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Pro-environmental Attitudes, Local Environmental Conditions and Recycling Behavior

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Pro-environmental attitudes, local environmental conditions and recycling behavior*

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Abstract

We investigate some motivations of recycling, using Italian survey data. We find that people declaring an interest in environmental issues or belonging to an environmental association are more likely to recycle. This suggests that the motivations for behaving pro-environmentally have an expressive and non-instrumental motivation. However, we also find that if people perceive to live in a deteriorated environment, they are less likely to recycle. We discuss possible explanations for this finding.

Keywords: Pro-Environmental Behavior, Intrinsic Motivation, Recycling, Environmental Degradation

JEL Codes: Q57, Q53, R11, D91

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1 Introduction and motivation

In recent years the interest in the environment and pro-environmental attitudes has been increasing dramatically[1]. Kollmuss and Agyeman (2002) define pro-environmental "a behavior that consciously seeks to minimize the negative impact of one's actions on the natural and built world". The quality of the environment is a public good, which may be more or less local depending on which of its many dimensions is considered. This quality depends on collective interventions to be necessarily coordinated through political and legal institutions. However, this coordination cannot be successful unless it is based on widespread good attitudes toward the environment among the general public. Understanding the motivations of pro-environmental behavior is therefore important in the formulation of policies (see e.g. Steg and Vlek, 2009). To give an example, pro-environmental behavior driven by moral or social determinants may be crowded out by measures designed around the reaction of self-interested individuals.

This paper studies one commonly observed form of environment-friendly behavior, i.e. recycling. Recycling is individually costly, because messy and time consuming, while the social gains from it, mainly reduced use of landfills and incinerators, are hardly noticeable, so investigating the psychological motivations of recyclers has attracted a sizable literature (Ackerman, 2013). We contribute to this literature by using a 2012 survey of Italian households. Waste disposal in Italy is managed at the municipal level in accordance with national legislation, but methods and results differs widely from area to area. Recycling is legally compulsory, but to comply with the rules remains to a large extent a choice at the household level, as non compliance is seldom sanctioned. Indeed, urban separate waste collection was only 38% in 2012, even if it increased to 58% in 2018[2].

Our research questions are then the following: first, we investigate the impact on domestic waste recycling of pro-environmental attitudes - declaring interest in environmental issues or belonging to an environmental association- and second, we investigate the impact on recycling of perceived bad local environmental conditions (polluted air, dirtiness on the streets or a degraded environment).

Since recycling choices may be affected by self-selection problems (Best and Kneip, 2011, p. 923) we use a probit model with sample selection in the spirit of Van de Ven and Van Praag (1981) in order to include in the regression only those who choose to recycle i.e. who have the possibility of recycling but who are not technically constrained to do so.

To give a preview of the answers data suggest to our research questions we find that being eco-conscious is associated with more recycling, while perceiving local environmental deterioration is associated with less recycling.

Our first finding that concern for the environment leads to more sorting of waste provides evidence in favor of a role for inner motivations in pro-environmental behavior. Examples of inner motivations proposed in literature go from a nature-centered system

[1] See Blankenberg and Alhusen (2018) for a review.

[2] These figures can be found at: https://www.catasto-rifiuti.isprambiente.it/index.php?pg=nazionein Following European directives, Italian legislation started in 1975 and has been subsequently progressively extended and modified. An important step has been the so called Ronchi's decree(D.Lgs. 5 february) 1997. Most recently the law of 4 October 2019, n. 117 has been approved to enact the 2015 E.C. Circular Economy Package adopted by Member states on May 22 2018.

of values to a sense of social responsibility, with a related affirmation of self-identity.

Our second finding uncovers the possibility of an "environmental poverty trap": the worse the conditions of the local environment in people's perception the less they respect recycling rules, with the potential result of further deterioration. We propose various, not mutually exclusive, explanations for this prisoner's dilemma situation. The first explanation is that people infer from the state of the environment what are the prevailing environmental social attitudes and norms and align with these norms. The literature distinguish between two possible channels of influence of social cues on norm compliance, the "informational" and the "focusing" channel. The first is active when the appropriate behavior is learned by observing others. The second is active when a norm is brought to the attention of an agent by the behavior of others. The "focusing" channel may have counter-intuitive effects. For instance, observing anti-environmental behavior might lead to pro-environmental behavior, if it draws attention to environmental problems. However, in the case we are studying the "informational" channel seems to prevail[3].

We also suggest that the probability of escaping from the dilemma may be lowered by "bounded rationality" effects such as "loss aversion" and "status quo bias" (Kahneman et al., 1991). In the presence of loss aversion, the welfare cost from losing something we value is greater than the welfare gain from getting it, while the status quo bias arises when the current state of affairs (status quo) is perceived as a reference point, any change from which causes disutility. If these effects are at work, people will do more to preserve a clean environment than to improve a degraded one. In what follows we will also show how other deviations from full rationality such as "framing effects" and "cognitive dissonance" may be used to interpret our second result.

Our analysis sheds light on antecedents of people's choices as regards the environment, and assesses the weight of non-economic factors in producing these choices. The aim is to offer a more realistic approach to the formulation of effective environmental policies. Well designed public action requires a good understanding of how people behave and make decisions. Insights into behavioral motivations other than self-interest can lead to a rethinking of standard advice on policy. To give an example, households might not be fully aware of the social benefits of recycling because these are not easily perceived. Informational campaigns on these benefits may then be effective in encouraging correct waste disposal, and unlike pecuniary incentives based policies or law enforcement do not risk crowding out intrinsically motivated behavior. Social marketing aimed at reinforcing the identity and self-image attributes of pro-environmental behavior may also be useful[4].

