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

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Summary

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Keywords: Intrinsic Motivations, Extrinsic Motivations, Social Norms, Recycling, Waste Reduction, Green Preferences

JEL Classification: Q53, R11, K42

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WASTE PREVENTION AND SOCIAL PREFERENCES: THE ROLE OF INTRINSIC AND EXTRINSIC MOTIVATIONS

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Abstract

Though reduction is at the top of the waste management hierarchy, EU policies have historically introduced waste management incentives mainly concerning waste recovery and recycling, in addition to actions aimed at reducing disposal in landfills. Only very recently have EU policies started defining targets for waste reduction. Against this backdrop, we aim to examine whether individual behavior towards waste reduction is more strongly driven by extrinsic motivations such as social norms, or intrinsic motivations such as purely altruistic preferences. We exploit a large new survey that covers thousands of individuals for the EU27, to test the role of motivations when people are faced with collective management of the public good. We find that diverse motivations are behind the reduction of food waste: extrinsic motivations nevertheless increase the likelihood of producing more waste. Green consumption / recycling-oriented attitudes and individualistic thinking about waste management relate to 'waste producers'. This shows that in order to go beyond a recycling-oriented society towards reduction of the source of waste externality – its generation – the nature of social preferences matters. Behavior patterns leading to waste reduction are less socially oriented, less exposed to peer pressure and more reliant upon purely 'altruistic' social attitudes. Policy makers should learn from the relevant insights on social behavior we here address if our societies aim to fully integrate the idea of waste reduction alongside recycling in the future.

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

JEL: Q53, R11, K42

Introduction

Though waste generation reduction is at the top of the 'waste hierarchy' (Pearce, 2004), a real decoupling between waste generation[1] and consumption has never taken place, despite the fact that policy efforts have intensified to tackle waste-related externalities and recycling markets have flourished giving birth to real 'industries' related to 'waste recycling chains' (Kinnaman, 2006; Mazzanti and Zoboli, 2006). Reasons for this lack of decoupling are to be found in the (excessive) policy focus on management and disposal rather than on waste reduction at the source (Mazzanti and Montini, 2009; D'Amato et al. 2013; Viscusi et al., 2011). The latter is relatively more expensive as an option; it requires rethinking consumption and production strategies, namely behavioral and technological 'innovations'. Thus, even the boost in recycling can be questioned regarding its long term social benefits, too much policy and media attention on recycling may bring about distorted perceptions: society 'feels good' about recycling more, while the real key objective is to reduce the amount of waste being produced – in both relative and absolute terms. Beyond emission level regulations, it is rare to find policy targets defined in terms of the 'reduction' of environmental burdens, in this case the amount of waste generated per capita/per GDP unit. Though the EU has especially introduced various Directives in the waste realm (Packaging Directive, Landfill Directive among others, Nicolli and Mazzanti, 2011), we have seen only minor achievements toward the key objective of reducing waste generation, which still has not decoupled from consumption growth (EEA, 2009)[2]. Most efforts have been targeted towards increasing recycling and better managing disposal. While these are desirable and socially beneficial goals, they are not sufficient for long run sustainable targets. On the heels of the new target scenarios suggested by the 2008 Waste framework Directive that indicate waste per capita reduction targets to EU countries, there is room and need for a better understanding of the levers behind waste reduction. Societies need to 'move up the waste hierarchy' (EEA, 2013).

Since the adoption of the EU Strategy on the prevention and recycling of waste in 2005, national waste legislations have proved more effective in improving the overall recycling rates and in reducing the amount of waste going into landfills. Between 1998 and 2008, the recycling and

[1] Waste generation is alternative to waste production. It is technically waste being collected, that is waste collection and generation/production are alternative definitions.

[2] See Figure 1, which presents waste generation, recycling and composting trends in the EU regarding Municipal Waste Generation (MSW). Besides Germany, main countries and Europe as a whole has not achieved a reduction of waste generation. EEA (2013) states that "If 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 what the EEA found some years ago (See Figure 2 as well, from EEA (2009)).

composting of municipal waste increased from 19% to 38% at the EU level and the amount of landfilled waste decreased from more than 50% to 40%[3]. Improvements in recycling rates, however, have not been accompanied by comparable improvements in waste minimization. Although waste prevention is at the top of the 'waste hierarchy' (as the most desirable option compared to recycling, re-use and recovery, and much more advantageous than landfill), the amount of waste generated (and collected) in the EU is still rising. It is only very recently that the EU has set targets on waste prevention for the future[4]. The road is paved by many difficulties given the current stagnation, which does not help in emphasizing environmental targets, while the costs of waste prevention are higher on average and actions resulting in waste reduction imply radical changes in behavior and life style. This suggests that the combination of economic tools (such as taxes and charging schemes, as well as EPR principles) introduced by legislation have provided stronger incentive towards recycling than waste reduction.

Ex post analyzes of past policies have shown that at various scale levels (e.g. the EU, individual states) policies have succeeded at targeting disposal and recycling, but not waste generation (among others, Mazzanti and Zoboli, 2009). For what concerns waste (municipal solid waste), the forecasts show an increasing generation of waste, but decreasing amounts of waste sent to landfills, as ever more waste is incinerated or recycled (Andersen et al., 2007). Achieving the reduction of waste produced per capita in the EU requires the design of waste-prevention policies. Similarly, the policy target of reaching 'zero landfill' by 2020 would seem a rather unlikely achievement (ETC/SCP, 2012).

[3] The Eurostat news release 33/2013 of March 2013 shows up that in 2011 recycled or composted municipal waste is 40% compared to 27% in 2001. Nevertheless, in addition to evident country heterogeneity, the amount generated is still high: even a country such as Denmark peaks at a top level of 718 kg per capita. Germany, Italy, Spain and the UK are between 500 and 600. Recycling is most common in Germany, the only country that shows real decoupling (Nicolli et al., 2012), incineration peaks in Denmark, composting in Austria. Different countries have specialised in diverse waste management and disposal infrastructures, without tackling the challenge of waste reduction at source.

