Pro-Social Behaviors, Waste Concern and Recycling Behavior: a natural experiment from Italy

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Abstract

This paper examines the relationship among some pro-social behaviors, individual's attitude regarding waste prevention and disposal, and the individual's recycling behavior. We consider a period at the end of the nineties, during this period the policy makers started to make the population aware of the importance of waste prevention, disposal and recycling, thus the individual awareness of and behaviors related to environmental waste problems were mainly influenced by the way of being of the population. Following Czajkowski et al. (2017), we develop a utility function that represents the individual level of satisfaction, which is influenced by certain aspects related to environmental quality. Using the 1998 wave of the Multipurpose Household Survey (MHS) conducted by the Italian Central Statistical Office and multivariate models we show that there is a positive relationship among pro-social behaviors, waste concern and recycling behavior that is robust to the inclusion of social participation variables.

Keywords— Pro-Social Behaviors, Waste Concern, Recycling Behavior, Social Participation, Multipurpose Household Survey, Italy

1 Introduction

The economic literature increasingly recognizes that individuals are not solely concerned with monetary rewards/punishments but also with non-monetary aspects, such as the various behavioral norms (warm-glow, altruism, social, personal) that may be used to induce desirable actions (Meier 2006; Van Den Berg 2008; Abbot et al. 2013; Alpizar and Gsottbauer 2015). People's attitudes and behaviors toward environmental protection have become a fertile area in which to examine the importance of non-monetary incentives. Several studies in the economic literature have considered the role of pro-social behaviors, in pro-environmental attitudes and

activities. For example, Halvorsen (2008), Hage et al.(2009) and Abbot et al.(2013) show that moral and social norms influence pro-environmental behaviors, while Brekke et al. (2003, 2010) and Czajkoswi et al. (2015) find that self image is central to recycling behavior. Finally, Owen and Videras (2006, 2007) and Videras et al.(2012) show that individuals who are more willing to behave according to civic and cultural norms and have more social ties are also more welling to protect a public good, namely, the natural environment. The aim of this paper is to improve our general knowledge concerning the importance of non-monetary motives in environmental quality by investigating, theoretically and empirically, the relationship among pro-social behavior and waste concern and recycling behavior. The paper contributes to the literature by some important aspects: a) incorporating pro-social behaviors, waste concern and recycling behavior into a microeconomic framework; b) estimating the relationship among them using unique Italian data; and c) controlling for the robustness of the results by considering additional pro-social behaviors, such as social participation. In the theoretical framework, we extend the existing literature in two regards. Departing from Brekke et al.(2003,2010), we do not focus our attention on the influence of individual identical agents on the social welfare function but identify a generic agent and underline that in the society there can be different agent with different levels of optimal ideal and moral effort. In addition, respect to Czajkoswi et al. (2017), we include additional components in the utility function: the attitude toward devoting effort to safeguard the environment, the recycling activity and the pro-social behaviours. In the empirical analysis, we use a dataset of approximately 36,000 individuals from the Multipurpose Household Survey (MHS) conducted annually by the Italian Central Statistical Office (ISTAT). We consider the year 1998 for a crucial and fundamental reason: at that time the environmental policy aimed to make the population aware of the importance of waste prevention, disposal and recycling was beginning (Decreto Ronchi, Legislative Decree 22/1997), thus individual awareness of and behaviors related to environmental waste problems were influenced exclusively by their own way of being. Among the main environmental problems, we consider waste prevention and disposal, as the European Commission had published several waste-related directives intended to reduce waste generation and increase waste recycling (Nicolli and Mazzanti 2011; Cecere et al. 2014). We measure environmental attitudes using a dummy variable that equals one if the respondent claims that "waste prevention and disposal "is "the most worrying environmental problem". Moreover, to measure an individual's willingness to incur a cost to protect the environment, we use an environmental behavior variable denoted $RecyclingBehavior$. The latter is a binary variable equal to one if the individual recycles at least one of four different materials: paper, glass, plastic and aluminum. The key independent variable is $Pro-Social\ behaviors$, which

is measured on a scale from 0 to 3, with 3 being associated with the highest level of social cooperation that limits free-riding behavior. Using probit models, we show that pro-social behaviors are related to an individual's concern regarding waste prevention and disposal and to an individual's decision to recycle. These findings are robust to the inclusion of more pro-social behaviors, such as social participation variables, which might be correlated with our key independent variable. To the best of our knowledge, an empirical assessment of the relationship among pro-social behaviors, waste concern and recycling behavior has never been performed for the Mediterranean countries. The paper is organized as follows. Section 2 offers a brief review of the related literature, while Section 3 presents the theoretical model. Section 4 describes the data and presents the empirical strategy. Section 5 illustrates the results, while the final section concludes.

2 The Literature

The literature has investigated the importance of psychological factors in pro-environmental behavior in general and in waste recycling in particular. Several studies consider beliefs, values, social influences, and social and personal norms[1] (Thomas and Sharp 2013). Vining and Ebreo (1990), using data from Champaign and Urbana in Illinois (USA), show that among the factors that distinguish recyclers from non-recyclers are knowledge and intrinsic motives, such as altruism and environmental concerns. Using experimental data, Hopper and McCarl Nielsen (1991) find that recycling behavior is influenced by social and personal norms. Hornik et al. (1995), Schultz et al. (1995), and Thogersen (1996), in reviews of prior empirical psychological studies on recycling behavior, show that the important predictors are social influence (of friends, family members and neighbors) and knowledge of, attitudes toward and commitment to recycling. More recent studies confirm the importance of knowledge, attitudes and personal norms in waste recycling (Ebreo and Vining 2000; Chu and Chiu 2002; Barr 2007; Sidique et al. 2010). Other contributions from the economic literature have focused on warm-glow and social norms and the joint impact of the two.[2] Bruvoll et al. (2002), using Norwegian data, show that sorting activi-

[1]Social norms are rules and standards that are understood by members of a group and that guide and/or constrain social behavior without the force of law. The violation of social norms is met with sanctions. Social norms may become internalized, in which case sanctions (in the form of feelings of guilt or pride) are administered by the individual upon him or herself. Internalized norms are called personal (moral) norms (Biel and Thogersen 2007).