The rest of the paper is organized as follows: the next section offers a short overview of the background literature, the third section describes the data we use and the methodology of the analysis we follow, the fourth section explains the econometric model that we adopt, in the fourth section results are presented and discussed, while the fifth section concludes.

[3] See Cialdini et al. (1990) and Krupka and Weber (2009).

[4] An intrinsically motivated person is taken away the chance to display his or her own interest and involvement in an activity when someone else offers a reward, or commands, to undertake it (Bowles and Hwang, 2008).

2 Related Literature

The investigation of pro-environmental behavior has generated a rich interdisciplinary literature. Any agent who reduces the negative human impact on the biosphere creates a public good from which all other agents get benefits without bearing the cost. Agents pursuing only their self-interest as assumed by standard economic theory will then have an incentive to free-ride. The contribution of various approaches is necessary to understand why individuals act in ways which are costly to them while their benefits accrue to society as a whole, as is the case of pro-environmental behavior.

Influential psychological frameworks used for the analysis of pro-environmental behavior are the "Norm Activation Model"(Schwartz, 1977), the "Theory of Reasoned Action" (Fishbein and Ajzen, 1980), the "Theory of Planned Behavior", (Ajzen et al., 1991) and the "Values-Beliefs-Norms Theory (VBN)" (Stern et al., 1999). Further works (see e.g. Steg et al., 2014) integrate these frameworks.
According to the Norm Activation Model or Theory (NAM), a personal norm (i.e a subjective moral obligation) is activated when one is aware of the negative consequences of a certain behavior and takes responsibility for not behaving pro-socially. The Theory of Reasoned Action (TRA) suggests that a person's behavior is determined by the belief that the behavior will lead to an intended outcome (intention). This intention is, in turn, a function of attitudes toward the behavior itself and of subjective norms (Fishbein et al., 1975). The Theory of Planned Behavior was proposed by Ajzen et al. (1991) to improve on the predictive power of the TRA by including perceived behavioral control. The Value-Belief-Norm Theory is a generalization of NAM to adapt it to environmentalism: the values behind norms need not be simply altruistic, as they are in NAM, while the awareness of adverse consequences of a certain behavior and the related ascription of responsibility may concern any valued objects, not necessarily other people.

These frameworks underline the importance of personal and social norms and moral and cultural values as determinants of behavior, while allowing for a disparity between the ethical rules people believe in and the lifestyle decisions they make in practice.

Important insights on behavior towards the environment come from the work of behavioral economists who aim to integrate into economic analysis psychological insights from the laboratory or from natural and field experiments, as opposed to the normative approach of a pure self-interested fully rational agent, postulated in standard economic models[5]. They find that individuals deviate from the "homo oeconomicus" paradigm in two main directions. First, people are not fully but rather "boundedly" rational. Experiments show the relevance of habits, reference points and framing effects, just to mention some departures from the expected utility framework that may be particularly relevant for informing policies. A second direction of research in behavioral economics explores other-regarding preferences. There is ample evidence of choices not motivated exclusively by self-interest but better explained by sociability, altruism, reciprocity, identity seeking etc.[6] Strategies chosen in experimental games, such as the dictator,

[5]For overviews on behavioral economics and environmental policies, see e.g. Venkatachalam (2008), Gsottbauer and Van den Bergh (2011) and Pasche (2016).

[6]For the relation between sociability and subjective well being see Becchetti et al. (2012), as well as the overview in Pelloni (2016). Recent works are Marujo and Neto (2017), Capecchi et al. (2018), Schmiedeberg and Schröder (2017), Pagan (2016), Rasciute et al. (2017) and Lardies-Bosque et al.

ultimatum and public good games, are difficult to reconcile with preferences driven exclusively by self-interest. Evidence for the importance of other-regarding preferences is provided by Kahneman and Knetsch (1992) who maintain that contributing to a public good is a "purchase of moral satisfaction".

There is some evidence that individuals subscribing to values beyond their immediate own interests, that is prosocial or biospheric values, are more likely to engage in environmentally significant behavior, see e.g. (see e.g. De Groot and Steg, 2008). Individual motivations have been suggested to go from pure altruism to warm-glow altruism to ecocentrism (see e.g. De Young, 1996; Barr and Gilg, 2007; Thøgersen, 2008; Farrow et al., 2017)

So, people may behave pro-environmentally because they care about the well-being of others as in Becker (1974). Andreoni (1990) defines warm-glow as the affect generated by a good action, such as giving to others, while for Brekke et al. (2003) socially responsible behavior creates a positive self-image. Similarly, Halvorsen (2008) relates warm-glow to the respect for social and moral norms. However, pro-social behavior may depend on the behavior of others within a given group through reciprocity, social norms and reputational concerns (Rabin, 1993; Fehr and Gächter, 2000; Bénabou and Tirole, 2006). The theory of normative conduct (Cialdini et al., 1990) distinguishes two kinds of social norms. Descriptive norms are those supposed to be generally respected (what people do) while injunctive norms are those generally approved (what people approve).

The literature on the antecedents of pro-environmental behavior often distinguishes between extrinsic and intrinsic motivations (Deci, 1971). Intrinsically motivated behaviors are self-rewarding, while extrinsically motivated behaviors are enacted to pursue an external reward. Pure altruism or the 'warm glow' effect can be classified as intrinsic motivations, while any behavior caused by external benefits, whether monetary or social is driven by extrinsic motivations. It is not always easy to say whether behaving according to reciprocity, social norms and reputational concerns is intrinsically motivated or not. People may respect a social norm either because it is in their private interest to do so (e.g. to show others they are good citizens) or because this reinforces their sense of identity, or both. It is worth stressing that social norms may stabilize an already established social equilibrium with good properties but are not enough for social change. Social change requires an innovation in personal norms, which may start among pioneers and then spread across communities through contagion effects.

