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by

Grazia Cecere, Susanna Mancinelli, Massimiliano Mazzanti

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Waste Prevention and Social Preferences: The Role of Intrinsic and Extrinsic Motivations

Grazia Cecere[*] Susanna Mancinelli[†] Massimiliano Mazzanti[‡]

Abstract

It is only recently that EU policies have started defining targets for waste reduction despite waste prevention being at the top of the 'waste hierarchy'. Against this backdrop, we examine whether individual behavior towards waste reduction is more strongly driven by extrinsic motivations such as social norms, or intrinsic motivations, such as altruistic preferences. We exploit a new survey covering 22,759 individuals from EU27 countries. Our results suggest that individual preferences matter to move beyond an orientation based on recycling, to achieve a reduction of the sources of waste. Behaviour patterns which lead to waste reduction are seldom socially oriented, seldom exposed to peer pressure, and very reliant on purely 'altruistic' attitudes.

Keywords: intrinsic motivations, extrinsic motivations, social norms, recycling, waste reduction, green preferences.

JEL: Q53, R11, K42

[*] Telecom Ecole de Management, Institut Mines Telecom, France. Université Paris Sud, RITM, France. e-mail: grazia.cecere@telecom-em.eu

[†] Dept. of Economics and Management. University of Ferrara, Italy. e-mail: susanna.mancinelli@unife.it

[‡] Dept. of Economics and Management. University of Ferrara, Italy. CERIS CNR Milan. SEEDS – Sustainability Environmental Economics Dynamics Studies, http://www.sustainability-seeds.org. e-mail: mzzmsm@unife.it

1. Introduction

Although reducing waste is at the top of the waste hierarchy (Palmer et al. 1997; Pearce, 2004), no real decoupling between waste generation[4] and consumption has been demonstrated. The European Commission has published several waste Directives (see Nicolli and Mazzanti, 2011), but they have only brought about minor changes within the key objective of reducing waste generation (EEA, 2009), one of the main targets in the EU's long term transition towards a green economy (EEA, 2013b, 2014a,b).[5] Most efforts have been targeted towards greater amounts of recycling and better management of waste disposal. While these are desirable and socially beneficial goals, they are not sufficient for the achievement of long-term sustainability targets. Too much policy and media attention related to recycling as a final societal aim can somewhat distort perceptions: society 'feels good' because more waste is being recycled, while the real objective should be to reduce the amount of waste being produced, in both relative and absolute terms. EU targets on waste prevention are very recent.[6] The means achieving them is difficult given the current economic stagnation, which does not emphasise environmental targets. The costs of waste prevention are high and actions aimed at reducing waste imply radical changes in behavior and life styles.

Although economic tools have had some positive effects on waste management, it is generally agreed that individual decisions about what to buy and how to dispose of goods play a fundamental role in waste prevention and recycling programs. Thus, a good understanding of the factors influencing individuals' preferences and behaviours is essential to tackling the problem of waste effectively.

In the present article, we investigate individual behaviour towards waste reduction by exploiting a recent large EU surveys about individuals. The empirical analysis presented is backed by theoretical discourse that revolves around intrinsic and extrinsic

[4] Waste generation is meant as waste collected, i.e. here waste collection and waste generation/production are terms used interchangeably.

[5] See Figure A1 in the Appendix, which depicts waste generation, recycling and composting trends in the EU related to Municipal Waste Generation. Apart from Germany, the leading European countries have not achieved any reduction in waste generation. The EEA (2013a) states that "[i]f the figures are compared for the years 2001 and 2008, 26 countries recorded an increase and six countries a decrease. This suggests that the economic downturn that started in 2008 may have caused a reduction in municipal waste generation per capita. Overall, however, the picture is mixed and there is no clear evidence of improved waste prevention across countries between 2001 and 2010". This confirms other EEA figures (see also Figure A2 and EEA, 2009).

[6] At http://scp.eionet.europa.eu/facts/WPP one can read: "The revised EU Waste Framework Directive (2008/98/EC) requires that by 12 December 2013 Member States establish national waste prevention programs. In Article 3 (12) (2008/98/EC) 'prevention' is defined as 'measures taken before a substance, material or product has become waste, that reduce: the quantity of waste, including through the re-use of products or the extension of the life span of products; the adverse impacts of the generated waste on the environment and human health; or the content of harmful substances in materials and products'". The EEA recently started monitoring national waste prevention plans in addition to waste management. 2014 marks the first annual survey of waste prevention programmes aimed at assisting member states in accordance with the EEA mandate as described by the 2008 Waste Framework Directive (see EEA, 2014a, p. 37).

motivations that might characterise an individual's waste management behavior. We specifically test whether individual behavior towards waste reduction is mostly driven by intrinsic or extrinsic motivations.

Since individual behavior is at the heart of this analysis, micro economic studies are crucial. The shortcoming of these studies on empirical sides is that their survey-based nature often limits the available dataset to a regional setting, or prevents a study from producing completely generalisable results.

As far as the EU is concerned, studies that rely upon individual data mainly refer to Scandinavian and UK experiences, due in part to the relatively richer availability of regional and municipal datasets (see among others D'Amato et al., 2013; Mazzanti and Nicolli, 2013; Mazzanti et al., 2012; 2011, 2008 for analyses and surveys on regional-like data). For instance, Hage et al. (2008) investigate the main determinants of the collection rates of household plastic packaging waste in some Swedish municipalities, using spatial econometrics for a cross-section of 282 units. This work is linked to other analyses on recycling and separated collection performances focusing on household behaviour, using survey data at a local level (Hage and Söderholm, 2009). Barr (2007) analyses households' waste management (waste reduction, reuse and recycling), considering behavioural values, behavioural intentions and the actions of 673 residents in Exeter, UK. Grahm-Rowe et al. (2014) analyse household food waste through a qualitative study on 15 UK household food purchasers.

One of the empirical bullets of our study is that it focuses on the EU as a whole, rather than on regions and municipalities. In fact, our research hypotheses are tested on an original dataset containing 22,759 individual data, which were collected in 2011 by the Gallup Organization on behalf of Eurobarometer (EU Commission). The data includes detailed information on waste related behavioural preferences. Our analysis econometrically investigates whether, among the many socio-economic drivers, individuals' intrinsic and/or extrinsic motivations are significant. We verify these effects with reference to 'food waste' (e.g. bio-waste), a major proportion waste whose production is effectively linked to individuals' day-to-day behavior.[7]

The paper is organised as follows: Section 2 reviews the literature on intrinsic and extrinsic motivations behind individuals' pro-social behavior, focusing particularly on the waste management context. It also describes the conceptual framework and formulates the main research hypothesis. Section 3 presents the dataset and some socio-economic information on respondents. Section 4 discusses the estimations and the results of the econometric analysis. Section 5 concludes .

2. Crowding out, crowding in: the role of intrinsic and extrinsic motivations

The idea that the motives which induce people to engage in pro-social behavior may go beyond purely economic reward has been widely recognized and accepted by economists, who have turned to psychological studies for an explanation that transcends the classic view of the wholly selfish, monetary motives of the human being. The present section provides a short review of the general relevant literature in these terms (Section 2.1), with a particular focus on waste management (Section 2.2) which informs

[7] Bio waste is the specific target addressed by the EU Landfill Directive. Further details are provided below.

the conceptual framework of our analysis and formulation of our main research hypothesis.

2.1 Relevant literature

In the economic literature on pro-social behavior, it is possible to distinguish at least four groups of theories.[8] The first includes theories that explain people's pro-social behavior in view to achieving a private or material reward, such as tax breaks in the case of donations or the creation of social networks in the case of voluntary work (Olson, 1965). The second group includes theories based on the idea that people care about the well-being of others for three reasons: first, people's own utility function is directly and positively influenced by the well-being of others, as in the case of Becker's (1974) pure altruists and their donation to a public good; second, people perceive a 'warm glow' from their pro-social behavior, as in the case of Andreoni's (1989, 1990) impure altruists who, by contributing to the public good, 'get some private good benefit from their gift per se, like a warm glow' (Andreoni, 1989, pp. 1448-1449); third, people dislike inequality and hence behave altruistically towards those worse off than themselves, as in Fehr and Schmidt (1999). The third group of theories includes those on people moved by a sense of reciprocity so that their pro-social behavior depends on the behavior of others within a given group (Rabin, 1993; Fehr and Gächter, 2000). Finally, the fourth group refers to social norms and reputational concerns as triggers for people's pro-social behavior (Bènabou and Tirole, 2006).