[2]The reference points for warm-glow are Deci (1971) in the psychological literature and Andreoni (1990) from economics literature. According to Deci (1971), warm-glow means that an individual is motivated to perform an activity when he/she receives no apparent reward except the activity itself. In the model of Andreoni (1990),

ties by households are based on many different motives, including social or moral obligations. In a study of recycling behavior in a Swedish municipality, Berglund (2006) shows that people who take a strong positive moral stance toward waste sorting are more likely to express relatively low opportunity costs of the time devoted to these activities and respond negatively to the introduction of economic incentives in waste management. Kinnaman (2006), in summarizing results on residential recycling in United States, suggests that the benefits of recycling accrue primarily as warm-glow utility gained by recycling households, to the extent that households may even be willing to pay for the opportunity to recycle. In investigating individual behavior regarding waste reduction using large EU surveys, Cecere et al. (2014) find that individual behavior regarding waste reduction is driven primarily by altruistic motives, which are not necessarily associated with either economic incentives or social norm pressure. Hage et al. (2009) analyze the determinants of recycling efforts in Swedish households, focusing on the case of packaging waste (i.e., paper, glass, plastic and metal). They develop a theoretical framework that integrates norm-motivated behavior into a simple economic model of household choice. The results indicate that a moral motive ("I recognize a moral obligation to recycle") explains household recycling rates, while a social norm ("Important persons close to me want me to recycle") is not statistically significant. Halvorsen (2008) models how warm-glow and moral and social norms and the opportunity cost of time affect household recycling efforts. He uses data from Norway on six recycling activities, finding that indicators of warm-glow and moral and social norms increase household recycling activities. Abbot et al. (2013), using English local government data, show that social norms affect recycling but do not find a significant relationship between warm-glow and recycling. Warm-glow can also be interpreted as self image gains from contributing to the public good. Various other authors have developed more sophisticated models based on the premise that individuals derive intrinsic value from self image motive (Daube and Ulph 2016). Nyborg et al. (2006) construct a model in which individuals are motivated by a concern for self image, which depends on the total benefit of a "green "good yields to the population and by the perception of what share of the population is choosing to consume the "green "option. Hence, the individuals' intrinsic incentive to be pro-social increases as the share of the population acting in that way increases. Brekke et al. (2003) identify warm-glow with a positive self image, a relationship that depends on the degree to which individuals believe that their behavior is socially responsible. The individual's self image of being socially responsible is determined by a comparison of that individual's actual behavior with an endogenously determined morally

warm-glow means that the individual's utility is not just a function of the consumption of the private and public goods but also of the individual's contribution to the public good itself. This is commonly referred to as the "warm-glow"effect and describes a form of impure altruism (Daube and Ulph 2016).

ideal behavior. The morally ideal contribution was defined as the contribution that would have maximized social welfare had it been provided by all. Brekke et al. (2010) consider the role of what they refer to as duty orientation. A duty-oriented individual prefers a self image of being a socially responsible person. Duty orientation can be regarded as an extension of the standard impure altruism model (Andreoni 1990): like the impure altruist, a duty-oriented individual receives a warm-glow, which increases with the size of his or her contribution; however, unlike the impure altruist, the warm-glow decreases in perceived responsibility, and there is also a so-called cold shiver from not giving enough. If the level of perceived responsibility is held fixed, duty orientation is behaviorally indistinguishable from a warm-glow model. Using data from Statistics Norway, empirical results show that duty orientation is central to recycling behavior, responsibility ascription is influenced by the perception of what others are doing, and people are reluctant to accept responsibility based on uncertain information, indicating that responsibility is a burden. Czajkowski et al. (2014), investigating the determinants of individuals' stated preferences for household recycling, construct a model in which economic factors, personal moral sentiments and social pressure can all contribute to an individual's decision on how much they recycle. Using Polish data, the main result is that the willingness to pay for higher levels of household recycling is primarily linked to a moral motivation, associated with the belief that sorting at home is more thorough than sorting at a central facility. Social capital has also been emphasized as a significant factor influencing pro-environmental attitudes and behavior (Pretty and Ward 2001; Pretty 2003). Using data on Scotland, Collins et al.(2006) show that social capital, measured by charitable work, is positively associated with waste recycling. Torgler and García-Valinas (2007) empirically investigate the determinants of an individual's attitudes toward preventing environmental damage in Spain, showing that social capital, such as trust and membership in voluntary environmental organizations, has a strong impact on an individual‘'s preferences to prevent environmental damage. Using data on Taiwan, Tsai (2008) estimates the impact of social capital on the regional recycling rate. He provides evidence that regional social capital measured by the number of volunteers in associations and the number of social organizations is highly correlated with a region‘s recycling rate. Owen and Videras (2006), using data from the World Values Survey, find that individuals who are more willing to behave according to civic norms are also more willing to protect the public good of the natural environment. Owen and Videras (2007) and Videras et al. (2012) using OECD and US datasets, respectively, extend the results of Owen and Videras (2006) to church groups (and churchgoing) and social ties. Finally, using Italian data, Fiorillo (2013) reports that membership in non-profit associations and church attendance are correlated with recycling behavior. Crociata et al. (2015) extend

the association to cultural participation, while Agovino et al. (2016) also include environmental associations and voluntary activities.

3 Theoretical Framework

The theoretical analysis is related to the relationship among pro-social behaviours, environmental attitudes and recycling activities. We investigate from a theoretical point of view three fundamental aspects strictly connected to each other: the pro-social behaviours of individuals, their environmental sensibility and the level of recycling activity. The behaviour, the attitude and the action are not in contrast each other and this will be clearly confirmed by the empirical analysis. Following Czajkowski et al. (2017), we develop a utility function that represents the individual level of satisfaction, which is influenced by certain aspects related to environmental quality. The agents care about private consumption c, the level of environmental quality G, which is derived from a significant degree of recycling activity in the society, the pro-social behaviours S, means the respect of the agent for the other members of society, the extent to which they consider it is important to respect the environment R, and how much waste they recycle W. In our model we have the individual exogenous income I, the price of the private consumption that is normalized to 1, p that is the implicit price of the sum of efforts of the single generic agent i. Thus we have the following utility functions:

$$U_i = I - p(g_{Si} + g_{Ri} + g_{Wi}) + G + S_i + R_i + W_i \tag{3.1}$$

The equation of the utility function includes an expression for total effort,

$$g_{Ti} = g_{Si} + g_{Ri} + g_{Wi}$$

which represents the sum of the efforts of representative agents i. Let us define g_{Si} as the effort of agent i devoted to reach her respective target of pro-social behaviors S_i. To represent the pro-social behaviors in the utility function, we introduce the variable g^*_{Si} that denotes the moral ideal pro-social behavior for the agent i. Thus, we can write the following expression