[4] We refer to the site http://scp.eionet.europa.eu/facts/WPP, where it is stated that 'The revised EU Waste Framework Directive (2008/98/EC) requires that by 12 December 2013 Member States establish national waste prevention programmes. According to Article 30 (2) of the WFD, the European Environmental Agency (EEA) is invited to include in its annual report a review of progress in the completion and implementation of waste prevention programmes'. Some national prevention programmes which were already developed in accordance with Article 29 in the Waste Framework Directive are now under discussion. 'Waste prevention is defined in Article 3 (12) (2008/98/EC) as: "prevention" means 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. According to Article 29 (2008/98/EC) the waste prevention programmes have to be evaluated at least every sixth year. They shall be integrated either into the waste management plans or into other environmental policy programmes, as appropriate, or shall function as separate programmes' (http://scp.eionet.europa.eu/facts/WPP).

Policies may well be reshaped to reduce waste generation and are needed given the externalities involved in waste production and disposal (Brisson and Pearce, 1995; Pearce, 2004). Policies are not the only possible source of change. Individual motivations are certainly also influenced by a change of relative prices, though other factors are in place as well. One key example is the mixed-good nature of many environmental goods, which applies to waste as well. The context of impure (or mixed) public good provision (Cornes and Sandler, 1984, 1986) can be relevant for explaining much environmentally related behavior. It is here worth noting that the early adoption of an impure public good approach to better understand an activity such as philanthropy in Cornes and Sandler (1984) was further developed by Andreoni (1989, 1990) in his well-known specification of warm-glow giving. The concept and theoretical models of mixed public goods have been applied extensively to environmental issues (Bahn and Leach, 2008; Ekins, 1996; Kotchen, 2005; Kotchen and Moore, 2007; Markandya and Rübbelke, 2004; Pittel and Rübbelke, 2010; Rübbelke, 2002; van't Veld and Kotchen, 2011). On this basis, even with the lack of stringent environmental policy framework, firms and consumers could contribute to environmental damage reduction. Although economic tools have some impact in positively affecting waste management, it is now widely agreed that individual decisions about what to buy and how to dispose of goods play a fundamental role in waste prevention and recycling programs. A clear understanding of all factors influencing individual behaviors is then essential in order to effectively tackle the problem of waste.

Economic literature has provided evidence at various levels, macro, meso (regional, municipality) and micro, which proves useful when studying the various waste determinants and effects of policy. Due to the relatively better data available and policy relevance, most studies have focused on macro/meso settings (Johnstone and Labonne, 2004; Shinkuma and Managi, 2011; Mazzanti and Montini, 2013). Relevant factors appear to belong to social, economic and policy spheres. Within this literature, several works have recently concentrated on waste generation and disposal drivers, focusing on the analysis of regional frameworks (Hage and Soderholm, 2008; De Jaeger and Eyckmans, 2008, Dijkgraaf and Gradus, 2009, 2004; Allers and Hoeben, 2010), which sometimes provide hints of a more microeconomic flavour.

Micro economic studies are also crucial, since they offer the possibility to study waste-related issues in strict connection with economic theory (Viscusi et al. 2011). The intrinsic limit is that their survey-based nature often constrains the available dataset to a regional setting, or generally prevents a study from achieving totally generalizable results. Some US-based studies that use individual and site datasets have recently appeared (Gumber-Rubandrian and Timmins, 2011; Viscusi et al. 2011).

The contribution of Viscusi et al. (2011) is especially relevant for our analysis, given that it investigates the role of 'social norms' and 'pro environmental behavior' with reference to plastic recycling. We intend to offer complementary insights within such a microeconomic-based stream of research.

In the present article, we specifically aim at investigating individual behavior towards waste reduction and recycling. We develop a conceptual framework that revolves around the motivations other than economic incentives that induce people to engage in pro-environmental behavior. We take into account the role of waste management and policies among the possible levers of such behavior. We exploit a recent EU survey, administered in 2011 to around 22000 individuals in all European countries, in order to derive information on waste related behavior – reduction of food waste and recycling attitudes[5] - as well as related preferences.

We study different factors that can potentially induce individual behavior to increased waste recycling and reduction. The first factor postulates that agents only react to economic incentives provided by the government, such as taxes and subsidies (disposal fees or recycling subsidies). The second takes into account motivations that go beyond the economic incentives provided by the government. We disentangle intrinsic and extrinsic factors. In the first case (intrinsic motivations), agents obey to an individualistic-based altruism and make pro-environmental choices that maximize both social and individual welfare (as in the case of Andreoni's (1989, 1990) pure or impure altruists). In the second case (extrinsic motivations) agents are induced to engage in pro-environmental behavior by reasons linked to perceived external pressure as defined by Tirole and Bènabou's (2006) reputational concerns.

Within this setting, we specifically aim at testing whether individual behavior towards waste reduction and recycling is mostly driven by intrinsic or extrinsic motivations. In particular, we want to investigate if only intrinsic motivations hold in waste reduction, whereas in waste recycling both intrinsic and extrinsic motivations may play a role. The analysis econometrically investigates whether these effects are significant among the many socio economic drivers. We verify such effects with reference to 'food waste' (e.g. bio-waste), a key element of waste generation whose generation is effectively linked to individuals' daily behavior.

[5] Particular attention should be addressed to the waste reduction in bio-waste as they represent a large share of waste production in household. Bio waste is the specific target that the EU Landfill Directive addresses. We provide more insights below.

The paper is organized as follows: §2 discusses the conceptual framework of pro social behavior and warm glow giving, § 3 presents the dataset and main features of socio economic information of respondents, § 4 shows the econometric evidence, §5 concludes and gives ideas for further research.

2. Conceptual framework

The motives that induce people to engage in pro environmental behavior may go beyond simple Pigouvian economic instruments. There is a significant current in the literature[6] that has analyzed agents' environmental behavior in the context of the mixed public good, where the benefit deriving from the private component of the good leads to individual equilibrium choices that support environmental targets: these 'choices' often go beyond legal and contractual obligations. In addition, great interest has been devoted to including individual environmental behavior within psychological literature (Barr et al., 2001; De Young, 1996). In these works, the non-pecuniary levers of environmental behavior are attributed to different norms of behavior as altruism, social or moral norms, warm-glow and eco-centrism. Regions and countries where waste policies are not characterized by Pigouvian elements show significant performances regarding recycling and other waste indicators. Cost recovery tools or simple public expenditures that provide infrastructure (e.g. curb-side collection) support environmental behavior. Social norms, warm-glow giving, intrinsic and extrinsic motivations and other social preferences detached from strictly 'economic' incentives may well support recycling and waste reduction behavior (Abbott et al., 2012).