Indeed, the literature on social learning proposes that new behaviors can be acquired by observing and imitating others. Social interactions may then lead to sustainable behavior by restructuring individual identities and institutions towards more ecological robustness (Reed et al., 2010).

Specifically related to our work are previous studies on the individual motives for recycling. Studies using Norwegian survey data are Brekke et al. (2003), Halvorsen (2008) and Koford et al. (2012). Halvorsen (2008) finds that believing that recycling contributes to a better environment, considering oneself a responsible person, wanting others to do the same as well as following the golden rule are all associated with

(2015). Indeed, for the favourable environmental consequences of substituting "relational goods", i.e non-instrumental social relationship to market goods, as well as for the effects of city planning on the choice see Pullinger (2014) and Shao and Rodríguez-Labajos (2016).

more recycling. Thøgersen (1994) finds evidence of re-framing and crowding-out of moral norms when economic incentives are introduced in the form of differentiated garbage. Berglund (2006) looking at a municipality in northern Sweden finds a higher willingness to pay to avoid recycling in people with lower "Green Moral Index". Finally, Brekke et al. (2003) show that warm glow and self-image motivations have different implications for the production of public goods[7].

Koford et al. (2012) reports on the results of giving households in Lexington, Kentucky, monetary rewards or communication appeals (informative, guilt, and feel good inducing appeals) to recycle. The $1 monetary incentive had the greatest impact on household recycling, while the monetary incentives interacted negatively with communication appeals. The communication appeals by themselves had little impact overall.

D'Amato et al. (2016), using English data, show that giving a positive answer to questions about knowledge and interest in climate change and the environment is associated with more waste reduction and recycling. Ferrara and Missios (2005), using a data set from Canada, show that socially-minded people recycle more. Viscusi et al. (2011) empirically investigate the role of personal and social norms in affecting recycling of plastic water bottles in the US, finding only personal norm are effective. [8] Finally, Abbott et al. (2013) find that social norms (proxied by the mean recycling volume of a reference group of local authorities) are positively associated with individual recycling, but find no evidence of warm-glow motivations, which should not lead to a proportional decrease in time spent recycling when kerbside quality goes up. Cecere et al. (2014) use data for EU27 and do not find that the intrinsically motivated recycle more. They consider more intrinsically motivated those respondents that do not to prefer to pay taxes to cover waste management based on the quantity generated.

Motivations to recycle may reflect national culture and institutions so that investigations conducted for different countries can add value. The empirical literature on the issue in Italy, to which we contribute, consists of just a few articles. Cecere et al. (2014) write: "research should consider more explicit ways to closely measure intrinsic and extrinsic motivations, through focused survey with questions aimed at measuring, for instance, the individuals involvement in environmental issues (intrinsic motivations)." Luckily, our survey offers a reliable measure of intrinsic motivation as respondents are asked about their interest in environmental issues and about their participation in ecological associations.

Among the works using Italian data, Fiorillo (2013) and Aprile and Fiorillo (2019) are based upon sources dating back to the beginning of the 2000s. In Fiorillo (2013) the main emphasis is on social capital and on individual income as drivers of recycling, while Aprile and Fiorillo (2019) focus on the role of specific environmental concerns, from climate change to pollution, classified as egoistic, altruistic and biospheric in motivating recycling[9]. A third contribution is Gilli et al. (2018). They build a proxy

[7]In particular self-image motivations may explain why people believe an increase in the efficiency of the recycling system will lead to an increase in their effort in recycling, perceived as costly.

[8]In particular, respondents who would be upset if neighbors put recyclables in the garbage or consider self environmentalists recycle more while respondents who think neighbors would be upset if someone put recyclables in garbage do not recycle more.

[9]In a related study, Aprile and Fiorillo (2017) study how environmental concerns affect water conservation behavior. They find that different kinds of concerns might have contrasting effects. Specifically, pollution and resource exhaustion concerns are positively related to water conservation

for intrinsic motivations from answers to questions that go from being informed about environmental problems to buying goods with lower packaging or made with recycling materials. This proxy turns out not to be correlated with recycling. Finally, Crociata et al., 2015 and Agovino et al., 2017 , using different questions from the same database we use, discover a positive relationship between cultural consumption (e.g. buying newspapers and going to cinemas) and recycling behavior as well as the purchase of organic food.

As said above we also study the impact of perceived bad local environmental conditions on recycling practices and in particular detect the possibility of vicious (or virtuous) environmental circles. A vicious circle develops if people tend to recycle less if they perceive environmental degradation. Related papers are Crociata et al. (2016), Agovino et al. (2016), which find evidence of strong spatial dependence between provinces in terms of separate waste collection rates. So neighborhood effects may cause not only individual but also institutional "behavioral contagion". Antoci (2009) and Antoci and Borghesi (2012) develop theoretical models in which people may consume more to self-protect from environmental degradation, provoking further degradation and trapping society in a non-Pareto-optimal equilibrium. We might think of air conditioning in reaction to global warming, or to urban sprawl and increased fuel emissions to avoid urban pollution.