$$S_i = -s(g_{Si} - g^*_{Si})^2$$

for agent i

To formalize the effort level of the agent that considers the environmental protection a priority, we introduce the variable R_i, which is defined in the following expressions as

$$R_i = -r(g_{Ri} - g^*_{Ri})^2$$

The variable R_i represents the level of the environmental sensitivity of the agent i; here, again, we include the variables g^*_{Ri}, which represents the exogenous, ideal optimal effort level devoted by each agent with different degrees of awareness with respect to ecological issues. Finally, we define the level of effort for the agent that effectively carries out the recycling activity W_i. In this case, we consider the ideal optimal effort devoted to recycling activity as g^*_{Wi}. We describe this aspect using the following expression:

$$W_i = -w(g_{Wi} - g^*_{Wi})^2$$

for agent i. The parameters s, r, w are weakly positive constant. Clearly, the ideal level of effort is greater for those agents with a pro-environmental attitude.

Having stated these expressions and conditions, we can rewrite equations 3.1:

$$U_i = I - p(g_{Si} + g_{Ri} + g_{Wi}) + (g_{Ti} + \sum_{j \neq i}^{n} g_{Tj}) - s(g_{Si} - g^*_{Si})^2 - r(g_{Ri} - g^*_{Ri})^2 - w(g_{Wi} - g^*_{Wi})^2 \quad (3.2)$$

where

$$G = g_{Ti} + \sum_{j \neq i}^{n} g_{Tj}$$

The agent i maximizes equations 3.2 and the optimal total effort for her is:

$$\hat{g}_{Ti} = (\frac{p-1}{2s} + \frac{p-1}{2r} + \frac{p-1}{2w}) + g^*_{Si} + g^*_{Ri} + g^*_{Wi} \quad (3.3)$$

This value corresponds to the effort that maximizes the utility of the generic agent i and, consequentially, all other agents belonging to the society maximize their utilities with different efforts. Specifically, we note that each optimal effort level depends on the ideal level of effort for each agent of the society. From 3.3 we obtain some important information. The optimal effort of the agents depends fundamentally from the level of the ideal effort. Thus each agent in the society maximizes her utility following an ideal level of pro social behaviour, sensitivity toward the environmental problems and recycling activity. All of these components are linked additively as a consequence the agents move their efforts toward their respective ideal level of effort. Even if they differ in the ideal level of efforts they tend to maximize their utility function by considering own ideal level of effort. Each category of agents rationally decides to reach the optimal values to maximize 3.2. All the agents of society simultaneously devote greater effort, thus all of these decision variables move in the same direction; there is no incentive to partially increase one or two types of effort given the ideal level of effort that they wish to reach.

4 Empirical hypotheses, data and strategy

From a theoretical perspective we have emphasized the relationship among three decision variables. This type of link is characterized by an ideal optimal value that each agent seeks to reach. At the end of the maximization process, it is clear that all of these variables move in the same direction. In other words, the agents simultaneously have an incentive to increase all efforts to maximize the utility function. We expect a positive relationship among these variables in the empirical investigation. In particular, we believe that there would be a positive link between pro-social behaviors and the level of sensitivity toward environmental problems and between pro-social behaviors and recycling activity. Hence, our empirical hypotheses are as follows:

- The measure of pro-social behaviors is positively correlated with the measure of waste concern;
- The measure of pro-social behaviors is positively correlated with the measure of recycling behavior.

The empirical analysis uses the 1998 wave of the Multipurpose Household Survey (MHS) conducted annually by the Italian Central Statistical Office. This large dataset is one of the best available for studying pro-environmental attitudes and behavior in a cross-sectional framework, as it investigates a wide range of behaviors through face-to-face interviews using a sample of approximately 20,000 households, roughly corresponding to 60,000 individuals. The 1998 wave is an invaluable dataset because there is a section on environmental issues not available in the other waves. The unit of analysis is the individual. The final dataset used in the empirical analysis contains 36,394 observations. Table 1 reports the definitions of the variables used in the econometric analysis with weighted summary statistics.

4.1 Measures of waste concern and recycling behavior

The 1998 wave of the MHS includes a section devoted to environmental issues. This section is used for identifying measures of pro-environmental attitudes and behavior. Among the main environmental problems, we consider waste prevention and disposal, as waste reduction is at the top of the waste hierarchy (Palmer et al 1997; Pearce 2004) and the European Commission has published several waste directives with the aims of reducing waste generation and increasing waste recycling (Nicolli and Mazzanti 2011; Cecere et al. 2014). We consider the individual‘s concern regarding waste prevention and disposal as a measure of waste concern. The first dependent variable, $Waste\ Concern$, is a dummy variable equal to one if the respondent claims

that "waste prevention and disposal "is "the most worrying environmental problem ". Individuals who express concern regarding waste prevention and disposal are not necessarily willing to incur a cost to protect the environment. To measure willingness to pay a cost to protect the environment, we use a different variable, i.e., recyclig behavior. The second dependent variable, *Recycling Behavior*, is a binary variable equal to one if the individual recycles at least one of four different materials: paper, glass, plastic and aluminium. *Recycling Behavior* is a behavioral action, as it demonstrates actual willingness to support a cost to protect the environment.[3] As Table 1 shows, while less than half of the respondents in our sample express concern regarding waste prevention and disposal ($Waste\ Concern$), the proportion of respondents who recycle (*Recycling Behavior*) is greater, at 65%.

4.1.1 Measure of Pro-Social behaviors

The key independent variable is $Pro-Social\ behaviors$, measured on a scale from 0 to 3, with 3 indicating the highest level of civic cooperation that limits free-riding behavior. A series of environmental questions in the 1998 wave of the MHS captures individual behaviors toward a social cooperation. We examine three behaviors, and we add 1 to $Pro-Social\ behaviors$ each time the respondent states that he/she never engaged in the following behaviors: (a) "throw paper in the street "; (b) "double park"; and (c) "engage in noisy driving behaviors ". The sample average of the index of pro-social behaviors is 1.77, and the standard deviation is 0.85.