For what concerns waste recycling and reduction, analysis of pecuniary and non-pecuniary incentives is even more challenging if we compare waste realms to other environmental externalities, since the related environmental actions generally present low individual benefits and high opportunity cost of time. The importance of non-monetary incentives in waste recycling has already been emphasized in literature (Berglund, 2006; Brekke et al. 2003, 2007, 2010; Hage et al. 2009; Halvorsen, 2008). Kinnaman (2006) indeed suggests that the benefits of recycling households are 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[7]. Viscusi et al. (2011) show that in the recycling of plastic water bottles, private values, such as pro-environmental behavior, prove more effective than external norms and economic incentives.

What the literature has emphasized is that economic incentives play a marginal role in the

[6] Bahn and Leach (2008); Ekins (1996); Kotchen (2005); Kotchen and Moore (2007); Markandya and Rübbelke (2004); Pittel and Rübbelke (2010); Rübbelke (2002); van't Veld and Kotchen (2011).

[7] "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).

individual's pro-environmental behavior; other motivations, namely the drivers of pro-environmental behavior, must thus be considered.

This article aims at analyzing specific motivations within the non-pecuniary incentive pool. We empirically test such motivations through data deriving from an original survey administered in an institutional environment where economic incentives do not predominate. In order to design policy recommendations, it is particularly important to distinguish between *intrinsic* and *extrinsic* motivations in individual behavior[8]. Indeed, we argue that waste-oriented conduct (namely waste recycling and waste reduction, pillars in the waste management hierarchy) may well be driven by these two sets of motivations in different ways.

First of all, then, it is worth focusing on *intrinsic* and *extrinsic* motivations. In the set of *intrinsic motivations* we include beliefs that are endogenously determined by individuals and that induce behavior which maximizes both social and individual welfare. *Warm-glow* and *joy of giving* enter the category of intrinsic motivation, where Andreoni's (1989, 1990) *impure altruists* and Becker's (1974) *altruists* are individuals characterized by intrinsic motivation. It is not relevant if a contributor to a mixed public good, in pursuing the maximization of social welfare, also aims at maximizing his own utility function through the 'warm-glow' he gets from his own giving, or if he merely considers the maximization of social welfare, thus complying with an ideal of social income and social welfare function. What we want to point out is that agents driven by intrinsic motivations are interested neither in peer (social) approval nor in pecuniary rewards. They obey 'individualistic based altruism' (e.g. driven by bequest values, inter-generational preferences, etc.).

In the category of *extrinsic motivations* we include reasons that are ascribable to 'perceived external pressure'. We hence consider motivations related to the individual's need to gain social appraisal in this set. Tirole and Bènabou's (2006) *reputational concerns* enter this category. The agent is here interested in fostering a good self-image and in his choices he is influenced by the potential positive or negative judgment of society[9]. In the case of extrinsic motivations, the relevant variables of the agent's benefit function are not the public good or the individual contribution to the public good, but the *social rewards* that derive from the pro-social behavior of the agent. Beyond any considerations about egoistic or altruistic purpose, agents' behavior in the case of extrinsic motivation is not so different from behavior driven by economic incentives provided by the

[8] We take a different approach with respect to Halvorsen (2008) who considers warm-glow and social norms as inseparable reasons for the pro-environmental behavior of agents.

[9] Differences among intrinsic and extrinsic motivations are treated in Viscusi et al. (2011, p. 65) as *private values* 'reflected in becoming upset at neighbors not recycling' and *external norms* 'reflected in their beliefs about what their neighbors might think of them'.

government, such as taxes and subsidies. In the latter case, economic gains and not social rewards enter the agent's benefit function, but in any case it is not the public good as a whole or an individual contribution to the public good which drives this behavior.
For what concerns the individual behavior in our analysis, primarily focused on actions aimed at waste reduction[10], the main difference is that while recycling may be evident to the "*neighbors*' eyes", reduction is a private action which is unlikely to be observable by others.
On the basis of the considerations illustrated above, we formulate our research hypothesis:

While both intrinsic and extrinsic motivations may incentivize waste recycling, only intrinsic motivations are relevant in individual waste reduction.

Some implications in terms of policies derive from our analysis. Since waste reduction is not driven by extrinsic motivations, economic incentives may be considered, with no concern about an over-justification effect. As well analyzed by literature (Thogersen, 2003; Tirole and Bènabou, 2006), this effect may lead to a motivational crowding out, since economic incentives for agents contributing to the public good which are too high may induce suspicion in society and social approval may convert into social stigma. With economic incentives individuals cannot demonstrate their performance of an activity for reasons other than pecuniary ones. Obviously, this crowding out effect may arise only when motivations are extrinsic and social rewards are the levers of pro-environmental behavior. In the case of waste reduction, since no extrinsic motivations work, economic incentives may be considered for individuals who are not spontaneously driven by intrinsic motivations.

In the analyzes which follow, we will empirically analyze what the determinants of increasing individual waste reduction are and we will empirically test our research hypothesis. We analyze the motivations behind waste reduction with a focus on bio-waste, namely food waste. While this is a highly relevant source of waste, due to scarcity of disaggregated data, specific analyzes lack. The EEA (2009) states: 'A study published by the UK Waste and Resources Action Programme (WRAP) shows that roughly one third of the food bought in Britain each year, or 6.7 million tonnes, is thrown away. Of this waste, 4.1 million tonnes are 'avoidable', i.e. it is food that is no longer wanted or it has been allowed to go past its best (around 70 kg per head)' (p.16). More broadly, bio waste, which is the focus of the 1999 EU Landfill Directive, including food waste, paper and

[10] Where 'waste generation' is statistically defined as the amount of waste one delivers to collection infrastructures. Waste generation or production is, formally speaking, 'waste which is collected'(EEA, 2009).

cardboard, as well as biodegradable textiles, make up a considerable share of municipal waste, approximately 60–70 % in most countries. EU figures (EEA, 2009, pp. 52-54) show that the generation of bio municipal waste (BMW) was relatively stable over the 1995–2006 period although its production varies between countries and regions (Figure 10.1). Italy experienced an increase in BMW generation of 20% while Finland, for example, experienced a decrease of 9%. We note that in some countries BMW is accounted for as constant share of management of solid waste (say 62%) while other countries attempt to generate specific figures. Though the amount of BMW being landfilled has reduced over the years in all countries (since 1995, the first year which presents official data), the latest data (2008) presents high variation across countries. It is worth investigating the causes of this variation through quantitative analyzes as a result. As some examples among others, Germany appears as the best-performing country with only 7% of the 1995 figure being landfilled in 2008, the Flemish region follows with 17% while Italy, Finland and Hungary lag behind with shares of 67%, 57% and 77% respectively.