3 Empirical Strategy

3.1 Data

The data used in this study come from the Multipurpose Household Survey (MHS) collected by ISTAT (Italian National Statistics Office). The MHS is conducted every year and leads to a cross-sectional data set since every year different households are surveyed. This data set is very widely used by researchers in order to study pro-environmental behavior in Italy (see e.g. Crociata et al., 2015; Agovino et al., 2017; Aprile and Fiorillo, 2017). The MHS surveys approximately 20 thousand families from all Italian regions and it is composed of different questionnaires. The head of the household answers all the questions about the family's habits, while other questionnaires on personal behaviors or beliefs are filled in also by the other components of the family (each member of the family has his/her form). The data set is composed of about 40 thousand individuals. As we used recycling habits as our dependent variable and the related question was posed only to the heads of families, our final data set consists of 19266 observations. We used the 2012 wave which includes several questions on environmental concern, participation in environmental groups and recycling habits.

Our dependent variable is the recycling habits of the household. In the survey, individuals are asked: *"Does your family have the habit of collecting the following wastes separately and then throwing them into their containers?"* Where wastes refer to paper, glass, plastic bottles, drugs, batteries, cans, food, others. People can answer: *"Yes, always; Yes, sometimes; Never"*. In Italy, the types of wastes to be disposed of separately can differ across municipalities. We decided to measure recycling habits by

behavior while alteration of environmental heritage concerns exhibits a negative relationship with water saving behavior.

using only the most commonly recycled type of wastes which are paper, food, plastic bottles and glass (ISPRA, 2014). Hence, our dependent variable is a dummy, taking value one if the household declares to recycle paper, food, plastic bottles and glass answering *"Yes, always"* and zero otherwise[10].

We now turn to the description of the independent variables used for this study. A full list can be found in table 2. Our first two variables of interest capture a general concern for the environment. In the survey, individuals are asked to state "*how much they are interested about environmental issues on a scale from 1 - very interested- to 4 -not interested at all*". From this question we created a variable equal to one if the respondent declares to be very interested or enough interested and zero otherwise -in table 5 we show that the results are not sensitive to re-coding of the variable. Thanks to this question we are able to capture intrinsic motivation in a direct way as advocated by (Cecere et al., 2014, p. 923). People are also as asked about participation in ecological associations so we created a dummy variable which takes value equal to one if the respondent participates in ecological associations and zero otherwise. We notice that while this participation, while likely to be linked to environmental concerns, may also have further motivations, for example, the desire to build social capital.

Second, we consider those variables which allow us to study how people behave when they perceive to live in bad environmental conditions. In the survey, people are asked if the area in which they live presents *"air pollution"* or *"dirtiness on the streets"*. People may answer *"a lot; enough; a little; none; I don't know"*. The variables of interests are two dummies. The first dummy takes value one if the respondent declares that she lives in an area in which there is "*a lot*" or "*enough*" air pollution and zero otherwise; the second dummy takes value equal to one if the respondent declares to live in an area in which there is *"a lot"* or *"enough"* dirtiness on the streets and zero otherwise. In addition to these two measures, we use also an additional dichotomous variable for landscape degradation. In the survey, people are asked: "*According to you, is the landscape of the place where you live suffering from obvious degradation (dilapidated buildings, degraded environment, deteriorated landscape)?*" and people may answer either yes or no. Our dichotomous variable will take value one if the response is "*yes* " and zero otherwise.

As additional variables we included three dummies to control for age -the benchmark being the youngest group 18-30-, three dummies to control for education -the benchmark being compulsory education- and a dummy variable to control for gender. We also included regional dummies in order to control for regional fixed effects given the heterogeneity of local rules governing waste management. in Italy.

[Table 1 and 2 here]

3.2 Econometric Model

As pointed out by several studies, when studying recycling habits a self-selection bias might be present (Best and Kneip, 2011, p. 923). For this reason, we will use a model similar to the Tobit Type II (Wooldridge, 2010). The Tobit type II or Heckman Sample

[10]The descriptive statistics in table 2 show that 62 per cent of the sample usually recycle paper, food, plastic bottles and glass, confirming that these are the more commonly recycled types of wastes.

Selection Model allows the researcher to control for self-selection bias. In fact, by using a simple probit model, the coefficients of our estimates would be biased as it is possible to see from the results of table 3.

In the case of recycling waste, we could face two types of self-selection bias. The first one arises when people do not recycle not because they do not want to do so, but because it is especially hard for them to do so. For example, some people could find it difficult to reach the waste containers because they live in areas where the administration does not work properly or because of personal impediments, such as illness etc. The second type of self-selection relates to people living in areas with kerbside collection. In those areas, waste containers may have been removed from the streets. In this case, the only way in which people can dispose of waste is by recycling since they cannot decide to throw all types of waste in a generic container. For the purposes of our study, we are interested in observing people who face the option to recycle or not. Thus, we have to exclude from our sample the self-selected individuals who either cannot recycle or who are technically obliged to do so.

In order to overcome these two problems of self-selection, we use a two-stage model. While the rationale of this method is derived by Heckman (1979), the computation is derived by Van de Ven and Van Praag (1981). Actually, we perform a binomial probit with sample selection (Baum, 2006).

In the first stage, the dependent variable allows us to perform the sample selection. The dependent variable of the first stage is a dummy variable which takes value equal to one if the respondent declares that her family has no difficulties in reaching the containers and zero otherwise. In this case, our dependent variable is very useful to overcome the double self-selection bias that we face. Assuming that the availability of containers is a good proxy for the quality of waste management services provided by the municipalities and since recycling was introduced in Italy by the Ronchi decree in 1997, we expect people who have no problems in reaching the containers to have no difficulties in sorting out paper, glass, plastic bottles and food. Furthermore, thanks to the sample selection, we run our probit estimation on people who declare to have no difficulties in reaching the containers; thus, even if provided with the kerbside, we expect our individuals to have the outside option of throwing waste in a generic container if they do not want to recycle.