4.1.2 Demographic and socio-economic characteristics

To account for factors that might influence both waste attitudes and recycling behavior and pro-social behaviors, we control for numerous demographic and socio-economic characteristics. We account for gender ($Female$), with male as the reference category, and for marital status, by including categories for married, divorced and widowed against a base category of being single. We consider age ($Age31-40$, $Age41-50$, $Age51-60$, $Age61-70$, $Age71-80$, with $Age16-30$ used as the reference group), the number of individuals living in the household ($Householdsize$), two variables representing the level of education attained (*Loweducation* and *Bachelor's degree*, with *High school* being the reference category).We further control for the natural logarithm of household income (*Household income* (ln)), self-reported good health (*Goodhealth*), employment status (*unemployed*, *Entrepreneur*, *Employed*, *Retired* with other status employed

[3]Although recycling was mandatory in Italy 1998, in practice, it was voluntary with no monetary incentives or effective monetary sanctions.

Table 1. Weighted descriptive statistics

Variable	Description	Mean	Standard deviation
Dependent variables			
Waste concern	=1 if waste protection and disposal is the most worrying environmental problem	0.41	0.49
Recycling behaviour	=1 if respondent recycles at least one of four different materials: paper, glass, plastic and aluminum	0.65	0.48
Key independent variable			
Pro-Social behaviors	0-3 scale of civic behaviour	1.77	0.85
Demographic and socio-economic characteristics			
Female	= 1 if female. Reference group: male	0.50	0.50
Married	= 1 if married. Reference group: single	0.60	0.49
Divorced	= 1 if separated/divorced	0.03	0.17
Widowed	= 1 if widowed	0.05	0.22
Age31-40	= 1 if age between 31 and 40. Reference group: age16-30	0.18	0.39
Age41-50	= 1 if age between 41 and 50	0.17	0.38
Age51-60	= 1 if age between 51 and 60	0.15	0.36
Age61-70	= 1 if age between 61 and 70	0.12	0.33
Age71-80	= 1 if age between 71 and 80	0.07	0.26
Household size	Number of people who live in family	3.37	1.25
Low education	= 1 if no education, completed elementary school and completed junior high school. Reference group: high school (diploma)	0.59	0.49
Bachelor's degree	= 1 if university degree and/or doctorate	0.08	0.27
Household income (ln)	Natural logarithm of household income	10.73	0.44
Good health	= 1 if self-perceived health is good	0.76	0.42
Unemployed	= 1 if unemployed. Reference group: other status	0.07	0.25
Entrepreneur	= 1 if entrepreneur	0.05	0.22
Employed	= 1 if employed	0.45	0.50
Retired	= 1 if retired	0.18	0.39
Homeowner	= 1 if homeowner	0.72	0.45
Newspapers	= 1 if newspapers every day	0.24	0.43
Perception of community problems			
Micro-criminality	= 1 if pickpocketed	0.03	0.18
No parking problems	= 1 if no difficulty parking	0.35	0.48
No traffic problems	= 1 if no traffic problems	0.20	0.40
No pollution	= 1 if no pollution	0.24	0.46
No dirtiness problems	= 1 if no filth	0.23	0.42
Size of municipality			
Metropolis	= 1 if metropolitan area. Reference group: <2,000 inhabitants	0.22	0.42
Neighbouring metropolis	= 1 if close to metropolitan area	0.08	0.27
>50,000	= 1 if more than 50,000 inhabitants	0.15	0.36
10,000-50,000	= 1 if between 10,000 and 50,000 inhabitants	0.22	0.41
2,000-10,000	= 1 if between 2,000 and 10,000 inhabitants	0.24	0.43
Social participation			
Union membership	= 1 if passive and/or active participation in trade unions	0.09	0.29
Volunteering membership	= 1 if passive and/or active participation in voluntary associations	0.11	0.31
Political membership	= 1 if passive and/or active participation in political party	0.04	0.21
Church attendance	= 1 if church attendance one or more a week	0.33	0.47
Environmental membership	= 1 if passive participation in environmental associations	0.02	0.13

* The Pro social behaviors correspond to a 0-3 scale if respondent states that he/she never engaged in "throw paper in the street "; "double park"; "engage in noisy driving behaviors"

as the reference category), tenure status ($Homeowner$) and the habit of reading newspapers ($Newspapers$). The average respondent in the sample is married, has low education (elementary school and/or junior high school completed), is in good health and a homeowner. We also control for the quality of the surrounding environment where the respondent lives.These variables are designed to measure the respondent's beliefs regarding potential environmental problems related to the area where he/she lives.These indicators of subjective perception are public safety where the household lives ($Micro-criminality$) and a number of other issues such as parking ($No\ parking\ problems$), traffic ($No\ traffic\ problems$), pollution ($No\ pollution$) and dirtiness ($No\ dirtiness\ problem$). Moreover, we also control for the size of municipality (metropolis, neighboring metropolis, more than 50,000, 10,000-50,000, and 2,000-10,000, with fewer than 2,000 inhabitants being the reference category). Regional fixed effects are also included to account for the high regional heterogeneity in economic development and environmental quality existing in Italy.

4.1.3 Other pro-social behaviors: social participation

To isolate the effect of $Pro-Social\ behaviors$ and ensure that its coefficient estimates are robust, we also construct social participation variables and include them in some of the models to study how these variables influence $Waste\ Concern$ and $Recycling\ Behavior$. We construct three variables reflecting passive and active membership in associations. $Union\ membership$, $Volunteering\ membership$ and $Political\ membership$ are dummy variable equal to one if the individual is a passive member (the individual participated in meetings of an association) and/or a active member (the individual did unpaid work for association), in trade unions, volunteering associations and political parties. On average, approximately 10% of the respondents participate in trade unions and voluntary associations, while the participation rate in political parties is only 4%. Moreover, we also include a $Church\ attendance$, a binary variable that is equal to one if the respondent attends a church or another place of worship one or more times per week. Religious traditions include world views, ethical precepts and spiritual elements that shape perceptions of the natural environment and can act as guiding principles regarding how individual acts and choices affect nature (Owen and Videras 2007). The sample mean of this variable is 0.33. Finally, individuals who participate in activities promoted by environmental organizations may be more likely to learn about the value of preserving the natural environment (Owen and Videras 2006). Hence, we also include the variable $Environmental\ membership$, which equals one if the individual reports participation in environmental associations. The sample mean of this variable is only 0.02.