Thus, people's pro-social behaviours are driven by intrinsic and extrinsic motivations.[9] A generally accepted definition of intrinsic motivations comes from psychology (Deci, 1975) and identifies the peculiarity of an intrinsic motive in the absence of an external reward, and as a motivation that comes from 'within the person's attitude'. On the other hand, extrinsic motivation comes from outside the person. On this basis, motives such as pure altruism or the 'warm glow' can be considered intrinsic, since their rewards are purely internal, derived from the donor's own knowledge of his/her pro-social behavior, while motives that involve material rewards, such as tax breaks, may be considered extrinsic, since here behavior is instrumental in obtaining an external reward. Reciprocity, social norms and reputational concerns do not appear to only come from within the person, and in the case of social norms in particular further examination is necessary. People keen to conform to a socially shared perception of an ideal form of pro-social behavior are moved both by the desire to achieve a good self-image (essentially intrinsic) and to gain the respect and approval of others (essentially extrinsic). People behave pro-socially in order to signal their good traits to both themselves and others. Obviously, the more hidden the action the less relevant the social approval (Ariely et al., 2009).

The distinction between intrinsic and extrinsic motivations provides useful grounds to analyze interactions between them and to discuss one of the fundamental issues of economics: what are the incentives that drive people towards pro-social behavior. In fact, since pro-social behavior is costly, its magnitude will increase with external

[8] See Meier (2006) for a more detailed survey.

[9] Definitions of these two sets of motivations are not so precise or unambiguous, to the point that Reiss (2005) considers this distinction misleading and not yet scientifically convincing.

monetary incentives on the one hand according to the relative price effect. On the other hand, however, through what we might define as a 'motivation crowding-out effect', monetary incentives[10] could decrease intrinsic motivations at the basis of the pro-social behavior. The final net effect will depend on the magnitude of the two effects and, under specific conditions, the relative price effect can even be reversed.

Titmuss (1970) argued that paying for blood donations could undermine and reduce the willingness to donate. This idea has been widely exploited in the economic literature, and the empirical relevance of the motivation's crowding out effect has been demonstrated in many areas of the economy and society.[11] For example, external interventions may crowd-out or crowd-in intrinsic motivation, or leave it unaffected. Frey and Jegen (2001) identify 'controlling activities' as the psychological condition under which external incentives crowd-out individuals' intrinsic motivations, and 'perception of supportive activities' as the psychological condition under which external incentives crowd-in intrinsic motivation. Bowles and Polania-Reyes (2012) identify four mechanisms that may account for incentives' crowding-out and crowding-in effects on social preferences: first of all, incentives affect preferences, providing information about the beliefs of the person/institution who created the incentives, about the task itself and about the recipients of the incentives; second, incentives may induce moral disengagement, activating payoff-maximizing modes of thought; third, incentives may compromise an individual's sense of autonomy; and finally, incentives may affect how people learn new social preferences.

In voluntary work, the introduction of monetary incentives shifts the perception related to the individual's decision. Human beings calculate the costs and benefits of a job, namely if it is worth working for the wage received. In the absence of external monetary incentives, people work for an internal moral reward – the warm glow. If the external monetary incentive is not sufficiently high, it might be that the crowding-out effect overwhelms the relative price effect, so that volunteers who receive a low monetary reward work less than both people who receive large rewards and people who receive no reward at all (Frey and Goette, 1999; Gneezy and Rustichini, 2000a). Bolle and Otto (2010) explain the existence and persistence of crowding-out and crowding-in effects on the basis of the signals offered by prices. Using empirical results from a blood donation survey, they analyze whether 'not paying' is different from 'paying (almost) nothing': the issue is that the introduction of a monetary incentive for people who show pro-social actions is a signal (price) of the value of their action. So, if a monetary incentive is introduced, the crowding-out (crowding-in) effect might prevail if the price offered is considerably lower (higher) than the value estimate people have of their behavior.

Motivations can be undermined only when a previously-set non-monetary relationship is transformed into an explicitly monetary one. If motivations are extrinsic from the beginning, the increase of external incentives will be likely to increase effort as predicted by standard theory.

If an individual's motivation for pro-social behavior is social approval, Ariely et al. (2009) show that the effectiveness of monetary incentives crucially depends on visibility. When the action is visible, the presence of economic incentives may induce

[10] In the context of monetary incentives we consider both positive incentives (rewards) and negative incentives (fines).

[11] For an exhaustive survey, see Frey and Jegen (2001) and Bowles and Polania-Reyes (2012).

suspicion in society, and social approval can be converted to social stigma (Bènabou and Tirole, 2006). In this case the crowding-out effect prevails. If the action is hidden, the relative price effect (which is independent of visibility) increases pro-social behavior and a crowding-in effect prevails.

2.2 The conceptual framework of waste management

Several studies within the psychological literature consider individual motivations when the pro-social behavior is pro-environment (Barr et al., 2001; De Young, 1996). In these studies, the non-pecuniary levers of environmental behavior are attributed to different behavioural 'norms' such as altruism, social or moral norms, warm-glow, and eco-centrism. In the context of waste recycling and reduction, analysis of pecuniary and non-pecuniary incentives is more challenging if we compare waste realms to other environmental issues, since the related pro-environmental actions generally present low individual benefits and high opportunity time costs. The importance of non-monetary incentives in waste recycling has been emphasised in the literature (Berglund, 2006; Brekke et al., 2003, 2007, 2010; Hage et al., 2009; Halvorsen, 2008). Kinnaman (2006) suggests that recycling is increased more by warm-glow incentives than by unit-based pricing, to the point that households may even be willing to pay for the opportunity to recycle.[12] Using U.S. data, Viscusi et al. (2011) show that in the recycling of plastic water bottles, 'private' values, such as individual pro-environmental behavior, prove more effective than external norms and economic incentives. Abbot et al. (2013) show that social norms (peer pressure) affect recycling but do not find a significant relationship between warm-glow and recycling.

The importance of intrinsic and extrinsic motivations and their interactions in individual behavior has been emphasized above. Indeed, we argue that waste-oriented conduct (namely waste recycling and waste reduction, which are two of the pillars in the waste management hierarchy) may well be driven by these two sets of motivations in different ways. For the purposes of the present analysis, we include different motives in the groups of intrinsic and extrinsic motivations.

In the set of *intrinsic motivations* we include beliefs that are endogenously determined by individuals and that induce behavior which maximises both social and individual welfare. Warm-glow and 'joy of giving' are included in the category of intrinsic motivation, and Andreoni's (1989, 1990) impure altruists and Becker's (1974) altruists are individuals characterised by intrinsic motivation. It is not relevant if a contributor to a public good, in pursuing the maximisation of social welfare, also aims at maximising his/her own utility function through the 'warm-glow' received from giving, or if s/he merely considers the maximisation of social welfare, thus complying with an ideal of social income and social welfare function. What we want to emphasise is that agents driven by intrinsic motivations are interested in neither pecuniary rewards nor peer (social) approval. They do not expect any external rewards for their actions (Deci, 1975) but merely obey 'individualistic based altruism' (e.g. actions driven by option values, bequest values, inter-generational preferences, etc.).

[12] 'Recycling is something parents and children feel good about, and for this reason households may be willing to pay for the mere opportunity to recycle' (Kinnaman, 2006, p. 222).

In the category of *extrinsic motivations,* we include reasons that are ascribable to 'perceived external pressure'. We consider motivations related to the individual's need to gain external rewards, either economic or in term of social appraisal. Bènabou and Tirole's (2006) reputational concerns are in this category. The agent is interested in fostering a good self-image, and in his/her choices s/he is influenced by the potential positive or negative judgments of society. In the case of extrinsic motivations, the relevant variables of the agent's benefit function are not just the public good or the individual contribution to the public good, but include the external rewards that derive from his/her pro-social behavior. A crucial property of external motivation is its dependency on the visibility of the pro-social behavior. No external rewards will be perceived if the behavior is hidden.

In relation to individual behavior, in our analysis, which focuses primarily on actions aimed at waste reduction, the main difference is that while recycling may be visible to '*neighbours*' eyes', waste reduction is a more private action which is unlikely to be observable by others, at least in most cases.[13]

On the basis of the above considerations, we formulate our main research hypothesis:

> *While waste recycling may be induced by both intrinsic and extrinsic motivations, waste reduction is mainly associated with intrinsic motivations.*

As already emphasised, people responding to intrinsic motivations are not interested in external incentives, either positive (rewards) or negative (fines). Hence, the intrinsic motivations of people who carry out actions aimed at waste reduction should not be very responsive to Pigouvian economic instruments (e.g. pricing proportional to the externality or waste pressures). Under Pigouvian policies, it is generally true that the more environmentally friendly behavior, the higher the pecuniary reward (or the lower the tax burden).

The introduction of a monetary incentive might actually crowd-out the intrinsic motivation at the basis of waste minimisation. This crowding-out effect might increase if people perceive a control on their activity (Frey and Jegen, 2001; Bowles and Polania-Reyes, 2012), and a crowding-in effect might prevail if the monetary incentive is considerably higher than the value people confer on their activity (Bolle and Otto, 2010). On the other hand, non-monetary interventions could crowd-in intrinsic motivations by supporting individuals' perceived competences and sense of autonomy in carrying out particular activities aimed at waste reduction.