The independent variables of the selection equation are: a dummy variable on the respondent's health which takes a value equal to one if the respondent declares that she feels sick and zero otherwise[11]; a dummy variable taking a value equal to one if the respondent says that she lives in an apartment building; a set of dummy variables to measure the size of the family.

The equations of our model are:

$$P(Y_1 = 1|X_1) = \alpha + \gamma_1 X_1 + \varepsilon_1 \tag{1}$$

$$P(Y_2 = 1|X_2) = \alpha + \beta_1 Concern + \beta_2 X_2 + \varepsilon_2 \tag{2}$$

[11] Unfortunately, there are no more objective measures in our data set.

$$P(Y_2 = 1|X_2) = \alpha + \beta_1 Degradation + \beta_2 X_2 + \varepsilon_2 \quad (3)$$

The assumption of the model are:

$$\begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \end{pmatrix} \sim N \left\{ \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right\}$$

The equations are estimated following a two-stage procedure where equation (1) is the selection equation and equations (2) and (3) are the equations of interest. Y_1 is the dummy for encountering no difficulties in reaching the containers described above and Y_2 is the dummy for recycling. X_1 is the set of control variables of the selection equation while X_2 is the set of control variables of the main equation[12]. Actually, we are estimating equation (2) and (3) only for individuals who can easily reach the containers, since in equation (1) we calculate the probability for an individual to reach the containers easily. Hence, equation (1) performs a sample selection, selecting only the individuals who can reach the containers. Since these kinds of models often suffer from multicollinearity (Cameron and Trivedi, 2009) we performed a variance inflation factor (VIF) analysis among the regressors. In our case, the VIF is always less than 10 and the conditional index is lower than 30.

4 Results

4.1 First Stage Results

We present in this section the results as regards the selection equation. The results obtained in the first stage are almost identical for all the regressions we ran. The marginal effects of the selection equation are reported in the first column of table 3.

[Table 3 here]

The results of the selection equation show that living in a family with three members is going to increase the probability of reaching the containers easily by 2.6 percentage points, while living in a family with more than five members turns out not to be significant. These results are in line with previous studies (Fiorillo, 2013). In the literature it has also been shown that larger families tend to produce a smaller amount of waste per capita (Thanh et al., 2010): by a similar token, there could be economies of scale in sorting waste. Living in an apartment building increases the probability of reaching the containers easily by 5 percentage points. We included this variable since in the literature it has been shown that housing conditions might affect the collection of waste (Kirakozian, 2016). Finally, as also shown by Crociata et al. (2015), having health problems means reaching the waste containers is more difficult. In our case, if one declares that she is not satisfied with her health conditions, the probability of reaching the containers easily decreases by 7.7 percentage points.

[12]Please note that -differently from a standard Heckman Sample Selection model- our main equation does not include the Inverse Mills Ratio since we are using the model first presented by Van de Ven and Van Praag (1981), that is a binomial probit with sample selection. The way in which we compute our regressions is very similar to a bivariate probit with partial observability (Baum, 2006).

4.2 Second Stage Results

4.2.1 Pro-environmental attitudes and recycling

The descriptive statistics in table 2 show that only 9.8 per cent of individuals consider themselves very interested in environmental issues, and 38 percent enough interested. Members of environmental associations are only 1 percent of the sample. The results displayed in the second column of table 3 show that to have a concern towards the environment positively affects the probability to recycle also when we control for several factors such as age, education, gender and region of residence. To be interested in environmental issues (belonging to an environmental association) increases the probability of recycling by about 4.7 (7.9) percentage points, with a high level of statistical significance. i.e a p value lower than 0.01 (0.05).

The socio-demographic controls we used in our model have effects which are in line with those found in previous studies (Crociata et al., 2015; Fiorillo, 2013). In particular, age and education have a positive impact on recycling habits. As pointed out by an OECD study (Ayalon et al., 2013), old people are usually more likely to recycle and they are usually also more respectful of social norms. Our results show that being aged between 30-65 increases the probability of recycling by 1.5 percentage points, while being over 65 increases the probability of recycling by 3.1 percentage points. Education is usually positively correlated with recycling (Jenkins et al., 2003; Ferrara and Missios, 2005). Again our results are consistent with the literature. In our case, having a high-school diploma does not increase the probability of recycling, while having a university degree or a PhD increases the possibility of recycling by 2.4 percentage points. The coefficient for the gender variable is negative and slightly significant. Notice that most of the respondents are men since most Italian families were headed by men in 2012. The fact that families headed by women tend in our data to recycle less may not reveal a genuine gender difference in attitudes towards the environment, but rather reflect the more difficult psychological and/or material conditions that at least a part of these families is likely to be experiencing. It is worth recalling that in the literature we have contrasting evidence about the impact of gender on environmental behavior (Kirakozian, 2016, p. 7).

Finally, it is worth noticing that without correcting for the self-selection bias all these estimates would suffer from a certain degree of overestimation as we can see from the results relative to the probit equation in the third column of table 3 and that the re-coding of our dependent variable does not influence our results as we can see from table 5. Moreover, the coefficient $\hat{\rho}$ shows a high correlation between the selection equation and the main equation. This result tells us that much of the unobservable effects in the selection equation impacts the equation of interest for recycling.