Food waste is thus an interesting case study since it is a relevant source of BMW whose disposed share EU policies aim to drive down to zero (EEA, 2009). Waste reduction is clearly a pillar of this strategy. Technological options such as composting waste in small or large-scale plants and behavioral innovations in consumption – changing consumption habits by reducing consumption and/or shifting to goods that present less packaging - may reduce the amount of waste produced. The motivations behind waste reduction are multifold.

3. The Data

The empirical estimation is based on well-suited individual data, collected in 2011 by the EU (European Commission, 2011)[11] in all 27 European countries on the basis of an extended questionnaire. The dataset includes approximately 22,759 observations. The primary objective of the survey is to understand the attitudes of Europeans towards resource efficiency, as well as practices concerning resource efficiency, waste management and recycling.

The questionnaire was divided into 5 main sections: (a) socio-demographic data (b) general questions related to attitude toward waste management (c) information related to food waste (d) questions related to willingness to purchase recycled or second-hand products (e) questions to measure preferences in waste management.

[11] Flash Eurobarometer 316 -Attitudes of Europeans Towards Resource Efficiency

Regarding our variable of interest is FOODWASTE which is ordinal in nature and based on 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', ' 31% to 50%', 'More than 50%.* The descriptive statistics shows that 14% (3,187) of EU citizens declared they did not waste any of the food they purchased. This is not surprising since we should be aware of the fact that in rural areas food waste is normally recycled as an input to farming activities or composted in dedicated sites. The role of rural areas will be evident when discussing econometric outcomes. The majority of individuals, about 69.96 % (15,922) estimate that 15% or less of the food they purchased ended up being wasted. A further 12.55% (2,856) admitted that between 16% and 30% of the food they purchased went into the waste bin, 2.64 % (600) stated that between 31% and 50% of the food that they purchased was thrown out and 0.85% (194) estimated that more than 50% of the food that they bought they threw away. Across all countries, the Eastern countries are those that wasted less food with respect to others, again consistent with their larger share of rural areas.

Extrinsic motivations are captured by two main variables namely GREEN_ATTITUTE and INTRINSIC-MOTIVE. First, the key *social norm attitude* is measured by the variable GREEN_ATTITUTE which measures to what extent individuals evaluate the product's environmental impact[12] once they decide which products to buy (79%). This variable measures the real environmental engagement of individuals. Secondly, in order to measure the contribution of individuals to the '(mixed) public good' waste reduction, we include the dummy variable INTRINSIC-MOTIVE as an explanatory variable, which measures to what extent individuals prefer to pay an amount based upon to the *quantity of waste* that their household produces rather *than paying for waste management through their taxes*. The former is conceptually more Pigouvian in style, pricing waste according to effective production. The latter option is more inclined towards cost recovery strategies, funding public infrastructure (e.g. curbside recycling) that supports composting, recycling and proper disposal through waste taxes or tariffs. Statistics show that the largest majority of individuals, about 83.86 %, prefer the latter option. Individuals who prefer to pay taxes for waste management based on the quantity generated contribute to the public good quite independently upon their actions. This is clearly an attitude which relates to more altruistic preferences (intrinsic motivations) regarding the individual perspective on waste management.

Given that the EU allows room for shaping national policies towards the achievement of EU targets set by EU directives, it is relevant to evaluate the role of national policy commitment, namely the

[12] Whether the product is reusable or recyclable.

national commitment towards waste targets (WASTE POLICY 2006). Considering that the EU has set medium to long term targets (e.g. the 1999 EU directive defined targets on bio waste landfill reduction to be achieved by 2016), each country can flexibly 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 into the regression that characterizes to what extent each country is committed to and stringent on waste management and disposal. This variable is constructed using the EEA EIONET official EU source (on the basis of national factsheets[13]) data on 2006 (we introduce a lagged year with respect to 2011 to mitigate endogeneity). It assures a detailed bottom up perspective: the index is constructed on the basis of specific information that is present in the factsheet (Nicolli and Mazzanti, 2011; Mazzanti and Zoboli, 2009 for insights on index construction). This index is bound between 0.1 and 0.95, where a high value suggests a stringent waste management policy (Annexe Table A3). The countries that show the highest values are Denmark, Sweden, Belgium and Germany while Greece, Ireland, Malta and Cyprus have the least stringent policies. The index is necessary to capture 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' behavior. In addition to micro based levers, individuals are also embedded and placed in defined institutional environments that may contribute to influencing their behavior.

As far as socio-demographical variables are concerned, the average age of the population is about 54 years and 41% of individuals are male. Students represent 35.3% of the sample, the category "employee" represents 35.5% of the sample, 9.5% affirm they are self-employed and 6.7% manual workers[14]. Unemployed and retired people represent about 27.58% of the sample. The largest number of people declared to live in an urban area 44.7% and 19.3% in a metropolitan area.

We also include a series of dummy variables that measure green preferences namely the variable TOBUY1, TOBUY2, TOBUY3, TOBUY4, TOBUY5[15]. TOBUY1 indicates if the price affects the choice to buy recycled products. TOBUY2 measures if individual buys recycled products for their usability and quality. TOBUY3 measures whether individual wants to buy products for brand name. TOBUY4 indicates if individual wants to buy recycled product for their brand and TOBUY5 indicates if individual choices recycled products for other reason. Additionally, the dummy variable MINDED

[13] http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition.
[14] Employment variables as well as macro regional dummies capture income effects.
[15] This set of variables contains some non responses which reduces the observations once included into the regression.