In relation to extrinsic motivations, high economic incentives might crowd-out motivation effects, when the action is visible. High economic incentives do not allow individuals to demonstrate to society that their performance of an activity is for reasons other than pecuniary ones (Thøgersen, 2003; Bènabou and Tirole, 2006). On the other hand, if the action is hidden, a crowding-in effect should prevail (Ariely at al., 2009). When action is visible, extrinsic motivation may be incentivised by any action that

[13] In fact, in small communities where agents often interact, waste prevention/reduction might emerge also as a 'visible' attitude.

facilitates the visibility of the effort.[14]

The introduction of monetary incentives (Pigouvian taxes) to induce actions aimed at waste reduction must be considered very carefully. In fact, since waste reduction is mainly a hidden action, pecuniary incentives might trigger individuals who are not spontaneously driven by intrinsic motivations but at the same time it might crowd-out intrinsic motivations determining a loss of participation from those already acting to reduce waste.

Table 1. Summary of the conceptual framework

Behaviour	**Visibility**	**Motivation**	**Incentives**	**Possible effects of the incentives**
Waste reduction	Mainly hidden	Mainly intrinsic	Monetary incentives (as pigouvian tax)	- No effect
				- Crowding-out effect with monetary incentives considerably lower than the value estimate people have of their behavior
				- Crowding-in effect with monetary incentives considerably higher than the value estimate people have of their behavior
			Incentives linked to supportive activity	- Crowding-in effect
Waste recycling	Mainly visible	Both extrinsic and intrinsic	Monetary incentives (as pigouvian tax)	- Crowding-out effect with high monetary incentives (social approval may convert to social stigma)
			Incentives which facilitate the visibility of the action	- Crowding-in effect

Non-monetary incentives must necessarily be considered too when waste reduction is the aim. Moreover, since the motivations at the basis of waste reduction and recycling may be different, the two behaviours may not take the same pace. A substitution effect

[14] Abbott et al. (2012) consider curbside collection as one way to facilitate the visibility of recycling efforts.

between the two actions could arise. Since both behaviours are costly, individuals will choose the combination that maximizes their net returns. Hence, if individuals' pro-environmental behaviours are triggered mainly by extrinsic motivations, that is, by the desire to obtain social approval, they will be more likely to expend higher levels of effort on more visible actions.

In the following, we empirically analyse what are the factors that back increasing individual waste reduction, and we test our research hypothesis, that is, whether intrinsic motivations are more relevant than extrinsic motives in reducing waste through individual actions.

3. The empirical analysis

3.1 The Data

The empirical estimation is based on individual data collected in 2011 by the Gallup Organization on behalf of Eurobarometer EU (European Commission, 2011)[15] in all 27 European countries via an extended questionnaire. The dataset includes 22,759 individual observations. The survey is aimed at understanding the attitudes of Europeans towards resource efficiency, and their practices related to resource efficiency and waste management.[16] It allows for a detailed view of individual behavior across Europe. The questionnaire has five main sections[17]: (a) socio-demographic data, (b) attitudes to waste management, (c) information related to food waste, (d) willingness to purchase recycled or second-hand products, and (e) questions to measure preferences related to waste management. To the best of our knowledge, our work is the first to exploit this dataset.

We are able to analyse households' waste management across all 27 EU countries.[18] Our analysis of the motivations behind waste reduction is conducted with a focus on bio-waste, namely food waste. While this is a highly relevant source of waste, the scarcity of disaggregated data has resulted in very few specific analyses. Bio waste, which is the focus of the 1999 EU Landfill Directive and includes food waste, paper and cardboard, and biodegradable textiles, makes up a considerable share of municipal waste, approximately 60%-70% in most countries. We believe that food waste is an interesting case study, since it is a relevant source of Biodegradable Municipal Waste (BMW) whose share EU disposed waste policies aim to drive down to zero (EEA, 2009).

[15] Flash Eurobarometer 316 -Attitudes of Europeans Towards Resource Efficiency. The survey is designed to ensure an estimate of a true value of characteristics of a population at a given time in order to reduce the sampling error. The survey is conducted by telephone in the language of the country.

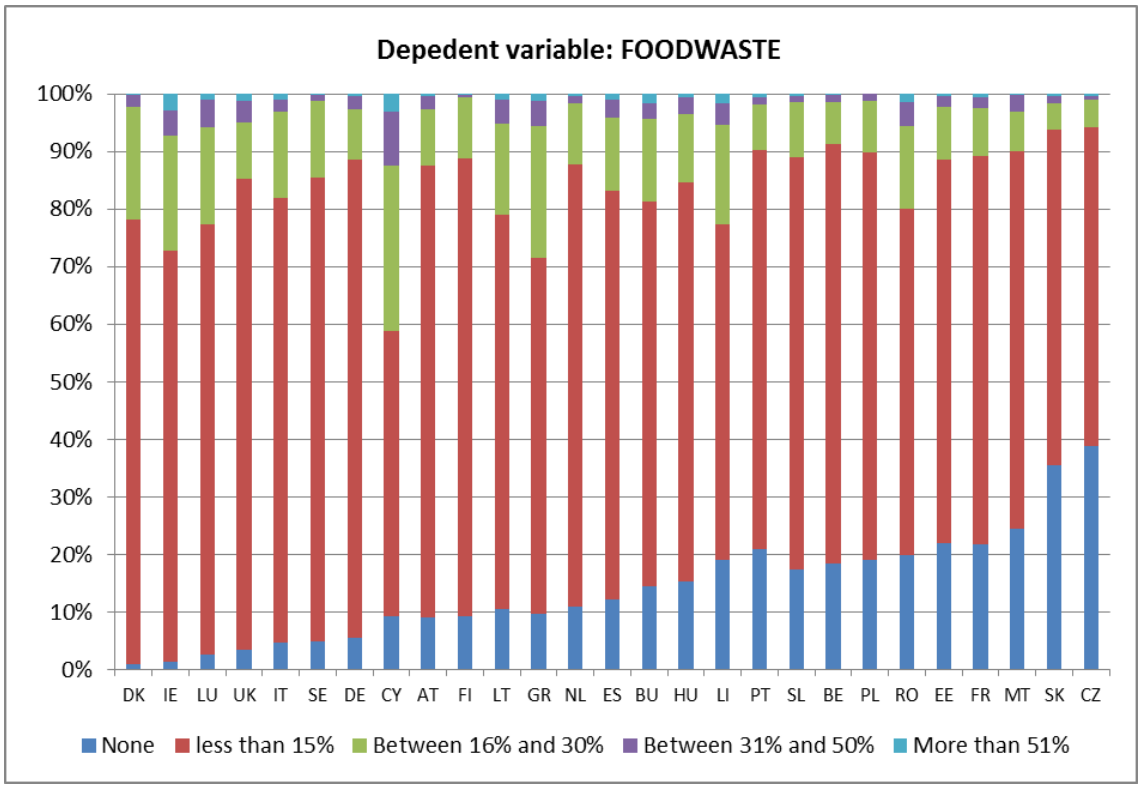
[16] Regarding socio-demographical variables, the average AGE of the population is about 54 years old and 41% of individuals are male. Students represent 35.3% of the sample (among them about 12% are full time students). The category "employee" represents 35.5% of the sample, 9.5% say they are self-employed, and 6.7% are manual workers. Unemployed and retired people represent about 36.3% of the sample. The largest numbers live in an urban area (44.7%) or a metropolitan area (19.3%).

[17] For more details regarding the questionnaire see: ttp://ec.europa.eu/public_opinion/flash/fl_316_en.pdf

[18] We acknowledge our lack of information about individual behavioural intentions, which does not allow us to apply the theory of reasoned action, which, as emphasized by Barr et al. (2001), is a suitable model for analysing environmental behaviour.

Hence, our variable of interest is FOODWASTE, that is an ordinal variable based on responses to the question: 'Can you estimate what percentage of the food you buy goes to waste?'. The mutually exclusive responses permitted were: '*none', ' 15% or less', ' 16% to 30%', ' 31% to 50%', 'More than 51%'.* Descriptive statistics show that 14% (3,187) of EU citizens declare not to waste any of the food they purchase. This is not surprising since in rural areas food waste is normally recycled as an input to farming activities, or composted in dedicated sites. The majority of individuals, about 69.96% (15,922) estimate that 15% or less of the food they purchase is wasted; 12.55% (2,856) admit that between 16% and 30% of the food they purchased went into the waste bin; 2.64 % (600) state that between 31% and 50% of the food they purchased was thrown away; and 0.85% (194) estimate that more than 51% of the food they bought went to waste. Figure 1 shows the distribution of food waste across countries.