4.2.2 Local environmental conditions and recycling

As stated previously, to gauge the effects if local environmental conditions on recycling we use three different dummies. The first is built from the "*perceived air quality*" question, the second from the "*perceived dirtiness on the streets*" one and the third from the "*perceived degradation*" question. The descriptive statistics in table 2 show that 31 per cent of individuals perceive air pollution, 26 per cent perceive dirtiness on

the streets and 17 per cent of individuals declare to live in a degraded environment. Almost 50 per cent of individuals declare to perceive at least one of these problems in the local environment.

[Table 4 here]

The results of the regression are shown in table 4. We see that perceived environmental degradation has a negative impact on pro-environmental behavior. According to our data, perceiving dirtiness in the streets decreases the probability of recycling by 3.5 percentage points, while living in a degraded environment decreases the probability of recycling by 4.2 percentage points. Finally, perceiving polluted air decreases the probability of recycling by 1.7 percentage points[13].

4.3 Discussion

Our first finding that to be environmentally conscious leads to more recycling corroborates the existing evidence in favor of the hypothesis that pro-environmental behavior has an expressive and non-instrumental component, i.e. it is something one does following an intrinsic motivation (Brekke et al., 2003) rather than as a means to an individual end.

Various, connected interpretations are possible for our second finding that people perceiving bad local environmental conditions tend to recycle less. According to the psychological frameworks seen before (NAM/TRA/TPB/ VBN) a certain behavior is determined by the value the individual places on the behavior, the belief that the behavior will lead to valued outcomes and the views of significant others (social influence).

Perceiving a deteriorated environment may lead to less perceived behavioural control: recycling can be hindered by constraints such as a belief that one's behavior will not have any impact.

Another related insight is that people learn from each other and are influenced by peer effects and existing social norms (see e.g. Abbott et al., 2013). Peer effects are externalities arising when the actions of a reference group affect individual behavior. We might suppose that those who live in a deteriorated environment face lower social pressure to behave pro-environmentally, and, in particular, that they have a lower incentive to recycle. Pro-social behavior is in fact often conditional on other people's cooperative behavior (Fischbacher et al., 2001). Conditional cooperation is related to reciprocity: people cooperate if others do the same. Frey and Torgler (2007) show that people are willing to pay taxes if they perceive that the others pay taxes as well. A bad state of the local environment may become a signal that few people are taking care of the environment. Consequently, people are less willing to act pro-environmentally themselves[14]. A common finding in the literature on littering is that

[13]For comparisons please note that to be engaged in environmental organizations increases the probability of recycling by 10 percentage points while having a degree or a PhD increases the probability of recycling by 4 percentage points.

[14]This effect could be present among local authorities, as shown by works on proximity effects among municipalities, pointing out that municipalities with higher rates of pro-environmental choices influence nearby municipalities (Agovino et al., 2016).

the act is significantly more likely in a littered setting than in a clean setting. We suggest that something analogous happens for recycling (see Cialdini et al. 1990)[15].

Krupka and Weber (2009) provide experimental evidence that thinking about what others will do has a positive effect on pro-social behavior even when they observe or think most others behave in a selfish way. This may happen when observations of others' behavior serve as a means to activate specific norms in the observer's mind-the "focusing effect" mentioned earlier. Our data do not support the presence of such an effect.

Another possible explanation for our second finding looks at the decision heuristics used in behavioral economics to explain a wide range of "anomalies", i.e deviations from full rationality. According to the "status quo effect", people tend to think in terms of gains and losses rather than in terms of their net assets, and therefore encode choices in terms of changes from a reference point. In the case at hand, the current condition of the environment could be the reference point. Loss aversion may be another useful concept to explain the asymmetric impact that the conditions of the local environment have on recycling. Prospect theory shows that a loss is more significant than the equivalent gain. This suggests that people will accept to bear the costs of recycling if by doing so they feel they are preserving a clean environment, i.e. avoiding a loss in its quality. However, the same costs will be deemed too high if aimed at improving the condition of a deteriorated environment.

A comment is in order. We use measures of perceived dirtiness, landscape degradation and pollution. These capture the subjective rather than the objective state of things: we know that people perceive dirtiness, but we do not know what the real level of dirtiness is. Nevertheless, perceptions can obviously be crucial in determining behavior, even when they are not correct. For instance, it is known from experiments that choices may be influenced by so-called "framing effects". Tversky and Kahneman (1981) describe how even phrasing affected participants' responses to a hypothetical life and death situation. Participants were asked to choose between two treatments for 600 people affected by a deadly disease. Treatment A was predicted to result in 400 deaths, whereas treatment B had a 33 percent chance that no one would die but a 66 percent chance that everyone would die. This choice was then presented to participants either with positive framing, i.e. saying how many people would live, or with negative framing, i.e. how many people would die. Treatment A was chosen by 72 percent of participants when it was presented with positive framing ("saves 200 lives") dropping to 22 percent when the same choice was presented with negative framing ("400 people will die"). In analogous fashion, people who look at the state of the environment with a negative framing could be less inclined to recycle, while those who look at the state of the environment with a positive framing may be more inclined to recycle.

Finally, it is possible that the causation arrow does not go from perceiving bad local environmental conditions to less recycling but in the opposite direction. It is painful to believe one thing while acting against this belief, as stressed by Festinger (1962) in

[15]Psychologists distinguish between two possible channels of influence of social cues on norm compliance. The first is a focusing influence, whereby norms only impact behavior when an individual's attention is drawn to them; and the second is an informational influence, whereby a norm exerts a stronger impact when an individual observes more others behaving consistently with that norm. We find support for both effects. However, in the case we are studying the "informational" channel seems to prevail.

his "A theory of cognitive dissonance". People will then tend to align perceptions with behavior. It is possible that some people not willing to pay the cost of recycling use their perception of environmental deterioration as a justification belief.