LAW measures to what extent waste infrastructure can affect individual behavior. MINDED COLLECTION measures to what extent individuals believe that better waste collection services should be done to improve waste management. Table 1 presents all information on the set of covariates and Table A1 presents the correlation matrix of the covariates.

In order to consider country and regional fixed effects, we will include a set of dummy variables in the econometric specification. Firstly, we include the dummy variable measuring the country fixed effect for the 27 countries represented in our sample. Secondly, we include a set of dummy variables to measure heterogeneity among the Northern, Eastern, Central and Southern European macro regions. Thirdly, we include 202 regional dummy variables. The sample analyzed indicated the administrative regions where individuals live.

(Table 1 here)

4. Econometric evidence

Our results are illustrated in Tables 2 and 3. To test the robustness of our results we estimate different models, controlling for the presence of heteroskedasticity, and we report the results of the robust estimations. As the dependent variable is ordinal in nature, the Ordered logit has been used to estimate the different models. The ordered logit has the following specification (Cameron and Trivedi, 2010):

$$y_i^* = x_i'\beta + \mu_i$$

Where y_i^* is a latent variable measuring the level food waste, x_i is a set of explicative regressors (without an intercept), and u_i is an error term logistically distributed. Every person has its own y_i^*, which is determined by its characteristics x_i and unobserved factors u_i . They choose the category of y that represents most closely their y_i^*. So, for the 5 alternatives j (j=0 to 4) we define:

$$y_i = j \ if \ \alpha_{j-1} < y_i^* \leq \alpha_j \qquad j = (0,...,m)$$

Where $\alpha_0 = -\infty$ and $\alpha_m = \infty$, so:

$$\Pr(y_i = j) = \Pr(\alpha_{j-1} < y_j^* \leq \alpha_j)$$

$$= \Pr(\alpha_{j-1} < x_i\beta + u_i \leq \alpha_j)$$

$$= \Pr(\alpha_{j-1} - x_i\beta < u_i \leq \alpha_j - x_i\beta)$$

$$= F(\alpha_{j-1} - x_i\beta) - F(\alpha_j - x_i\beta)$$

Where F is the cumulative logistic function of u_i. The regression parameters, β, and the 3 threshold parameters α_1, α_2 and α_3 are obtained by maximising the log likelihood with $p_{ij} = \Pr(y_j = j)$ as defined above.

In Table 2, Specification (a) includes exclusively the individual variable with the measure of GREEN_ATTITUDE. Specification (b) estimates the effect the individual variables including both the GREEN_ATTITUDE and INTRINSIC MOTIVATION. Specification (c) includes the into the regression the country dummies to measure country specific effect. Specification (d) estimates the actual green attitude of individuals measured with the actual decision to buy recycled products with the set of dummies measuring the actual decision to buy recycled product. In Table 3 Specification (e) measures both the effect of stringent waste management policy in the behavior of individuals by adding a lagged country policy variable and the regional dummies while the Specification (f) includes only the national stringent policy index. Specification (g) includes into the regression the regional dummies to measure the unobserved local environmental heterogeneity. Table A2 presents the results of the estimation with the Tobit estimation[16].

We anticipate that main results are robust to the inclusion of country and regional dummies and country specific factors.

Econometric outcomes deliver messages that are coherent with our conceptual framework. If on the one hand some 'preferences' about law enforcement and collection do not prove significant; on the other, the two key variables we assess, GREEN_ATTITUDE, which captures extrinsic motivations, and INTR-MOTIVE, the variable that by our conceptual definition targets intrinsic motivation values attached to waste management policies, do provide relevant insights.

The effect of extrinsic motivations is positive and significant in four out of five regressions. It disappears only when we introduce the set of variables 'To Buy' (TOBUY1 – TOBUY5'), which captures diversified attitudes towards green consumption. All in all, the message is that extrinsic motivations that are chiefly related to the effects of social norms and imitative behavior due to peer pressure, does not drive down waste production. As we hypothesized, however, these can well make

[16] Results are robustly confirmed by a Tobit specification which provides robustness checks (Table A2).

a difference in recycling behavior (Abbott et al., 2012 presents related evidence through UK data), but not in actions aimed at reducing waste, which often lack the social and relational component. In effect, the coefficient sign is positive. This means that social norms may well be effective in increasing recycling insofar as it entails more reciprocity and visibility in terms of individual actions. We often confront ourselves with others' actions especially in densely populated dwellings and in residential neighborhoods. The 'green content' of recycling can nevertheless generate a cognitive and social lock in equilibrium that is detrimental to the real target of waste policy: reducing waste. Municipalities and individuals might well improve their recycling performances while they increasing the waste they produce. These factors are not inconsistent. The inconsistency lies within the excessive emphasis our societies have assigned to recycling, in itself a short-term target. The EU has in fact introduced member countries duties regarding the fixation of waste policy frameworks that aim at reducing waste produced. This is the '2020 and beyond' kind of target. Some countries have already defined general policy frameworks for that aim.

Our extrinsic motivation variables are empirically compelling since they express green preferences that are strongly characterized by consumption related behavior. This is exactly what we intend. A large part of recycling attitudes relate to the consumption of green products. These may certainly be more efficient in terms of resource use. Nevertheless, the emphasis is still on consumption choices. The issue remains that buying a green (e.g. recycled packaging) product is different from the decision to avoid consuming that packaging (e.g. by reducing consumption itself and/or refilling/reusing times the same recipient several times). Behavioral changes and 'innovations' are certainly needed to cope with the challenge of reducing waste. Summing up, 'recyclers' or 'green consumers' are not by any means necessarily 'waste reducers'.

On the contrary, it is extremely interesting to observe that, overall, the EU evidence shows us how intrinsic motivations may positively correlate with waste reduction. The variable INTRINSIC-MOTIVE that takes value 1 if an individual prefers to pay taxes for waste management based on the quantity generated and 0 otherwise, gives a positive sign. We recall that in our conceptual approach it is not relevant if a contributor to a mixed public good, in pursuing the maximization of social welfare, either aims at maximizing his own utility function too, through the warm-glow he gets from his own giving, or if he merely considers the maximization of social welfare, thus complying with an ideal of social income and social welfare function. What we wish to stress is that agents driven by intrinsic motivations are neither interested in peer (social) approval nor in pecuniary rewards. They conform to 'individualistic based altruism' (e.g. driven by bequest values, inter-generational

preferences, etc.). It would seem that this category of people is the closest we can observe to that of 'waste reducers': people whose behavior obeys neither to economic incentives nor to external peer pressure, both features of extrinsic motivations.