Figure 1 - Percentage of food waste produced per country

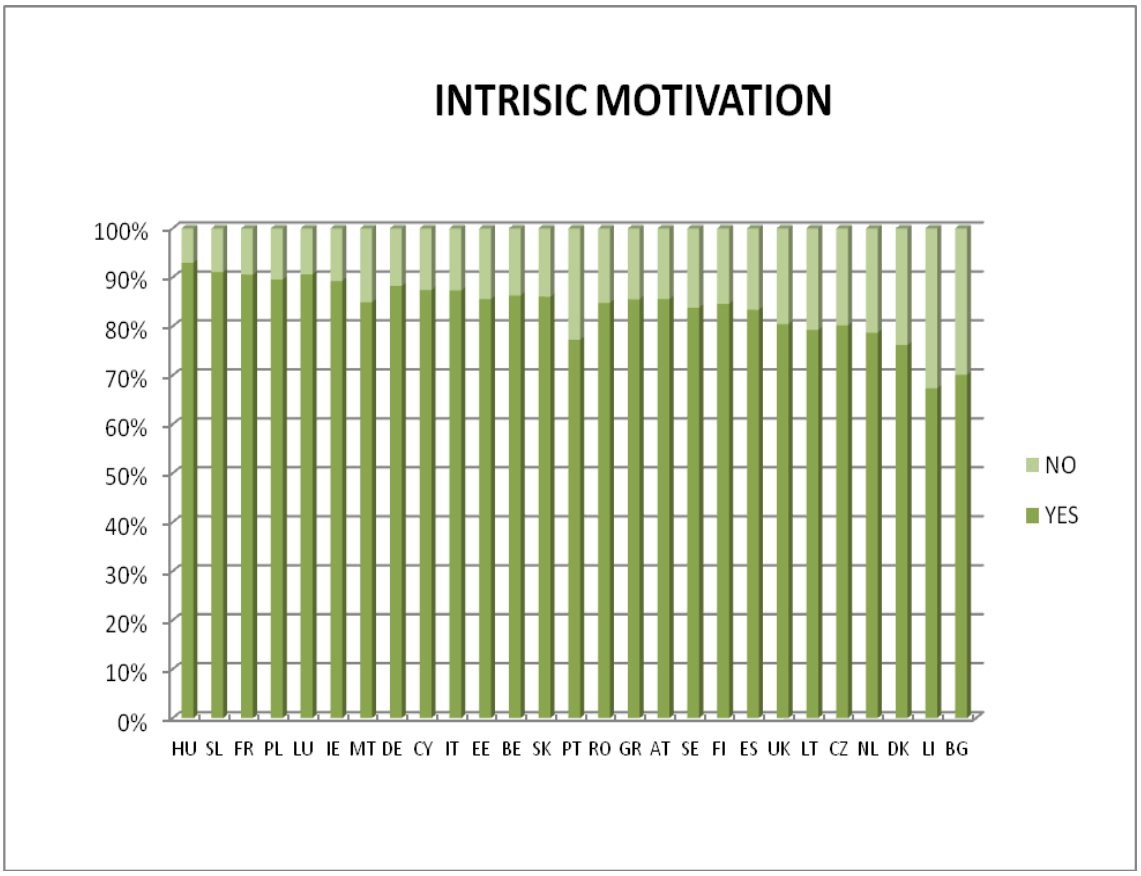


Source: Based on Eurobarometer, calculated by the authors

To measure the intrinsic and extrinsic motivation, we include a set of dummy variables. On the basis of the conceptual framework which depicts intrinsic motivations as not very responsive to Pigouvian economic instruments, we use the dummy variable INTRINSIC-MOTIVE to capture individuals' intrinsic motivations. INTRINSIC-MOTIVE is an explanatory variable that takes the value 1 if the individual does not prefer to pay taxes to cover waste management based on the quantity generated (those who answered 'yes'), and 0 otherwise. It measures to what extent individuals prefer to pay an amount based upon the *quantity of waste* that their household produces rather *than paying for waste management through their taxes*. The former, pricing waste according to effective production, is more Pigouvian in style. The latter inclines more towards cost recovery

strategies, funding public infrastructure (e.g. curbside recycling) that supports composting, recycling, and proper disposal through waste taxes or tariffs. We acknowledge that INTRINSIC-MOTIVE is an imperfect proxy of what we consider people's intrinsic motivation[19], nevertheless the individual's attitude variable clearly relates to more altruistic preferences (intrinsic motivations) with respect to waste management behavior. Figure 2 shows the percentage of individuals that answered 'yes' to INTRINSIC-MOTIVE in each European country.

Figure 2 - INTRINSIC-MOTIVE variables by countries



Source: Based on Eurobarometer, calculated by the authors

In order to measure extrinsic motivations, that may induce individuals to comply with social norms to gain social approval, we exploit a set of information which reflect individuals' attitudes towards 'green oriented' behaviors. These attitudes reveal two characteristics that are essentially linked to what we here define as extrinsic motivations: motivations are (i) *socially* recognized as "environmentally friendly", and

[19] Further 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) or the individuals' beliefs about the introduction of economic or social rewards for virtuous behaviors about waste (extrinsic motivations).

(ii) can be *visible* to others. In our analysis, extrinsic motivations are then captured by the dummy variable GREEN_ATTITUDE, which takes value 1 if individuals evaluate a product's environmental impact[20] once they decide which products to buy and 0 otherwise.

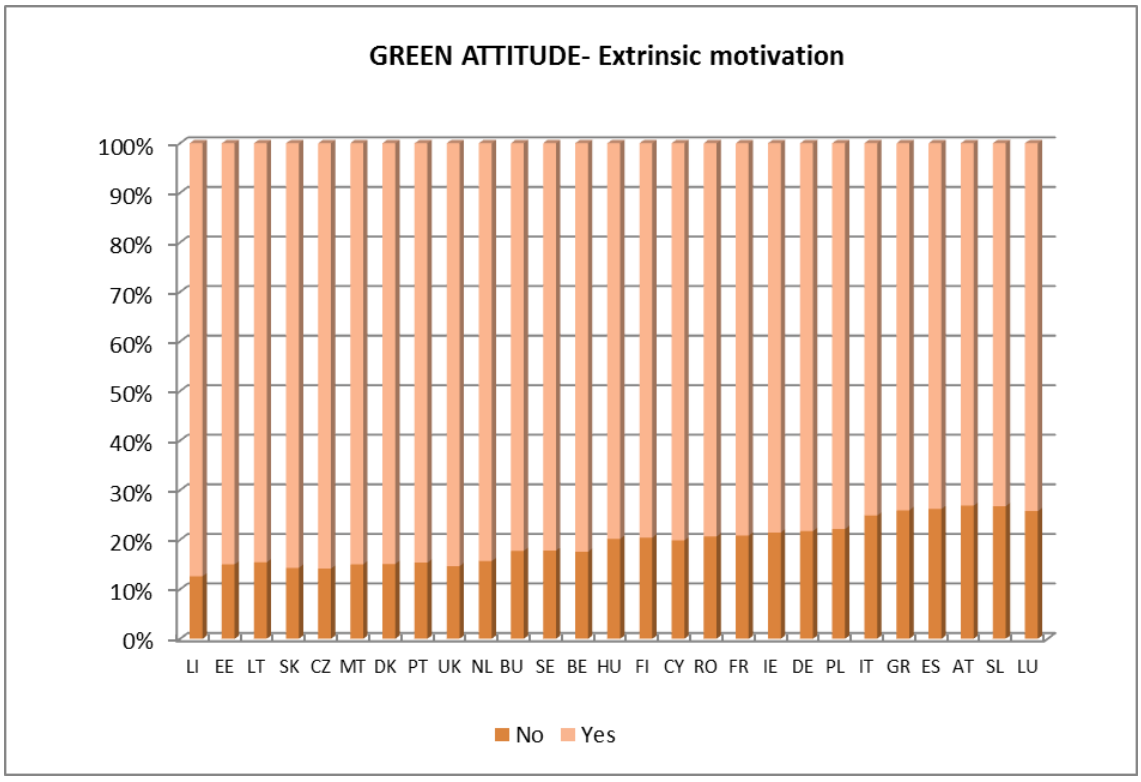
Figure 3 shows the distribution per country of this variable.

Moreover, we consider other five dummy variables which contemplate the principal factors that might induce respondents to buy recycled products: TOBUY1, TOBUY2, TOBUY3, TOBUY4, TOBUY5[21]. TOBUY1 indicates whether the price affects the individual's choice to buy recycled products. TOBUY2 measures whether the individual buys recycled products for their usability and quality. TOBUY3 measures whether the individual buys recycled products for their brand name. TOBUY4 indicates whether the individual buys recycled products for their environmental impact. TOBUY5 indicates whether individuals choose recycled products for other reasons.

While TOBUY1, TOBUY2, TOBUY3 concern motivations that are common in purchasing behavior, independently on the recycled nature of the product, the variable TOBUY4 has instead the flavor of being socially recognized as environmentally friendly.