Summing up, we find that people do not react pro-actively to perceived environmental degradation even though environmental degradation is found empirically to have a negative and persistent impact on their subjective well being (Menz, 2011; Ferrer-i Carbonell and Gowdy, 2007).

5 Conclusion

This paper contributes to the analysis of the determinants of pro-environmental behavior by investigating people's recycling habits in Italy.

First, we show that a higher general interest in environmental issues do push people to recycle more thus offering evidence in favor of the role of intrinsic motivations in governing pro-environmental behavior. However, we also show that people who state that the area where they live suffers from dirtiness in the streets, air pollution and/ or a generally degraded environment tend to recycle less. A possible explanation is that the perception of environmental degradation hurts conditional cooperation among individuals. A depleted environment signals non-cooperation in producing the public good environment' by fellow citizens and institutions.

We have also argued how concepts from behavioral economics such as status quo bias, loss aversion and framing effects may be useful in explaining the impact on recycling of perception of local environmental problems . Finally we have considered the possibility that this perception is influenced by a self-serving bias by non recyclers.

Standard economic theory sees pro-environmental behavior in the context of social dilemmas. Selfish individuals will free ride in the production of a public good in the absence of monetary incentives or legal sanctions. However, implementing these policies is costly and could even entail the dissipation of intrinsic motivations for pro-environmental behavior by other non-selfish individuals.

Information about the determinants of voluntary contributions to the production of environmental goods may then assist in the design of public environmental strategies. Overall, our results on the link between environmental concern and recycling indicate that public awareness campaigns and the diffusion of information on the benefits of environment-friendly behavior may represent a useful complement to price-based and law-based policy devices. On the other hand, if as we argue peer effects and social imitation are important antecedents of recycling, communication instruments and moral suasion may be useful in creating social norms that allow people to coordinate at good equilibria.

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Table 1: Variable description

Variable	Description
Socio-demographics	
Age (18-29)	Dummy =1 if respondent is aged between 18 and 29; 0 otherwise
Age (30-65)	Dummy =1 if respondent is aged between 30 and 64; 0 otherwise
Age ($\geq$ 65)	Dummy =1 if respondent is 65 or older; 0 otherwise
Compulsory Education	Dummy =1 if respondent has elementary education; 0 otherwise
Secondary Education	Dummy =1 if respondent has high-school education; 0 otherwise
Tertiary Education	Dummy =1 if respondent has graduate education; 0 otherwise
Female	Dummy =1 if respondent is female; 0 otherwise
Apartment	Dummy =1 if respondent lives in an apartment building; 0 otherwise
Containers	Dummy =1 if respondent has no difficulties in reaching the containers; 0 otherwise
Recycling	Dummy =1 if respondent recycle always paper, bottles, food and glass; 0 otherwise
Feel sick	Dummy =1 if respondent is not satisfied about her health status; 0 otherwise
Interest in environmental issues	
Member of Env. Ass.	Dummy =1 if respondent is part of an environmental association; 0 otherwise
Interest for the Environment	Categorical, ranging from 1 (very interested) to 4 (not interested at all)
Interest for the Environment	Dummy =1 if respondent is very or enough interested in environmental issues; 0 otherwise
Environmental Degradation	
Polluted Air	Dummy =1 if respondent perceives to live in a polluted area; 0 otherwise
Degrade	Dummy =1 if respondent perceives local environmental degradation; 0 otherwise
Dirtiness	Dummy =1 if respondent perceives to live in a dirty area; 0 otherwise

Table 2: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Socio-demographics					
Age (18-30)	0.351	0.477	0	1	19266
Age (30-65)	0.188	0.390	0	1	19266
Age ($\geq$ 65)	0.462	0.499	0	1	19266
Compulsory Education	0.574	0.494	0	1	19266
Secondary Education	0.307	0.461	0	1	19266
Tertiary Education	0.119	0.324	0	1	19266
Female	0.328	0.469	0	1	19266
North Italy	0.439	0.496	0	1	19266
Central Italy	0.184	0.388	0	1	19266
South Italy	0.377	0.485	0	1	19266
Apartment	0.654	0.476	0	1	19266
Containers	0.756	0.430	0	1	19266
Recycling (Paper, bottles, food and glass)	0.626	0.484	0	1	19266
Feel sick	0.054	0.226	0	1	19266
Interest in environmental issues					
Member of Env. Ass.	0.010	0.100	0	1	19266
Interest for the Environment (categorical)	2.57	0.858	1	4	18960
Interest for the Environment (dummy)	0.479	0.5	0	1	18960
Very interested	0.098	0.297	0	1	18960
Enough interested	0.381	0.486	0	1	18960
Not much interested	0.374	0.484	0	1	18960
Not interested at all	0.147	0.354	0	1	18960
Local Environmental Conditions					
Polluted Air	0.310	0.463	0	1	19266
Degradation	0.172	0.377	0	1	19266
Dirtiness	0.260	0.439	0	1	19266
Polluted Air or Degradation or Dirtiness	0.494	0.5	0	1	19266

Notes: The table shows the mean, standard deviation, minimum and maximum value of the variables used in the study. N is the number of observations.