People who express altruism through preferences for a taxation that is independent of the amount of waste they produce 'paradoxically' tend to reduce more than others. On the other hand, those who ask for a Pigouvian tax, based on the quantity of waste generated, reduce less[17]. As highlighted in our theoretical framework, people who are not moved by intrinsic motivations maximize their benefit function either through social or pecuniary rewards. Since waste reduction is not an observable action[18], and hence no social rewards may result, these individuals ask for economic incentives to move towards pro-environmental behavior.

Finally, we observe that these key outcomes are robust with respect to the inclusion of 'regional dummies' (e.g. EU macro regions, which capture more heterogeneity than country dummies, see table 3) and to the introduction of a key factor such as the waste policy indicator. This introduces information about the waste policy environment, more or less committed to achieving EU targets, in which individuals are embedded. The index itself shows a negative sign of the coefficient in all regressions where it is included and does not alter the main results of the key variables. The 'policy environment' thus matters. The index explains more variance with respect to the country dummy and tells us that the framework in which individuals are embedded also influences their behavior.

As far as socio economic 'controls' are concerned, we note that the production of food waste increases with age, with additional positive effects driven by gender – women interestingly generate less waste[19] – and occupational status – employed people are likely to produce more waste . These were essentially expected outcomes.

Moving our attention to educational levels, we see that estimates do not provide crystal clear results. Student status is interestingly detrimental in terms of waste production; this is somewhat

[17] This may imply that policy makers should target waste reduction through economic incentives on a part of society. As it is now, in a brand new or non-existent policy framework aimed at waste prevention, waste reduction is driven by intrinsic motivations.

[18] 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 in the end an 'absence' of production, an invisible factor in itself.

[19] Though the effect disappears when other structural controls are included. Gender issues are a fruitful direction in the economics of waste research agenda.

surprising but it is probably due to the specific short-term perspective. In addition, students often live in metropolitan areas. People living in metropolitan and urban areas face more difficulties in finding facilities and infrastructure geared towards waste reduction, especially bio-waste. These arguments also apply to the sign and significance of the estimated coefficients we find for macro geographical factors (e.g. eastern EU countries producing, or rather collecting, less waste[20]).

(Tables 2-3 here)

5. Conclusions

The article emphasizes the need of tackling the new challenge coming from the waste realm: the effective reduction of waste produced by individual consumption. Though waste prevention is at the top of the hierarchy, it has been often overlooked as a real target. The first wave of waste policies has oriented the effort towards recovery and recycling, actions which nevertheless do not produce by themselves an integration between waste prevention and waste management. Some advanced areas such as the EU have recently introduced medium long term targets to achieve absolute decoupling between consumption and urban waste generation with the ambitious objective to reduce the production of individual waste. This is a dazzling challenge for our societies that weights as much as the objective of halving emitted CO_2 in the next 30 years; it involves technological and behavioral innovations. In a still infant policy environment as waste prevention, we analyze the role of people's preferences and attitudes. We specifically address the role of intrinsic and extrinsic motivations, namely the way people play in the waste realm according to more 'extrinsic' social norms and social pressures, or more 'intrinsic' altruistic motivations.

The evidence we derive from a large new EU consumer survey tells us that in the case of food waste prevention, sustainable behavior is firmly dependent on intrinsic motivations. Where various geographical and policy factors play a significant role (namely living in rural areas and in frameworks where policy commitment on waste is stronger) micro economic factors impact the decision to reduce the amount of bio waste individuals produce. 'Waste reducers' tend to exhibit a sort of altruistic motivation, which does not relate to economic incentives or social norm pressures.

This result seems to differ from recent evidence that regards recycling attitudes where economic

[20] Geographically speaking, it is also worth noting that southern EU countries do not differ in terms of performances with respect to the western EU, and while Northern countries often present good environmental performances, they here lag behind. This is not surprising given that the 'waste performance leaders' in the EU are Germany, Austria and Belgium (Flanders), while the UK among others has historically been penalized by waste performances.

incentives and social norms play a substantial role. It confirms a potentially different content of waste prevention opportunities, from both technological and behavioral perspectives. 'Waste reducers' are potentially different from 'recyclers', who express green preferences (e.g. buying recycled goods) that are visible, social and do not correlate with the action of reducing waste.

Policy making might be interested in understanding people's motivations behind waste prevention and recycling in order to formulate effective waste management actions. Policy interventions in the waste management realm should draw upon both consumers' reactions to economic incentives and on the psychological – social contents of preferences, giving attention to the different recycling and waste reduction responses as induced by diverse motivations.

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Table 1. Descriptive statistics

