimated equation 1 with the full sample and obtained similar results qualitatively and in terms of statistical significance.

17. We compute these effects for a "typical" person in the U.S. We find similar results for "typical" individuals in other regions in our sample.

18. For WATER, we reject the null hypotheses that the estimate of Class 1 is equal to the estimates of Class 3 and Class 7 at the 8 percent and 6 percent level, respectively. For PRODUCT, we reject the null hypotheses that the estimate of Class 1 is equal to the estimates of Class 3 and Class 6 at the 1 percent and 10 percent significance level, respectively. For RECYCLE, we reject the null hypotheses that the estimate of Class 1 is equal to the estimate of Class 3 at the 10 percent level. For PROTECTION and PRICE, we reject the null hypotheses of equal coefficients between Class 1 and Class 3 and Class 1 and Class 6 at the 4 percent level or better. Finally, for PROTECTION and TAX we reject the null hypothesis of equal coefficients between Class 1 and Class 7 at the 3 percent level or better.

19. Our results also hold if we look at individuals for which both CHURCHGOER1 and CHURCHGOER2 equal zero, though we lose significance of a few coefficients in the reduced sample.

20. As an additional check on our results, we also ran two stacked probit models, one for similar behaviors (WATER, RECYCLE, and PRODUCT) and one for the attitudes (TAX, PRICE, PROTECT). This exercise allows us to control for potentially omitted individual characteristics with an individual-specific random effect. We find that our main conclusions are robust to this estimation technique. All these estimations are available from the authors upon request.

21. The results are available upon request.