Table 3: Environmental Interest

Dep. Var: *Difficulties in reaching containers*	(1) First Stage Heckprobit		
Household size=2	0.020^{**}		
(Base Category=1)	(2.55)		
Household size=3	0.026^{***}		
	(3.10)		
Household size=4	0.017^{*}		
	(1.88)		
Household size=5	-0.028^{*}		
	(-1.87)		
Household size=6	-0.003		
	(-0.11)		
Apartment	0.050^{***}		
	(8.31)		
Feel sick	-0.077^{***}		
	(-6.44)		
Dep. Var: *Recycling*		(2) Second Stage Heckprobit	(3) Probit (Model without Correction)
Interest for the environment (dummy)		0.047^{***}	0.065^{***}
		(8.04)	(9.82)
Member of Env. Ass		0.079^{**}	0.082^{**}
		(2.39)	(2.31)
Female		-0.010^{*}	-0.020^{***}
		(-1.67)	(-2.99)
Age (30-65)		0.015^{*}	0.024^{***}
(Base category= 18-30)		(1.83)	(2.64)
Age (≥ 65)		0.031^{***}	0.038^{***}
		(4.64)	(4.93)
Secondary Education		0.009	0.026^{***}
(Base category= compulsory education)		(1.32)	(3.38)
Tertiary Education		0.024^{**}	0.033^{***}
		(2.55)	(3.08)
Regional Fixed Effects	*Yes*	*Yes*	*Yes*
$\hat{\rho}$		-1.660^{***}	
		(-6.01)	
Wald test (p-value)		0.000	
Uncensored Observations		14,341	18,960

Notes: The table reports the average marginal effects. Column one shows the first stage of a probit with sample selection. The second stage reports the second stage of a probit with sample selection. In the third column results from a probit model without correction are shown for comparisons. The Wald test rejects the null hypothesis of non-correlation between the errors of the selection equation and the errors of the main equation. Standard errors are corrected for heteroskedasticity.
t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Local Environmental Condition

	(1)	(2)	(3)
	Recycling	*Recycling*	*Recycling*
Dirtiness	-0.035^{***}		
	(-5.64)		
Degrade		-0.042^{***}	
		(-5.76)	
Polluted Air			-0.017^{***}
			(-2.93)
Member of Env. Ass.	0.100^{***}	0.100^{***}	0.100^{***}
	(2.99)	(3.13)	(3.00)
Female	-0.012^{**}	-0.013^{**}	-0.012^{**}
	(-2.03)	(-2.25)	(-2.08)
Age (30-65)	0.018^{**}	0.018^{**}	0.018^{**}
(Base category= 18-30)	(2.28)	(2.28)	(2.28)
Age (≥ 65)	0.032^{***}	0.031^{***}	0.032^{***}
	(4.81)	(4.59)	(4.74)
Secondary Education	0.018^{***}	0.018^{***}	0.019^{***}
(Base category= compulsory education)	(2.84)	(2.88)	(2.86)
Tertiary Education	0.040^{***}	0.041^{***}	0.042^{***}
	(4.64)	(4.70)	(4.76)
Regional Fixed Effects	Yes	Yes	Yes
$\hat{\rho}$	-1.636^{***}	-1.525^{***}	-1.568^{***}
	(-4.99)	(-5.61)	(-5.71)
Wald test (p-value)	0.000	0.000	0.000
Uncensored Observations	14,560	14,560	14,560

Notes: The table reports the average marginal effects of the second stage of a probit model with sample selection. The results of the first stage are available upon request. The dependent variable takes value equal to 1 if the individuals declare to recycle and zero otherwise. The variables used to measure perceived degradation take value equal to 1 if the individual perceives dirtiness, degradation or polluted air and zero otherwise. The Wald test rejects the null hypothesis of non-correlation between the errors of the selection equation and the errors of the main equation. Standard errors are corrected for heteroskedasticity. t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Environmental Interest

Dep. Var: *Difficulties in reaching containers*	(1) First Stage Heckprobit		
Household size=2	0.020^{**}		
(Base Category=1)	(2.55)		
Household size=3	0.026^{***}		
	(3.10)		
Household size=4	0.017^{*}		
	(1.88)		
Household size=5	-0.028^{*}		
	(-1.87)		
Household size=6	-0.003		
	(-0.11)		
Apartment	0.050^{***}		
	(8.31)		
Feel sick	-0.077^{***}		
	(-6.44)		
Dep. Var: *Recycling*		(2) Second Stage Heckprobit	(3) Probit (Model without Correction)
Interest for the environment (categorical)		-0.031^{***}	-0.044^{***}
		(-8.89)	(-11.07)
Member of Env. Ass		0.068^{**}	0.068^{*}
		(2.07)	(1.90)
Female		-0.010	-0.019^{***}
		(-1.54)	(-2.73)
Age (30-65)		0.015^{*}	0.024^{***}
(Base category= 18-30)		(1.87)	(2.65)
Age (≥ 65)		0.033^{***}	0.039^{***}
		(4.84)	(5.17)
Secondary Education		0.007	0.023^{***}
(Base category= compulsory education)		(1.01)	(2.98)
Tertiary Education		0.021^{**}	0.029^{***}
		(2.19)	(2.66)
Regional Fixed Effects	*Yes*	*Yes*	*Yes*
$\hat{\rho}$		-1.540^{***}	
		(-5.87)	
Wald test (p-value)		0.000	
Uncensored Observations		14,341	18,960

Notes: The table reports the average marginal effects. Column one shows the first stage of a probit with sample selection. The second stage reports the second stage of a probit with sample selection. In the third column results from a probit model without correction are shown for comparisons. The Wald test rejects the null hypothesis of non-correlation between the errors of the selection equation and the errors of the main equation. Standard errors are corrected for heteroskedasticity.
t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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