4.2 Empirical strategy

We empirically model the relationship among pro-social behaviors, waste attitudes and recycling behavior using the following sets of models. First, we estimate *Waste Concern* and *Recycling Behavior* as a function of demographic, socio-economic characteristics and regional dummies

$$Pr(Waste_i = 1) = \Psi(\alpha_0 + \alpha_1 S_i + \alpha_2 D_i + \alpha_3 T_i) \tag{4.1}$$

$$Pr(Recycle_i = 1) = \Psi(\beta_0 + \beta_1 S_i + \beta_2 D_i + \beta_3 T_i) \tag{4.2}$$

where waste and recycle reflect an individual's concern regarding waste prevention and disposal and the individual's choice to recycle at least one of four different materials: paper, glass, plastic and aluminium. S is our measure of pro-social behaviors; D is a matrix containing gender, marital status, age, education, household size and income, self-reported good health, employment status, tenure status, the habit of reading newspapers, the quality of the surrounding environment and the size of municipality where the respondent lives. T is the vector of regional dummies; $\Psi(.)$ is the cumulative distribution function of a normal standard. Second, to assess the robustness of our measure of pro-social behaviors, we expand equations (4.1) and (4.2) to include individual social participation variables:

$$Pr(Waste_i = 1) = \Psi(\alpha_0 + \alpha_1 S_i + \alpha_2 D_i + \alpha_3 T_i + \alpha_4 SP_i) \tag{4.3}$$

$$Pr(Recycle_i = 1) = \Psi(\beta_0 + \beta_1 S_i + \beta_2 D_i + \beta_3 T_i + \beta_4 SP_i) \tag{4.4}$$

where SP is a matrix containing social participation variables, i.e., participation in trade unions, volunteering and environmental associations, political parties and churchgoing.

5 Results

In this section, we report the econometric results. Section 5.1 presents the findings from the baseline models, Section 5.2 reports results with robustness checks, while section 5.3 describes the policy implications.

5.1 Baseline findings

Table 2 presents the probit estimations of equations (4.1) and (4.2). The first column shows marginal effects, and the second column presents the standard errors, which are corrected for heteroskedasticity. Before commenting on the results regarding the measure of pro-social behaviors, we note the findings regarding the demographic and socio-economic characteristics and

regional dummies. The key demographic and socio-economic determinants of waste concern and recycling behavior are the age71-80 dummy, education and household income. The marginal effect for the age cohort between 71 and 80 years of age exhibits a negative sign and is statistically significant at the 1% level. Hence, being an older person decreases the probability of exhibiting waste attitudes and recycling behavior by approximately 6% and 9%, respectively. Low education enters the waste and recycling equations with a negative and statistically significant (1%) marginal effect. This means that an individual who has completed elementary school and/or junior high school has lower waste attitudes and recycling behavior than an individual with a high school diploma. Moreover, university graduates also have a higher probability of exhibiting waste attitudes and recycling behavior than do high school leavers (significant at the 1% level). Thus, the results suggest that individuals with more education are more likely to state their support for environmental quality than are individuals with low levels of education. Household income has a significant and positive effect on *Waste Concern* and *Recycling Behavior* (significant at the 1% level). Individuals with high income are more likely to state their concern regarding waste prevention and disposal and are also more likely to recycle. Finally, perceptions of community problems also matter. An individual who states that there are no traffic problems in the area where he/she lives has a lower probability both of being concerned about waste prevention and disposal and engaging in recycling behavior (significant at the 5% and 1% levels, respectively). A number of other demographic and socio-economic characteristics have differential effects on waste attitudes and recycling behavior. Beeing married increases the likelihood of reporting a concern for waste prevention and disposal. The likelihood of having a pro-environmental attitude does not seem to depend on household size, perceived health, tenure status, the habit of reading newspapers or employment status. However, if an individual perceives the area where he/she lives as not being polluted, this belief encourages his/her concern regarding waste prevention and disposal. Moreover, individuals living in area close to a metropolis have a higher likelihood of being concerned about waste.

Regarding recycling behavior, being female increases the probability of recycling, while being divorced decreases recycling behavior. Household size is statistically significant at the 5% level and takes a negative sign, indicating that larger families are less likely to recycle. Employment status is also important. Unemployed and employed individuals recycle less, while the retired recycle more (all significant at the 1% level). Moreover, an individual who reads newspapers every day is also more likely to recycle (significant at the 1% level). Furthermore, an individual who reports that there are no parking problems or dirtiness in the area where he/she lives has a higher likelihood of recycling (significant at conventional levels). Finally, living in a city close to a

Table 2. Probit results: marginal effects of waste and recycle

	Waste		Recycle	
Variable	dF/dx	Std. Err.	dF/dx	Std. Err.
Pro-Social behaviors	0.014***	0.003	0.029***	0.003
Female	-0.012**	0.006	0.012***	0.006
Married	0.020**	0.008	-0.009	0.009
Divorced	0.011	0.016	-0.053***	0.017
Widowed	-0.001	0.015	-0.004	0.010
Age31-40	0.002	0.010	0.002	0.011
Age41-50	-0.012	0.010	0.014	0.024
Age51-60	-0.018	0.011	0.023*	0.012
Age61-70	-0.019	0.013	-0.010	0.014
Age71-80	-0.062***	0.015	-0.087***	0.018
Household size	-0.002	0.003	-0.008**	0.003
Low education	-0.029***	0.007	-0.039***	0.007
Bachelor's degree	0.034***	0.010	0.031***	0.011
Household income (ln)	0.063***	0.010	0.100***	0.010
Good health	0.008	0.006	0.009	0.007
Unemployed	-0.020*	0.011	-0.063***	0.012
Entrepreneur	0.018	0.012	-0.015	0.013
Employed	-0.007	0.007	-0.032***	0.008
Retired	0.011	0.010	0.036***	0.010
Homeowner	0.004	0.007	-0.000	0.007
Newspapers	-0.010	0.006	0.023***	0.007
Micro-criminality	-0.022	0.014	0.030*	0.015
No parking problems	0.012*	0.007	0.031***	0.007
No traffic problems	-0.019**	0.008	-0.024***	0.009
No pollution	0.033***	0.008	0.001	0.008
No dirtiness problems	-0.014*	0.007	0.020**	0.008
Metropolis	0.018	0.011	-0.015	0.012
Neighbouring metropolis	0.029**	0.013	-0.028**	0.014
>50,000	0.016	0.012	-0.022*	0.012
10,000-50,000	0.017	0.011	-0.010	0.012
2,000-10,000	0.011	0.011	-0.019	0.012
Regional dummies	Yes		Yes	
No. of observations	35426		35212	
Pseudo R-squared	0.0158		0.1912	
Log-likelihood	-23231.29		-19019.69	