Hence, as proxy of extrinsic motivations we mainly consider GREEN_ATTITUDE and check also through the dummy variable TOBUY4. Note that both GREEN_ATTITUDE and TOBUY4 are visible actions, at least to the seller, to the other purchasers, and to friends.

Figure 3 - GREEN_ATTITUDE variables by countries



Source: Based on Eurobarometer, calculated by the authors

20 Whether the product is reusable or recyclable.

21 This set of variables contains some non-responses, which reduces the number of observations included in the regression.

Given that the EU allows for national policies to be shaped towards achievement of EU targets set by EU directives, it is relevant to evaluate the role of national policy commitment, namely the national commitment to reaching waste targets. For this purpose we include the variable WASTE POLICY 2006. This variable is constructed using the EEA EIONET official EU data (based on national factsheets)[22] for 2006 (we introduce a lagged year with respect to 2011 to mitigate endogeneity). It ensures a detailed bottom-up perspective. The index is constructed on the basis of specific information present in the factsheets (Nicolli and Mazzanti, 2011; see Mazzanti and Zoboli, 2009 for details of index construction). This index is bound between 0.1 and 0.95, where a high value suggests a stringent waste management policy (Annex Table A1). The countries with the most stringent waste management policies are Denmark, Sweden, Belgium, and Germany; while Greece, Ireland, Malta, and Cyprus have the least stringent policies. The index captures idiosyncratic country policy-related effects and observed country heterogeneity. The effect that exists between stringent policy management and the actual behavior of individuals enables us to control for macro forces that might influence individuals' behaviours. In addition to micro based levers, individuals are also embedded in defined institutional environments which may contribute to influencing their behaviours. Since the EU has set medium to long term targets (e.g. the 1999 EC Directive defines targets on bio waste landfill reduction to be achieved by 2016), each country has autonomy to decide the pattern and intensity of policy implementation. In order to measure the impact of policy commitment in relation to the waste realm, we include a country-based policy indicator in the regression that characterises to what extent each country is committed and the stringency of its waste management and disposal.

In order to measure attitudes towards institutions concerned with waste management, we include two dummy variables MINDED LAW and MINDED COLLECTION. MINDED LAW measures to what extent individuals believe that stronger low enforcement can affect individual behavior. MINDED COLLECTION measures to what extent individuals believe that waste collection services should be improved to improve waste management.

Table 2 presents the information related to this set of covariates; Table A3 in the appendix presents the correlation matrix of the covariates.

In order to consider country and regional fixed effects, we include a different set of dummy variables in the econometric specification. First, the dummy variable measuring the country fixed effect for the 27 countries represented in our sample; second, four dummy variables to measure heterogeneity among macro European regions (Northern, Eastern, Central and Southern European regions); third, 202 regional dummy variables to consider regional fixed effects.[23] This was possible since the sample analysed indicates the administrative regions of each individual's residence.

[22] http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition.

[23] The size of the dataset allows for the inclusion of this large number of controls, which increases the robustness of the estimates compared to that of smaller surveys.

Table 2. Descriptive statistics

Variable	Description of the variables	Obs	Mean	St. Dev.	Min	Max
FOODWASTE	The variable takes value 1 if an individual declares that s/he does not produce food waste, 2 if food waste corresponds to about *' 15% or less',* 3 if food waste corresponds to *'16% to 30%',* 4 if food waste corresponds to *' 31% to 50%',* 5 if food waste corresponds to *'More than 50%.*	22759	2.063	.666	1	5
	INTRINSIC AND EXTRINSIC MOTIVATIONS					
GREEN_ATTITUDE	Takes value 1 if an individual declares the product's environmental impact[24] influences the decision on what products they buy and 0 otherwise	22759	.798	.402	0	1
INTRINSIC-MOTIVE	Takes value 1 if an individual declares that s/he does not prefer to pay taxes for waste management based on the quantity s/he generates and 0 otherwise	20650	. 839	.368	0	1
TOBUY1	Takes value 1 if an individual buys recycled products for price reasons and 0 otherwise	19262	.187	.390	0	1
TOBUY2	Takes value 1 if an individual buys recycled products for quality/usability of the product and 0 otherwise	19262	.519	.500	0	1
TOBUY3	Takes value 1 if an individual buys recycled products for the brand name of the product and 0 otherwise	19262	.021	.143	0	1
TOBUY4	Takes value 1 if an individual buys recycled products for the environmental impact of the product and 0 otherwise	19262	.266	.442	0	1
TOBUY5	Takes value 1 if an individual buys recycled products for other reasons and 0 otherwise	19262	.008	.087	0	1
	SOCIO DEMOGRAPHICAL VARIABLES					
AGE	Indicates the age of the individual	22759	50.48	16.893	15	99
MALE	Takes value 1 if an individual is male and 0 if female	22759	.414	.493	0	1
SELF EMPLOYED	Takes value 1 if an individual is self-employed and 0 otherwise	22759	.095	.293	0	1
EMPLOYEE	Takes value 1 if an individual is an employee and 0 otherwise	22759	.353	.478	0	1
MANUAL WORKER	Takes value 1 if an individual is a manual worker and 0 otherwise	22759	.067	.249	0	1
HIGH EDUC	Takes value 1 if an individual is university educated and 0 otherwise	22759	.452	.498	0	1
STUDENT	Takes value 1 if an individual is a student and 0 otherwise	22759	.355	.479	0	1
METROP	Takes value 1 if an individual lives in a metropolitan area and 0 otherwise	22759	.193	.395	0	1
URBAN	Takes value 1 if an individual lives in an urban area and 0 otherwise	22759	.447	.497	0	1
RURAL	Takes value 1 if an individual lives in the country-side and 0 otherwise	22759	.360	.480	0	1
	INSTITUTIONAL PREFERENCES					
MINDED LAW	Takes value 1 if an individual declares that stronger law enforcement should be carried out to improve waste management 0 otherwise	22759	.411	.492	0	1
MINDED COLLECTION	Takes value 1 if an individual declares that better waste collection services should be created to improve waste management and 0 otherwise	22759	.661	.473	0	1
	GEOGRAPHICAL VARIABLES					
EASTERN_EUROPE	Equal to 1 if the country is located in Eastern Europe (Bulgaria, Czech Rep., Hungary, Poland, Romania, Slovak Rep., Slovenia), 0 otherwise	22759	.260	.439	0	1
NORTHERN_EUROPE	Equal to 1 if the country is located Northern Europe (Ireland, Great Britain, Northern Ireland, Denmark, Finland, Sweden, Estonia, Latvia, Lithuania), 0 otherwise	22759	.290	.453	0	1
SOUTHERN_EUROPE	Equal to 1 if the country is located in Southern Europe (Greece, Spain, Italy, Portugal and Malta), 0 otherwise	22759	.216	.412	0	1
WESTERN_ EUROPE	Equal to 1 if the country is located in Central Europe (Belgium, France, Luxembourg, Holland, Austria, Germany), 0 otherwise	22759	.233	.423	0	1

Source: Elaboration of the authors based on European Commission (2011) sample

[24] Whether the product is reusable or recyclable.

4. Estimation and results

4.1 Estimation

Our results are presented in Tables 3 and A2 (in the Appendix). To test the robustness of results, different specifications are estimated. We control for the presence of heteroskedasticity. Since the dependent variable is ordinal in nature, we use ordered logit estimators because the increase in value is sequential: this data feature allows us to test the intensity of individual waste production. The analysis does not try to identify cause–effect relationships; rather it aims to highlight the robust relationship between FOODWASTE and covariates. The marginal effects are presented in the Table 4; they are computed with respect to the regression (b).

4.2 Results

4.2.1 Main evidence

Table 3 presents different specifications in order to test the robustness of our results and the country and policy specific effects. Specification (a) includes an exclusive measure of extrinsic motivation GREEN_ATTITUDE. Specification (b) estimates the effect of the individual variables including both extrinsic motivation (GREEN_ATTITUDE) and INTRINSIC MOTIVATION. Specification (c) includes the country dummies to measure country specific effects. Specification (d) estimates actual green attitudes of individuals measured as the decision to buy recycled products, using the set of dummies measuring the decision to buy recycled products. The specifications (c) and (d) permit to include into the regression country fixed effects. In Table 2A, specification (e) measures the effect of stringent waste management policy on individual behavior by adding a lagged country policy variable and the regional dummies; specification (f) includes only the national stringent policy index; specification (g) includes the regional dummies in the regression to measure unobserved local environmental heterogeneity. In all regressions, the Wald Chi-Square test statistic rejects the null hypothesis. We might conclude that at least one of the predictors' regression coefficients is not equal to zero in the model, given the set of explanatory variables included in the model.