Variable	Description of the variables	Obs	Mean	St. Dev.	Min	Max
FOODWASTE		22759	2.063	.666	1	5
AGE	Indicates the age of the individuals	22759	54.79	16.894	15	99
MALE	Takes value 1 if individual is male and 0 otherwise	22759	.414	.493	0	1
SELF EMPLOYED	Takes value 1 if individual is self-employed and 0 otherwise	22759	.095	.293	0	1
EMPLOYEE	Takes value 1 if individual is employee and 0 otherwise	22759	.353	.478	0	1
MANUAL WORKER	Takes value 1 if individual is manual workers and 0 otherwise	22759	.067	.249	0	1
HIGH EDUC	Takes value 1 if individual is high educated and 0 otherwise	22759	.441	.497	0	1
STUDENT	Takes value 1 if individual is student and 0 otherwise	22759	.355	.479	0	1
METROP	Takes value 1 if individual lives in a metropolitan area and 0 otherwise	22759	.193	.395	0	1
URBAN	Takes value 1 if individual lives in an urban area and 0 otherwise	22759	.447	.497	0	1
RURAL	Takes value 1 if individual lives in country-side and 0 otherwise	22759	.360	.480	0	1
MINDED LAW	Takes value 1 if individual declares that stronger law enforcement should be done to improve waste management 0 otherwise	22759	.411	.492	0	1
MINDED COLLECTION	Takes value 1 if individual declares that better waste collection services should be done to improve waste management 0 otherwise	22759	.661	.473	0	1
GREEN_ATTITUDE	Takes value 1 if individual declares the product's environmental impact[21] influences the decision on what products to buy 0 otherwise	22759	.798	.402	0	1
INTRINSIC-MOTIVE	Takes value 1 if individual declares that she prefers to pay taxes for waste management based on the quantity generate and 0 otherwise	20650	.158	.365	0	1
TOBUY1	Takes value 1 if individual wants to buy recycled products for price reasons and 0 otherwise	19262	.187	.390	0	1
TOBUY2	Takes value 1 if individual wants to buy recycled products for quality/usability of the product and 0 otherwise	19262	.519	.500	0	1
TOBUY3	Takes value 1 if individual wants to buy recycled products for brand name of the product and 0 otherwise	19262	.021	.143	0	1
TOBUY4	Takes value 1 if individual wants to buy recycled products for environmental impact of the product and 0 otherwise	19262	.266	.442	0	1
TOBUY5	Takes value 1 if individual buys recycled products for other reasons and 0 otherwise	19262	.008	.087	0	1
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 North 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

[21] Whether the product is reusable or recyclable.

Table 2: Ordered logit predicting percentage of food waste produced (with country dummies, macro-regions and policy indicators)

	(a)		(b)		(c)		(d)	
AGE	-0.031***	(0.003)	-0.030***	(0.003)	-0.039***	(0.003)	-0.036***	(0.004)
AGESQ	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)
MALE	0.043***	(0.016)	0.032*	(0.017)	0.008	(0.017)	-0.001	(0.019)
SELF EMPLOYED	0.052*	(0.030)	0.058*	(0.032)	0.044	(0.033)	0.031	(0.036)
EMPLOYEE	0.099***	(0.021)	0.096***	(0.023)	0.071***	(0.023)	0.067***	(0.025)
MANUAL WORKER	-0.010	(0.035)	-0.018	(0.037)	0.056	(0.039)	0.030	(0.044)
HIGH EDUC	-0.043*	(0.023)	-0.072***	(0.025)	0.060**	(0.026)	0.052*	(0.028)
STUDENT	0.084***	(0.024)	0.043*	(0.026)	0.113***	(0.027)	0.095***	(0.029)
METROP	0.138***	(0.021)	0.143***	(0.022)	0.182***	(0.024)	0.168***	(0.026)
URBAN	0.095***	(0.018)	0.099***	(0.019)	0.121***	(0.020)	0.113***	(0.021)
RURAL	Ref		Ref		Ref		Ref	
MINDED LAW	0.022	(0.016)	0.015	(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	0.112***	(0.020)	0.130***	(0.021)	0.051**	(0.022)	0.027	(0.025)
INTR-MOTIVE			0.062***	(0.023)	0.075***	(0.024)	0.054**	(0.026)
TOBUY1							0.128	(0.114)
TOBUY2							0.186*	(0.112)
TOBUY3							0.382***	(0.130)
TOBUY4							0.116	(0.113)
TOBUY5							Ref.	
FRANCE					-0.105	(0.069)	-0.221***	(0.083)
BELGIUM					-0.047	(0.066)	-0.146*	(0.082)
THENETHERLANDS					0.156**	(0.066)	0.071	(0.079)
GERMANY					0.328***	(0.063)	0.219***	(0.077)
ITALY					0.360***	(0.064)	0.269***	(0.078)
LUXEMBOURG					0.594***	(0.062)	0.477***	(0.076)
DENMARK					0.527***	(0.060)	0.448***	(0.075)
IRELAND					0.606***	(0.063)	0.527***	(0.077)
UNITED_KINGDOM					0.400***	(0.065)	0.305***	(0.079)
GREECE					0.435***	(0.068)	0.355***	(0.082)
SPAIN					0.149**	(0.068)	0.094	(0.082)
PORTUGAL					-0.019	(0.074)	-0.133	(0.087)
FINLAND					0.093	(0.062)	-0.009	(0.077)
SWEDEN					0.277***	(0.063)	0.209***	(0.076)
AUSTRIA					0.173***	(0.064)	0.092	(0.078)
REPUBLIC_CYPRUS					0.823***	(0.070)	0.790***	(0.085)
CZECH_REPUBLIC					-0.742***	(0.070)	-0.858***	(0.085)
ESTONIA					-0.242***	(0.070)	-0.345***	(0.087)
HUNGARY					0.090	(0.071)	0.006	(0.086)
LATVIA					0.215***	(0.069)	0.131	(0.087)
LITHUANIA					0.021	(0.076)	-0.020	(0.098)
MALTA					-0.192**	(0.076)	-0.328***	(0.090)
POLAND					-0.238***	(0.066)	-0.248***	(0.082)
SLOVAKIA					-0.643***	(0.072)	-0.761***	(0.087)
SLOVENIA					0.032	(0.067)	-0.077	(0.083)
BULGARIA					0.040	(0.069)	0.057	(0.087)
cut1_cons	-2.091***	(0.066)	-2.106***	(0.070)	-2.275***	(0.088)	-2.238***	(0.153)
cut2_cons	0.106	(0.065)	0.110	(0.068)	0.073	(0.086)	0.183	(0.152)
cut3_cons	0.970***	(0.065)	0.987***	(0.068)	0.984***	(0.087)	1.127***	(0.152)
cut4_cons	1.562***	(0.068)	1.588***	(0.071)	1.603***	(0.089)	1.753***	(0.154)
N	22759		20650		20650		17636	

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

Table 3. Ordered logit predicting percentage of food waste produced with regional dummies