Notes: The dependent variables *waste and recycle* takes value 1, respectively, if a) individual claims that waste protection and disposal is the most worrying environmental problem and b) individual recycles at least one of four different materials: paper, glass, plastic and aluminum. The model is estimated with a standard probit. Regressors' legend: see Table 1. Regional dummies are omitted for reasons of space. The standard errors are corrected for heteroskedasticity. The symbols ***, **, * denote that the coefficient is statistically different from zero at 1, 5 and 10 %, respectively.

metropolis reduces the probability of recycling. The covariates also include 18 regional dummies ($Valle\ d'Aosta$ is aggregated with $Piemonte$), with $Lombardia$ as the reference region, for which the marginal effects are not shown for reasons of space. Individuals living in southern Italy are less likely to report pro-environmental attitudes and behavior. In particular, individuals in $Sicilia$ have the lowest probability of reporting being concerned about waste prevention and disposal, while individuals in $Campania$ have the lowest probability of recycling. As we control for a full set of individual-level demographic, social and economic variables, a plausible explanation for such findings should be sought in regional economic and institutional factors, comprising economic growth and environmental policy. The probit estimations of equations (4.1) and (4.2) with demographic, socio-economic characteristics and regional dummies (Table 2) show evidence for the expected positive relationships among pro-social behaviors, waste attitudes and recycling behavior. The marginal effects of $Pro-Social\ behaviors$ in the equations estimating $Waste\ Concern$ and $Recycling\ behavior$ are positive and statistically significant at the 1% level. The marginal effect of $Pro-Social\ Behaviors$ in explaining $Waste\ Concern$ is 1.4%. In the recycling equation, the marginal effect is twice as large, at 2.9%.

5.2 Robustness check

The observed association among pro-social behaviors, waste attitudes and recycling could conceal the effect of other factors that lead to individuals having a high willingness both to cooperate in the provision of public goods and to protect environmental quality. Thus, the first potential problem with the interpretation of our results is omitted variable bias. We address this problem by adding social participation variables. As described in Section 4.1.4, we consider variables intended to capture additional social/relational aspects of individual behavior such as membership in various types of associations and churchgoing. Tables 3 and 4 present the results for the waste and recycling equations (4.3) and (4.4). Standard errors corrected for heteroskedasticity are presented in brackets. In the waste equations, we find that the marginal effect on $Pro-Social\ behaviors$ remains unchanged when including the social participation variables (Table 3, Columns I through VI). We find evidence that union and volunteering membership are positive and significant predictors of reporting concern about waste prevention and disposal (both at the 1% level) (Columns I and II), the marginal effects of which are robust to simultaneously including all social participation variables (Column VI). Being a member (passive and/or active) of a trade union or a volunteering association is positively correlated with the likelihood of reporting waste concern, increasing the likelihood by 3.4% and 6.5%, respectively. When considered individually, political and environmental membership and church attendance

are statistically significant at conventional levels or greater (Columns III through V), but when considered simultaneously, their statistical significance disappears (Column VI), showing that they are not robust predictors of an individual's concern regarding waste prevention and disposal. In particular, the result on participation in environmental groups suggests that environmental membership is not an indication of greater environmental concern. It is important to emphasize that the marginal effects on the other covariates remain stable (with respect to the results reported in Table 2), with the exception of the habit of reading a newspaper every day. Adding control variables for social participation implies that newspaper readership is statistically significant at 5% with a negative sign (Table 3, Column VI). This evidence indicates that the habit of reading a newspaper every day decreases the probability of reporting $Waste\ Concern$.

In the recycling equations, we also find that the marginal effect on $Pro-Social\ behaviors$ remains stable when including social participation variables (Table 4, Columns I through VI). We also find evidence that union and volunteering membership are positive and significant predictors of recycling (both at the 1% level) (Columns I and II), the marginal effects of which are robust to simultaneously considering all social participation variables (Column VI). Being a member of a trade union or a volunteering association is positively linked to the likelihood of recycling behavior, increasing the likelihood by 4.8% and 8.0%, respectively. Moreover, when considered both individually and simultaneously with all other control variables, church attendance and environmental membership are robust predictors of recycling behavior (Column VI). Attending church one or more times per week and being a passive member of an environmental association is positively related to the probability of recycling, increasing the likelihood by 3.6% and 8.7%, respectively. This last result indicates that participation in environmental groups is an indication of higher pro-environmental behavior. It is also important to emphasize that the marginal effects on the other covariates remain stable (with respect to the results reported in Table 2) with the exception of being female. Adding church attendance implies that the marginal effect of being female on recycling behavior is no longer statistically significant (Table 4, Columns IV and VI). This finding indicates that the effect of being female on recycling behavior is mediated by churchgoing. Overall, the results in Table 3 and Table 4 show that being social-minded has a robust and positive statistically significant relationship with the likelihood of reporting waste concern and recycling behavior even after controlling for additional social relations aspects of individual behaviors that might correlate with the level of social cooperation.