The marginal effects computed at the mean value (on estimation b) show that the probability that individuals do not put food into waste bins is about 12% (Outcome 1). The highest level of probability is associated with Outcome 2 –individuals who put less than 15% of their food into waste bins with 73% probability at the mean value of the explanatory variables. The lowest level of probability is shown by Outcome 5-individuals who put more than 50% of their food into waste bins.

The results of the estimations support our conceptual framework and do not reject our research hypothesis. On the one hand, some ‘preferences’ related to law enforcement and collection are not significant, but on the other, the two key variables we assess, INTRINSIC-MOTIVE (the variable which according to our conceptual definition proxies intrinsic motivation values attached to waste management behavior) and GREEN_ATTITUDE (which captures extrinsic motivations) provide relevant insights. GREEN_ATTITUDE, as well as the other variable measuring extrinsic motivations, TOBUY4, which captures diversified attitudes towards green consumption, have a positive effect on the production of food waste.

Table 3: Ordered logit predicting percentage of food waste produced (with country dummies, macro- regions and policy indicators)

	(a)		(b)		(c)		(d)	
AGE	-0.032***	(0.003)	-0.031***	(0.003)	-0.037***	(0.003)	-0.034***	(0.003)
AGESQ	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)
MALE	0.042***	(0.016)	0.032*	(0.017)	0.009	(0.017)	-0.000	(0.019)
SELF EMPLOYED	0.051*	(0.030)	0.053*	(0.032)	0.049	(0.033)	0.035	(0.035)
EMPLOYEE	0.098***	(0.021)	0.091***	(0.022)	0.077***	(0.023)	0.071***	(0.025)
MANUAL WORKER	-0.012	(0.035)	-0.024	(0.037)	0.062	(0.039)	0.035	(0.043)
UNEMPLOYMENT	Ref.		Ref.		Ref.		Ref.	
STUDENT	0.149***	(0.020)	0.131***	(0.021)	0.055***	(0.021)	0.038*	(0.023)
HIGH EDUC	-0.061***	(0.019)	-0.063***	(0.020)	0.025	(0.021)	0.033	(0.023)
METROP	0.138***	(0.021)	0.143***	(0.022)	0.182***	(0.024)	0.168***	(0.026)
URBAN	0.095***	(0.018)	0.098***	(0.019)	0.122***	(0.020)	0.113***	(0.021)
RURAL	Ref.		Ref.		Ref.		Ref.	
MINDED LAW	0.023	(0.016)	0.016	(0.017)	0.001	(0.018)	-0.011	(0.019)
MINDED COLLECTION	0.022	(0.017)	0.010	(0.018)	0.018	(0.018)	-0.003	(0.020)
GREEN_ATTITUDE	0.111***	(0.020)	0.130***	(0.022)	0.051**	(0.022)	0.027	(0.025)
INTR-MOTIVE			-0.061***	(0.023)	-0.075***	(0.024)	-0.054**	(0.026)
TOBUY1							-0.227***	(0.083)
TOBUY2							-0.151*	(0.082)
TOBUY3							0.068	(0.079)
TOBUY4							0.218***	(0.077)
TOBUY5					Ref.		Ref.	
FRANCE					-0.111	(0.069)	0.259***	(0.078)
BELGIUM					0.052	(0.066)	0.472***	(0.076)
THENETHERLANDS					0.152**	(0.065)	0.442***	(0.074)
GERMANY					0.325***	(0.063)	0.525***	(0.077)
ITALY					0.348***	(0.063)	0.306***	(0.079)
LUXEMBOURG					0.588***	(0.062)	0.351***	(0.082)
DENMARK					0.519**	(0.060)	0.087	(0.082)
IRELAND					-0.603***	(0.063)	-0.146*	(0.087)
UNITED_KINGDOM					0.399***	(0.065)	-0.012	(0.077)
GREECE					0.429***	(0.068)	0.206***	(0.076)
SPAIN					0.138***	(0.068)	0.088	(0.078)
PORTUGAL					-0.035	(0.074)	0.786***	(0.085)
FINLAND					0.088	(0.062)	-0.859***	(0.085)
SWEDEN					-0.273***	(0.063)	-0.344***	(0.087)
AUSTRIA					0.169***	(0.064)	0.006	(0.086)
REPUBLIC_CYPRUS					-0.815***	(0.070)	0.129	(0.087)
CZECH_REPUBLIC					-0.741	(0.070)	-0.025	(0.098)
ESTONIA					-0.239***	(0.070)	-0.327***	(0.090)
HUNGARY					-0.088	(0.071)	-0.253***	(0.082)
LATVIA					0.213***	(0.069)	-0.762***	(0.087)
LITHUANIA					0.017	(0.076)	-0.082	(0.083)
MALTA					-0.193**	(0.076)	0.056	(0.087)
POLAND					-0.241***	(0.066)	0.126	(0.114)
SLOVAKIA					-0.643***	(0.072)	0.184	(0.113)
SLOVENIA					0.028	(0.067)	0.379***	(0.130)
BULGARIA					0.040	(0.069)	0.114	(0.113)
ROMANIA					Ref.		Ref.	
cut1_cons	-2.100***	(0.066)	-2.180***	(0.071)	-2.344***	(0.089)	-2.287***	(0.154)
cut2_cons	0.097	(0.065)	0.036	(0.069)	0.036	(0.087)	0.133	(0.153)
cut3_cons	0.961***	(0.065)	0.913***	(0.070)	0.915***	(0.088)	1.077***	(0.153)
cut4_cons	1.554***	(0.068)	1.514***	(0.073)	1.534***	(0.090)	1.703***	(0.155)
Wald chi (2)	1752.85		1551.13		2912.29		2372.42	
Pseudo R2	0.0451		0.0441		0.0880		0.0888	
N	22759		20650		20650		17636	

Standard errors in parentheses * p<.10, ** p<.05, *** p<.01

Table 4: Marginal effect at the mean value

	Mean value of the explanatory variables			
	AGE	50.00165		
	AGESQ	2784.197		
	MALE	0.4187409		
	SELF EMPLOYED	0.0948668		
	EMPLOYEE	0.3618886		
	MANUAL WORKER	0.0667797		
	HIGH EDUC	0.3638257		
	STUDENT	0.461937		
	METROP	0.1924455		
	URBAN	0.4445036		
	RURAL	0.3630508		
	MINDED LAW	0.4317191		
	MINDED COLLECTION	0.6723002		
	GREEN_ATTITUDE	0.8042615		
	INTRINSIC-MOTIVE	0.8420823		
	Marginal effects at the mean value			
	Margin	Std. Err.	z	P>|z|
Outcome 1	0.1167026	0.0022571	51.70	0.000
Outcome 2	0.7306146	0.0032478	224.95	0.000
Outcome 3	0.1240584	0.0023023	53.89	0.000
Outcome 4	0.0224582	0.0009982	22.50	0.000
Outcome 5	0.0061662	0.0005062	12.18	0.000

Overall, extrinsic motivations chiefly related to the effects of social norms and imitative behavior due to peer pressure do not drive down waste production. However, as hypothesized, they can make a difference in recycling behavior[25] (Abbott et al., 2013 presents related evidence through UK data). Social norms may well be effective for increasing recycling insofar as recycling entails more reciprocity and visibility related to individual actions,[26] but not for actions aimed at reducing waste, which often lack a social and relational component. In effect, the sign of the coefficient is positive. This means that the 'green content' of recycling nevertheless generates a cognitive and social lock in equilibrium that is detrimental to the true long-term target of waste policy: reducing waste.

In contrast, we observe that the coefficient of the variable INTRINSIC-MOTIVE has a negative sign.

In the definition that applies to our conceptual framework, intrinsic motivations are not very sensitive to monetary incentives, among which Pigouvian tools, where the more waste is generated, the more tax is paid. What we observe is that people who express a preference for taxation that is independent of the amount of waste they produce 'paradoxically' tend to reduce their amounts of waste more than others, also suggesting that individuals who ask for a Pigouvian tax, based on the quantity of waste generated, reduce their waste generation less. The results do not reject our research hypothesis: waste reduction is mainly associated with intrinsic motivations. As highlighted in our

[25] It is important to underline that the variable TOBUY4, which we use as proxy for extrinsic motivations, reveal respondents' recycling attitudes, since their willingness to buy recycled goods is in line with this aim.

[26] We often confront ourselves with others' actions especially in densely populated buildings and residential neighbourhoods.

theoretical framework, since waste reduction is mainly not an observable action[27] and hence neither social appraisal nor social stigma matter in defining its motivation, people who are not moved by intrinsic motivations should be incentivised by economic levers (such as Pigouvian tax). In our sample, these individuals ask for economic incentives to move towards pro-environmental behavior.[28] However, no straightforward positive net result is granted. In fact, a monetary incentive could have a negative impact on intrinsically motivated people who are already reducing waste; moreover, the introduction of a direct monetary fee could even worsen the waste reducing behavior of not intrinsically motivated people. As in Gneezy and Rustichini (2000b), a sort of justification effect can arise to mitigate people's guilt: since a payment is expected on the basis of the waste generated, people may not feel guilty if their waste increases. In this case the introduction of an economic incentive could have a negative net result on waste reduction.

4.2.2 EU policy and additional results

The POLICY2006 index – originally constructed out of EEA EIONET data sources - introduces information on the waste policy environment, more or less committed to achieving EU targets, in which individuals are embedded. This variable has a negative coefficient in all regressions in which it is included, and does not alter the main results of the key variables. As already highlighted, intrinsic motives are increased by external activities that individuals perceive as supportive, and in precisely this sense the 'policy environment' might well make a difference (waste policies are more 'stringent' on average in the nordic countries; data on policy indicators are available upon request). This index[29] explains more variance with respect to the country dummy and shows us that the macro framework in which individuals are embedded also influences their behavior. Macroeconomic studies have looked at country based specificities. Among others, Iafolla et al. (2012) find that different groups existed in the EU (over 1999-2008) in relation to the waste generation-GDP relationship: Austria, Germany, and Spain presented a bell shaped curve that pointed to absolute decoupling, while the Netherlands and the UK present only relative decoupling. All other countries were characterised by a monotonic positive link between waste and consumption.

The dummy variables that measure the EU macro regions have expected signs. Eastern European regions produce less food waste compared to Western European regions.[30] This might be associated with the legacy of communist regimes or simply due to the fact that these regions are generally less rich than Western countries. Interestingly, Northern European regions produce more waste. This result corroborates the hypothesis that waste production is associated with wealth of regions, with Eastern EU countries producing - or rather collecting - less waste.

[27] This highlights the joint social and psychological nature of recycling and waste reduction: recycling is always embodied in the visible production of goods, while prevention is an 'absence' of production, an invisible factor in and of itself.

[28] They would prefer to pay taxes for waste management based on quantity generated.

[29] It ranges between 0 and 1 such as, for instance, the OECD indicator on economic policy reforms.

[30] The performance of southern EU countries does not differ much from western EU countries, and although northern countries often present good environmental performances, the results here show them to be lagging behind. This is not surprising, given that the EU waste performance leaders are Germany, Austria, and Belgium (Flanders).

Among the socio economic 'controls', we note that the production of food waste increases with age, and there are positive effects based on gender (women generate less waste),[31] and occupational status (employed people tend to produce more waste). These outcomes are essentially what were expected. The coefficients of the variables measuring people's attitudes to institutions are not significant.

For the effect of education level, our estimates do not provide clear results. Student status is negative for waste production, which is somewhat surprising, but is likely due to their specific short-term perspective. Also, students often live in metropolitan areas. Residents in metropolitan and urban areas find it more difficult to find facilities and infrastructure geared towards waste reduction, especially bio-waste. Our results suggest that individuals living in metropolitan and urban produce more food waste compared to those in rural areas. This might be more related to sociologically-oriented reasons, or might be due to the better availability of and access to composting – either in domestic or public sites - in rural areas.

5. Conclusions

This article highlights the need to tackle the challenges related to waste and the effective reduction of food waste in society. Although waste prevention is at the top of the waste agenda, it is rarely a specific policy target. Some areas, such as the EU, have introduced medium-long term targets to achieve absolute decoupling between consumption and urban waste generation, with the ambitious objective of reducing the generation of individual waste. This is a huge challenge for European societies, as much as the objective of cutting CO_2 emissions by 40% by 2030, and will require technological and behavioral innovations. Environmental policy packages should take account of the socio-economic features that characterise waste-related behavior.

We have analysed the role of people's preferences and attitudes. We specifically address the role of intrinsic and extrinsic motivations related to waste management behavior. The measurement of intrinsic and extrinsic motivations aims to operationalise the conceptual framework: the available measures represent a first attempt to identify the motivations that lead individuals to reduce the amount of waste they produce. Further research is encouraged.

The evidence derived from data from a large EU consumer survey shows that, in the case of food waste prevention, behavior mainly depends on intrinsic motivations. Although on the one hand, various geographical and macro policy factors play a significant (expected) role; on the other, micro economic factors significantly impact on people's decision to reduce the amount of bio waste they produce. 'Waste reducers' tend to exhibit an altruistic motivation which is not necessarily associated with either economic incentives or social norm pressure. Those who reduce bio waste the most are not driven by the set of potential extrinsic motivations. Our extrinsic motivation variables are empirically compelling since they express green preferences that are strongly characterised by consumption-related behavior. A large part of recycling

[31] Though the effect disappears when other structural controls are included. Gender should be further explored in relation to research on the economics of waste.

attitudes relate to the consumption of green products. To sum up, 'recyclers' or 'green consumers' are not necessarily 'waste reducers'.

Though further research is needed to empirically verify the hypothesis using new data for other institutional contexts, people displaying the characteristics of 'waste reducer' are essentially different from 'recyclers', who might express green preferences (e.g. buying recycled goods) that are visible, social and are not automatically correlated with waste-reducing actions. We do not claim that recycling and waste reduction are necessarily in conflict, but that the 'recycling attitudes' of individuals are not (always) sufficient to promote waste reduction dynamics.

Policy interventions in the waste management realm should respond both to consumers' reactions to economic incentives and to the psycho-social content of preferences, and should also pay attention to the different recycling and waste reduction responses induced by different motivations. Municipalities and individuals might show improved recycling performance while also showing an increased production of waste. These facts are not inconsistent. The inconsistency might stem from the excessive emphasis that society puts on recycling, which is an intermediate waste policy target according to the waste hierarchy. On the one hand, incentives and facilities to encourage recycling may have positive effects on waste reduction, by stimulating a pro-environmental lifestyle and by affecting people's cultural learning of new preferences (Bowles and Polania-Reyes, 2012). On the other hand, they may have negative consequences due to a sort of multi-tasking effect (à la Holmstron and Milgrom, 1991) where the individual devotes less effort to waste reduction since it lacks any formal incentive compared to those related to recycling efforts. There can be a sort of trade-off between the two pro-environmental activities, so that individuals might feel some obligation to recycle but none to consider reducing their waste. The option of recycling may even induce an increase in waste production by mitigating the guilt associated with wasteful consumption (Catlin and Wang, 2013).

The current policy framework aimed at waste prevention is in its infancy and waste reduction is largely driven by intrinsic motivations. How to encourage non-intrinsically motivated people to engage in waste reduction requires careful consideration. Although standard economic tools can act as incentives for hidden actions (such as waste reduction), intrinsic motivations can be negatively affected if a previously non-monetary relationship is transformed into an explicitly monetary one. As Beretti et al. (2013) show, the crowding out effect of monetary incentives can become a crowding-in effect if individuals can choose whether to accrue economic rewards themselves or to support environmental causes. On this basis, a fiscal strategy could be one that allows people to decide how the money derived from a Pigouvian tax on the quantity of waste generated can be used in supporting a general environmental task.

In this context, it is important to consider policy instruments that positively influence motivations. Pricing in the waste realm should complement government campaigns aimed at increasing information and awareness about the waste problem.