Table 3. Probit results: marginal effects of robustness analysis of waste

Variable	I	II	III	IV	V	VI
Pro-Social behaviors	0.014(0.003)***	0.013(0.003)***	0.014(0.003)***	0.014(0.003)***	0.014(0.003)***	0.013(0.003)***
Union membership	0.044(0.009)***					0.034(0.010)***
Volunteering membership		0.070(0.009)***				0.065(0.009)***
Political membership			0.036(0.013)***			0.012(0.014)
Church attendance				0.013(0.06)**		0.007(0.006)
Environmental member.					0.041(0.020)**	-0.001(0.021)
Female	-0.010(0.006)*	-0.011(0.006)*	-0.010(0.006)*	-0.014(0.006)**	-0.011(0.006)*	-0.010(0.006)*
Married	0.019(0.008)**	0.021(0.008)**	0.020(0.008)**	0.019(0.008)**	0.020(0.008)**	0.020(0.008)**
Divorced	0.010(0.016)	0.012(0.016)	0.011(0.016)	0.011(0.016)	0.011(0.016)	0.011(0.016)
Widowed	-0.002(0.015)	0.000(0.015)	-0.001(0.015)	-0.002(0.015)	-0.000(0.015)	-0.001(0.015)
Age31-40	0.001(0.010)	0.002(0.010)	0.002(0.010)	0.001(0.010)	0.002(0.010)	0.001(0.010)
Age41-50	-0.015(0.010)	-0.013(0.010)	-0.012(0.010)	-0.013(0.010)	-0.012(0.010)	-0.016(0.010)
Age51-60	-0.019(0.011)*	-0.017(0.011)	-0.018(0.011)	-0.020(0.011)	-0.017(0.011)	-0.020(0.011)*
Age61-70	-0.019(0.013)	-0.017(0.013)	-0.019(0.013)	-0.023(0.013)*	-0.018(0.013)	-0.019(0.013)
Age71-80	-0.062(0.015)***	-0.056(0.015)***	-0.062(0.015)***	-0.065(0.015)***	-0.061(0.015)***	-0.060(0.015)***
Household size	-0.002(0.003)	-0.001(0.003)	-0.002(0.003)	-0.002(0.003)	-0.001(0.003)	-0.002(0.003)
Low education	-0.028(0.007)***	-0.026(0.007)***	-0.028(0.007)***	-0.029(0.007)***	-0.029(0.007)***	-0.025(0.007)***
Bachelor's degree	0.033(0.010)***	0.032(0.010)***	0.034(0.010)***	0.033(0.010)***	0.035(0.010)***	0.033(0.011)***
Household income (ln)	0.063(0.010)***	0.061(0.010)***	0.063(0.010)***	0.063(0.010)***	0.063(0.010)***	0.061(0.010)***
Good health	0.008(0.006)	0.009(0.006)	0.008(0.006)	0.008(0.006)	0.008(0.007)	0.008(0.006)
Unemployed	-0.020(0.011)*	-0.017(0.011)	-0.019(0.011)*	-0.018(0.011)*	-0.019(0.011)*	-0.017(0.011)
Entrepreneur	0.026(0.012)**	0.020(0.012)	0.017(0.012)	0.018(0.012)	0.019(0.012)	0.023(0.012)*
Employed	-0.012(0.007)*	-0.005(0.007)	-0.007(0.007)	-0.005(0.007)	-0.006(0.007)	-0.008(0.007)
Retired	0.011(0.010)	0.010(0.010)	0.012(0.010)	0.012(0.010)	0.012(0.010)	0.011(0.010)
Homeowner	0.004(0.007)	0.004(0.007)	0.004(0.007)	0.003(0.007)	0.003(0.007)	0.003(0.007)
Newspapers	-0.011(0.006)*	-0.012(0.006)*	-0.012(0.006)*	-0.010(0.006)*	-0.011(0.006)*	-0.013(0.006)**
Micro-criminality	-0.023(0.014)	-0.023(0.014)	-0.022(0.014)	-0.022(0.014)	-0.022(0.015)	-0.023(0.015)
No parking problems	0.011(0.007)	0.011(0.007)*	0.011(0.007)*	0.012(0.007)*	0.012(0.007)*	0.010(0.007)
No traffic problems	-0.018(0.008)**	-0.019(0.008)**	-0.019(0.008)**	-0.018(0.008)**	-0.019(0.008)**	-0.019(0.008)**
No pollution	0.033(0.008)***	0.033(0.008)***	0.033(0.008)***	0.032(0.008)***	0.034(0.008)***	0.033(0.008)***
No dirtiness problems	-0.013(0.007)*	-0.013(0.007)*	-0.013(0.007)*	-0.014(0.007)*	-0.014(0.007)*	-0.013(0.007)*
Metropolis	0.018(0.011)	0.019(0.011)*	0.018(0.011)	0.018(0.011)	0.016(0.011)	0.017(0.011)
Neighbouring metropolis	0.029(0.013)**	0.030(0.013)**	0.030(0.013)**	0.029(0.013)**	0.029(0.013)**	0.030(0.013)**
>50,000	0.015(0.012)	0.016(0.012)	0.015(0.012)	0.016(0.012)	0.015(0.012)	0.016(0.012)
10,000-50,000	0.017(0.011)	0.018(0.011)	0.017(0.011)	0.018(0.011)	0.016(0.011)	0.016(0.011)
2,000-10,000	0.010(0.011)	0.011(0.011)	0.010(0.011)	0.011(0.011)	0.010(0.011)	0.011(0.011)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	35248	35246	35277	35387	35005	34969
Pseudo R-squared	0.0164	0.0173	0.0161	0.0159	0.0161	0.0176
Log-likelihood	-23098.05	-23076.86	-23123.37	-23201.22	-22940.28	-22878.71