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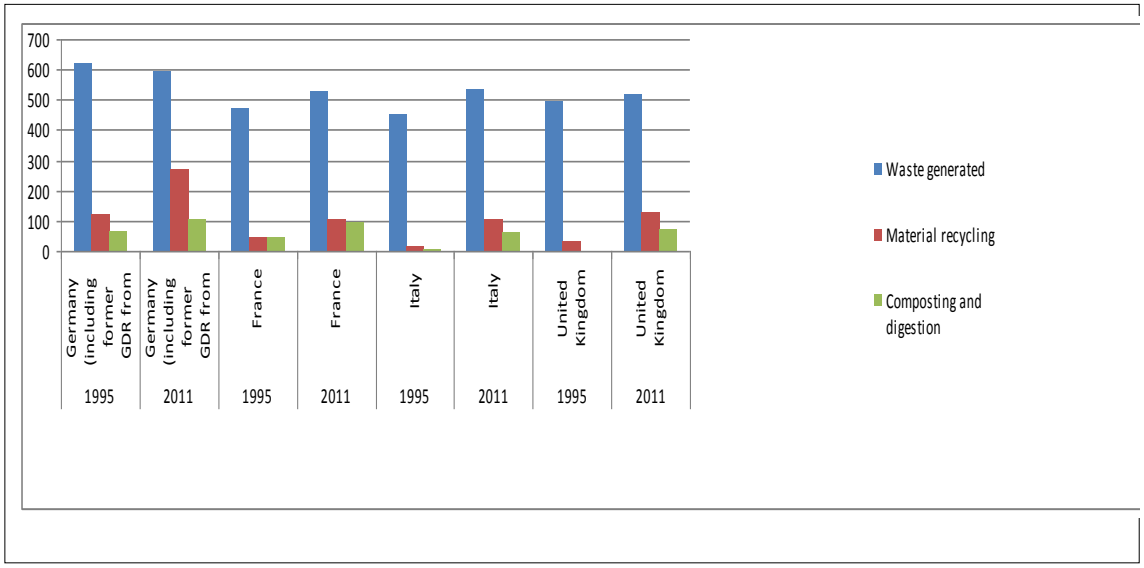
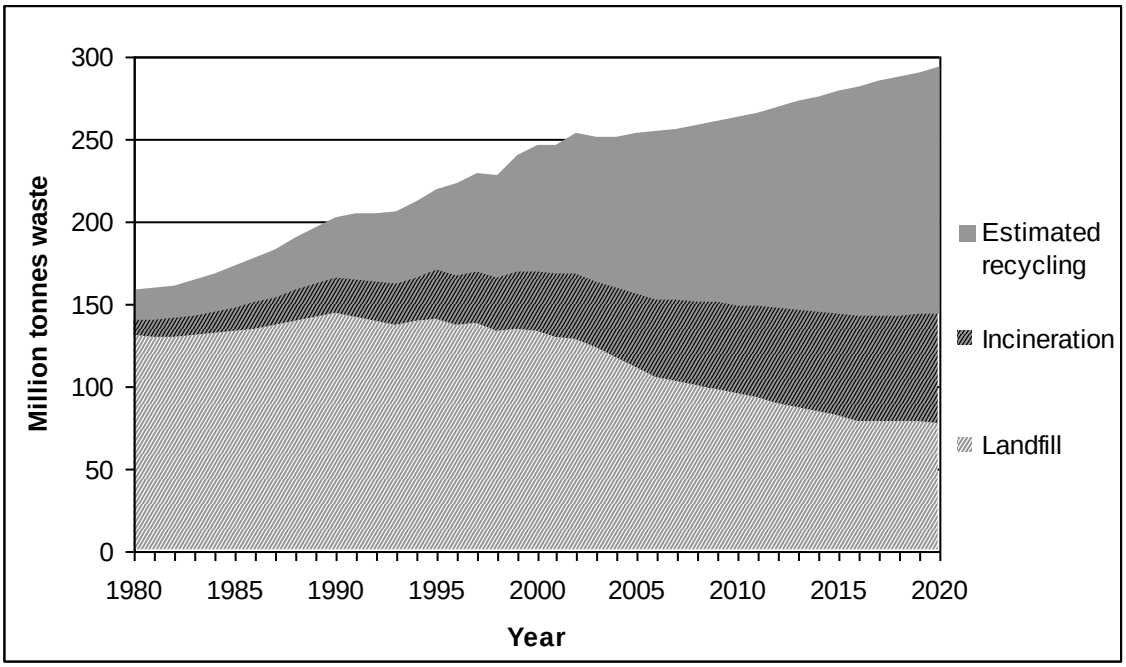
Appendix

Figure A1 – Waste generation. Recycling and composting in main EU countries



Source: Eurostat. 1995 and 2011 data (access to Eurostat site in June 2013).

Figure A2 – Waste projections



Source: EEA. 2009

Table A1: National policy indicator in 2006

Country	**Waste policy indicator level in 2006**
Austria	0.75
Belgium	0.95
Cyprus	0.35
Czech Republic	0.65
Denmark	0.95
Estonia	0.6
Finland	0.8
France	0.8
Germany	0.85
Greece	0.1
Hungary	0.65
Ireland	0.3
Italy	0.45
Latvia	0.45
Lithuania	0.8
Luxembourg	0.6
Malta	0.3
Netherlands	0.75
Poland	0.65
Portugal	0.45
Slovakia	0.65
Slovenia	0.7
Spain	0.45
Sweden	0.85
United Kingdom	0.55

Source: EEA EIONET (2006) data sources

Table A2. Ordered logit predicting percentage of food waste produced with regional dummies and policy index

	(e)		(f)		(g)	
AGE	-0.027***	(0.004)	-0.028***	(0.003)	-0.037***	(0.003)
AGESQ	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)
MALE	0.026	(0.019)	0.039**	(0.018)	0.009	(0.017)
SELF EMPLOYED	0.034	(0.036)	0.034	(0.033)	0.056*	(0.033)
EMPLOYEE	0.075***	(0.025)	0.100***	(0.023)	0.081***	(0.023)
MANUAL WORKER	-0.039	(0.044)	-0.029	(0.040)	0.063	(0.039)
UNEMPLOYED	Ref.		Ref.		Ref.	
STUDENT	0.073***	(0.023)	0.137***	(0.021)	0.053**	(0.021)
HIGH EDUC	0.005	(0.023)	-0.068***	(0.021)	0.027	(0.021)
METROP	0.116***	(0.025)	0.137***	(0.023)	0.168***	(0.027)
URBAN	0.092***	(0.022)	0.081***	(0.020)	0.129***	(0.020)
RURAL	Ref		Ref.		Ref.	
MINDED LAW	0.003	(0.019)	0.008	(0.018)	-0.000	(0.018)
MINDED COLLECTION	0.019	(0.020)	0.010	(0.018)	0.017	(0.019)
GREEN_ATTITUDE	0.100***	(0.025)	0.122***	(0.023)	0.051**	(0.022)
INTR-MOTIVE	-0.026	(0.027)	-0.067***	(0.025)	-0.078***	(0.024)
TOBUY1	0.182	(0.111)				
TOBUY2	0.258**	(0.110)				
TOBUY3	0.431***	(0.129)				
TOBUY4	0.210*	(0.111)				
TOBUY5	Ref					
EASTERN_EUROPE	-0.507***	(0.030)				
NORTHERN_EUROPE	0.061**	(0.024)				
SOUTHERN_EUROPE	-0.054	(0.037)				
WESTERN_EUROPE	Ref.					
POLICY2006	-0.402***	(0.059)	-0.407***	(0.041)		
REGIONAL DUMMIES					Yes	
cut1_cons	-2.287***	(0.147)	-2.388***	(0.079)	-2.464***	(0.173)
cut2_cons	0.061	(0.146)	-0.145	(0.077)	-0.099	(0.172)
cut3_cons	0.986***	(0.146)	0.740***	(0.077)	0.819***	(0.172)
cut4_cons	1.605***	(0.149)	1.352***	(0.080)	1.443***	(0.174)
Wald chi2	1555.37		1517.69		3170.62	
Pseudo R2	0.0602		0.0456		0.0940	
N	16629		19117		20650	

Standard errors in parentheses

* p<.10, ** p<.05, *** p<.01

Table A3: Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
FOODWASTE	1	1																			
AGE	2	-.246	1																		
MALE	3	.011	-.030	1																	
SELF EMPLOYED	4	.012	-.057	.118	1																
EMPLOYEE	5	.081	-.267	-.017	-.265	1															
MANUAL WORKER	6	.002	-.106	.105	-.088	-.209	1														
UNEMPLOYED	7	.040	-.021	.027	.083	.235	-.110	1													
STUDENT	8	.019	-.065	.005	.058	.227	-.051	.554	1												
HIGH EDUC	9	.036	-.046	.005	-.005	.055	-.020	.119	.065	1											
METROP	10	.020	.013	-.003	-.030	.004	-.002	.019	.022	-.442	1										
URBAN	11	-.050	.025	-.001	.035	-.050	.018	-.118	-.076	-.374	-.667	1									
RURAL	12	.009	-.007	.010	.003	.005	-.003	.012	.021	-.005	-.017	.022	1								
MINDED LAW	13	-.001	.017	-.009	-.031	.010	.006	.001	.003	.004	.017	-.021	.233	1							
MINDED COLLECTION	14	.012	.063	-.081	-.005	-.017	-.009	.013	-.005	-.025	-.008	.029	.048	.074	1						
GREEN_ATTITUDE	15	-.030	.046	-.015	.007	.024	-.025	.010	.020	-.023	-.021	.041	.039	.039	.039	1					
TOBUY1	16	-.024	-.012	-.003	-.011	-.017	.022	-.039	-.021	-.011	-.007	.016	-.025	-.010	-.061	.001	1				
TOBUY2	17	.033	-.049	.012	.020	.035	.006	.038	.036	.014	.002	-.014	-.003	-.012	-.017	-.006	-.497	1			
TOBUY3	18	.021	.005	.016	-.007	-.022	-.001	-.023	-.022	-.006	.018	-.013	.011	.002	-.014	-.001	-.069	-.151	1		
TOBUY4	19	-.018	.056	-.016	-.010	-.014	-.024	.000	-.011	-.004	-.002	.005	.023	.025	.077	.006	-.287	-.628	-.087	1	
TOBUY5	20	-.024	.043	.005	.001	-.020	-.008	-.003	-.019	-.004	-.001	.005	-.008	-.015	.006	.004	-.040	-.088	-.012	-.051	1