Table 3

Table 4. Probit results: marginal effects of robustness analysis of recycling

Variable	I	II	III	IV	V	VI
Pro-Social behaviors	0.030(0.003)***	0.029(0.003)***	0.029(0.003)***	0.029(0.003)***	0.030(0.003)***	0.029(0.003)***
Union membership	0.054(0.010)***					0.048(0.010)***
Volunteering membership		0.093(0.009)***				0.080(0.009)***
Political membership			0.029(0.014)**			-0.008(0.015)
Church attendance				0.042(0.006)***		0.036(0.006)***
Environmental member.					0.128(0.019)***	0.087(0.022)***
Female	0.014(0.006)**	0.013(0.006)**	0.013(0.006)**	0.005(0.006)	0.013(0.006)**	0.009(0.006)
Married	-0.010(0.009)	-0.008(0.009)	-0.009(0.009)	-0.009(0.009)	-0.008(0.009)	-0.008(0.009)
Divorced	-0.052(0.017)***	-0.050(0.017)***	-0.052(0.017)***	-0.049(0.017)***	-0.053(0.017)***	-0.048(0.017)***
Widowed	-0.018(0.016)	-0.016(0.016)	-0.017(0.016)	-0.015(0.016)	-0.016(0.016)	-0.017(0.016)
Age31-40	-0.005(0.010)	-0.003(0.010)	-0.004(0.010)	-0.006(0.010)	-0.004(0.010)	-0.005(0.010)
Age41-50	0.000(0.011)	0.003(0.011)	0.002(0.011)	-0.001(0.011)	0.004(0.011)	0.003(0.011)
Age51-60	0.021(0.012)*	0.022(0.012)*	0.022(0.012)*	0.017(0.012)	0.025(0.012)**	0.018(0.012)
Age61-70	-0.011(0.014)	-0.008(0.014)	-0.011(0.014)	-0.019(0.014)	-0.008(0.014)	-0.014(0.014)
Age71-80	-0.087(0.018)***	-0.080(0.018)***	-0.087(0.018)***	-0.098(0.018)***	-0.083(0.018)***	-0.088(0.018)***
Household size	-0.007(0.003)**	-0.007(0.003)**	-0.007(0.003)**	-0.007(0.003)**	-0.007(0.003)**	-0.006(0.003)**
Low education	-0.037(0.007)***	-0.034(0.007)***	-0.038(0.007)***	-0.039(0.007)***	-0.037(0.007)***	-0.032(0.007)***
Bachelor's degree	0.031(0.011)***	0.030(0.011)***	0.032(0.011)***	0.031(0.011)***	0.031(0.011)***	0.029(0.011)***
Household income (ln)	0.098(0.011)***	0.095(0.011)***	0.098(0.011)***	0.097(0.011)***	0.097(0.011)***	0.093(0.011)***
Good health	0.009(0.007)	0.010(0.007)	0.009(0.007)	0.010(0.007)	0.010(0.007)	0.011(0.007)
Unemployed	-0.064(0.012)***	-0.063(0.012)***	-0.064(0.012)***	-0.059(0.012)***	-0.062(0.012)***	-0.058(0.012)***
Entrepreneur	-0.006(0.013)	-0.014(0.014)	-0.015(0.014)	-0.014(0.013)	-0.012(0.014)	-0.004(0.014)
Employed	-0.039(0.008)***	-0.039(0.008)***	-0.032(0.008)***	-0.028(0.008)***	-0.031(0.008)***	-0.032(0.008)***
Retired	0.036(0.010)***	0.035(0.010)***	0.036(0.010)***	0.037(0.010)***	0.036(0.010)***	0.035(0.010)***
Homeowner	0.001(0.007)	0.001(0.007)	0.000(0.007)	-0.001(0.007)	0.001(0.007)	0.000(0.007)
Newspapers	0.022(0.007)***	0.022(0.007)***	0.022(0.007)***	0.023(0.007)***	0.024(0.007)***	0.021(0.007)***
Micro-criminality	0.028(0.016)*	0.027(0.016)*	0.028(0.016)*	0.030(0.016)*	0.028(0.016)*	0.028(0.016)*
No parking problems	0.031(0.007)***	0.030(0.007)***	0.031(0.007)***	0.031(0.007)***	0.032(0.007)***	0.030(0.007)***
No traffic problems	-0.023(0.009)**	-0.024(0.009)***	-0.024(0.009)***	-0.024(0.009)***	-0.024(0.009)***	-0.024(0.009)***
No pollution	0.002(0.008)	0.002(0.008)	0.002(0.008)	0.000(0.008)	0.003(0.008)	0.002(0.008)
No dirtiness problems	0.020(0.008)**	0.020(0.007)**	0.019(0.008)**	0.019(0.008)**	0.018(0.008)**	0.018(0.008)**
Metropolis	-0.015(0.012)	-0.015(0.012)	-0.015(0.012)	-0.015(0.012)	-0.016(0.012)	-0.016(0.012)
Neighbouring metropolis	-0.030(0.014)**	-0.029(0.014)**	-0.029(0.014)**	-0.028(0.014)**	-0.031(0.014)**	-0.031(0.014)**
>50,000	-0.023(0.012)*	-0.022(0.012)*	-0.022(0.012)*	-0.021(0.012)*	-0.023(0.012)*	-0.022(0.012)*
10,000-50,000	-0.011(0.012)	-0.011(0.012)	-0.010(0.012)	-0.010(0.012)	-0.011(0.012)	-0.011(0.012)
2,000-10,000	-0.019(0.012)	-0.018(0.012)	-0.018(0.012)	-0.018(0.012)	-0.020(0.012)*	-0.019(0.012)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	35036	35033	35064	35173	34796	34760
Pseudo R-squared	0.1918	0.1934	0.1913	0.1925	0.1922	0.1954
Log-likelihood	-18909.23	-18869.92	-18937.14	-18969.35	-18772.16	-18680.58

Notes: see Table 2

Table 4

5.3 Policy Implications

The results suggest some considerations on the environmental policy. To safeguard the environmental quality, the policy makers have an available toolkit of environmental instruments as: taxes, subsidies, incentives to innovate, public programs to sustain the environmental research, environmental monitoring, awareness toward the environmental issues. Often it is difficult to choose the best way to combine each alternatives. Supporting previous empirical investigations (Owen and Videras 2006), our theoretical and empirical analysis points out that social factors are related with the individual environmental behaviors. Pro-socially agents are more likely to have waste concern and recycling behaviors in environmental context. So, social policy designed for increasing social equality may have positive connection with environmental quality. Our results reiforce the idea that social and environmental policy are two aspects of the same coin as is extensively discussed in Wallimann (2013). This means that the policy makers have to recognize the economic circumstances, the institutional designs, and the social contexts in which agents take their choices (Shogren and Taylor 2008), implementing instruments of environmental policy that contemplate potential interactions with actions of social policy.

6 Conclusions

To extend the previous literature on the environmental habits of individuals in protecting the environment quality, this paper identifies an original and plausible connection among the concept of pro-social behaviors, waste concern and recycling behavior. We do so to establish a credible link between the existence of non-monetary motivations and environmental protection, especially in cases such as recycling activity. From a theoretical point of view, there are three fundamental aspects strictly connected to each other: the pro-social behaviors of individuals, their environmental sensibility and the level of recycling activity. We summarize these aspects in three words: the behavior, the attitude and the action. Analytically we formalize our point of view utilizing an agent's utility function in which we introduce the variables additively. In that way we model a situation in which these aspects are not in contrast each other and that is con?rmed by the empirical analysis. In the empirical analysis, our conceptual and analytical framework is applied to a representative sample of Italian individuals who express attitudes and behaviors regarding two main environmental issues: waste prevention and disposal and recycling activities. We consider the year 1998 for an important and original situation, after the Ronchi legiglative Decree of the 1997 enter into force the population was not yet aware of the importance of waste prevention, disposal and recycling, thus individual awareness of and

behaviors related to environmental waste problems were mainly influenced by their own way of being. This unique social context give us the possibility to detect the individuals? behaviors without the environmental policies as we have observed in the following years until today. The empirical findings, robust to the inclusion of additional social factors, show that pro-social behaviors are related to an individual?s concern regarding waste prevention and disposal and to an individual?s recycling behavior. So there is a positive relationship among pro-social behaviors, waste concern and recycling behavior. In particular, in the Italian context environmental policy aimed to increase waste recycling will be successful if accompanied by social policies in order to reduce social and economic inequalities. As Italy has characteristics of developed and developing countries and it is a member of the European Union (EU), our results and related policy implications can (could) be extended to developed and developing countries.

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