	(e)		(f)		(g)	
AGE	-0.028***	(0.004)	-0.027***	(0.003)	-0.036***	(0.004)
AGESQ	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)
MALE	0.025	(0.019)	0.039**	(0.018)	0.000	(0.019)
SELF EMPLOYED	0.034	(0.036)	0.038	(0.033)	0.031	(0.036)
EMPLOYEE	0.075***	(0.026)	0.104***	(0.024)	0.066**	(0.026)
MANUAL WORKER	-0.040	(0.044)	-0.023	(0.040)	0.029	(0.044)
HIGH EDUC	0.005	(0.029)	-0.068***	(0.026)	0.052*	(0.029)
STUDENT	0.080***	(0.029)	0.049*	(0.027)	0.096***	(0.029)
METROP	0.116***	(0.025)	0.137***	(0.023)	0.145***	(0.029)
URBAN	0.092***	(0.022)	0.081***	(0.020)	0.121***	(0.022)
RURAL	Ref		Ref		Ref	
MINDED LAW	0.003	(0.019)	0.007	(0.018)	-0.012	(0.019)
MINDED COLLECTION	0.019	(0.020)	0.010	(0.018)	-0.004	(0.020)
GREEN_ATTITUDE	0.100***	(0.025)	0.122***	(0.023)	0.026	(0.025)
INTR-MOTIVE	0.026	(0.027)	0.068***	(0.025)	0.058**	(0.027)
TOBUY1	0.183*	(0.111)			0.133	(0.115)
TOBUY2	0.259**	(0.110)			0.192*	(0.114)
TOBUY3	0.431***	(0.129)			0.399***	(0.132)
TOBUY4	0.211*	(0.111)			0.120	(0.114)
TOBUY5	Ref				Ref	
EASTERN_EUROPE	-0.507***	(0.030)				
NORTHERN_EUROPE	0.061**	(0.024)				
SOUTHERN_EUROPE	-0.054	(0.037)				
WESTERN_EUROPE	Ref					
POLICY2006	-0.401***	(0.060)	-0.409***	(0.041)		
REGIONAL DUMMIES					Yes	
cut1_cons	-2.261***	(0.145)	-2.309***	(0.077)	-2.403***	(0.236)
cut2_cons	0.087	(0.144)	-0.067	(0.075)	0.038	(0.235)
cut3_cons	1.012***	(0.145)	0.818***	(0.076)	0.991***	(0.235)
cut4_cons	1.632***	(0.147)	1.430***	(0.079)	1.622***	(0.237)
N	16629		19117		17636	

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

Appendix

Table A1. Correlation matrix among covariates

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
FOODWASTE	1	1																								
AGE	2	-.246	1																							
AGESQ	3	-.236	.983	1																						
MALE	4	.011	-.030	-.022	1																					
SELF EMPLOYED	5	.012	-.057	-.083	.118	1																				
EMPLOYEE	6	.081	-.267	-.323	-.017	-.265	1																			
MANUAL WORKER	7	.002	-.106	-.120	.105	-.088	-.209	1																		
HIGH EDUC	8	-.059	.068	.043	-.027	-.025	-.024	.110	1																	
STUDENT	9	.040	-.021	-.048	.027	.083	.235	-.110	-.686	1																
METROP	10	.036	-.046	-.039	.005	-.005	.055	-.020	-.097	.119	1															
URBAN	11	.020	.013	.016	-.003	-.030	.004	-.002	-.003	.019	-.442	1														
RURAL	12	-.050	.025	.017	-.001	.035	-.050	.018	.083	-.118	-.374	-.667	1													
MINDED LAW	13	.009	-.007	-.009	.010	.003	.005	-.003	-.001	.012	-.005	-.017	.022	1												
MINDED COLLECTION	14	-.001	.017	.012	-.009	-.031	.010	.006	.007	.001	.004	.017	-.021	.233	1											
GREEN_ATT	15	.012	.063	.055	-.081	-.005	-.017	-.009	-.013	.013	-.025	-.008	.029	.048	.074	1										
INTR-MOTIVE	16	.030	-.046	-.032	.015	-.007	-.024	.025	-.020	-.010	.023	.021	-.041	-.039	-.039	-.039	1									
TOBUY1	17	-.024	-.012	-.009	-.003	-.011	-.017	.022	.024	-.039	-.011	-.007	.016	-.025	-.010	-.061	-.001	1								
TOBUY2	18	.033	-.049	-.053	.012	.020	.035	.006	-.017	.038	.014	.002	-.014	-.003	-.012	-.017	.006	-.497	1							
TOBUY3	19	.021	.005	.011	.016	-.007	-.022	-.001	-.001	-.023	-.006	.018	-.013	.011	.002	-.014	.001	-.069	-.151	1						
TOBUY4	20	-.018	.056	.055	-.016	-.010	-.014	-.024	-.001	.000	-.004	-.002	.005	.023	.025	.077	-.006	-.287	-.628	-.087	1					
TOBUY5	21	-.024	.043	.045	.005	.001	-.020	-.008	-.002	-.003	-.004	-.001	.005	-.008	-.015	.006	-.004	-.040	-.088	-.012	-.051	1				
EASTERN_EUROPE	22	-.115	-.063	-.060	-.010	-.003	-.019	.032	.095	-.019	-.029	.070	-.048	.061	.093	-.012	-.014	.021	.006	.039	-.040	.013	1			
NORTHERN_EUROPE	23	.065	-.002	-.001	.017	-.023	.075	-.005	-.071	.082	.106	-.009	-.079	-.004	-.034	-.101	.050	.009	.043	-.050	-.038	-.010	-.366	1		
SOUTHERN_EUROPE	24	.080	-.077	-.078	-.008	.035	-.037	-.002	-.053	-.045	-.041	.087	-.056	-.053	-.037	.084	.002	-.018	-.035	.000	.054	.004	-.289	-.331	1	
WESTERN_EUROPE	25	-.029	.136	.132	-.001	-.007	-.026	-.024	.029	-.026	-.044	-.140	.182	-.007	-.022	.038	-.040	-.013	-.019	.014	.029	-.006	-.331	-.379	-.299	1

Table A2: Tobit Regressions predicting percentage of food waste produced (with country dummies, macro- regions and policy)

	(1)		(2)		(3)		(4)	
AGE	-0.019***	(0.002)	-0.020***	(0.002)	-0.020***	(0.002)	-0.017***	(0.002)
AGESQ	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)
MALE	0.008	(0.011)	-0.003	(0.011)	-0.002	(0.011)	0.016	(0.011)
JOB1	0.019	(0.020)	0.021	(0.020)	0.020	(0.020)	0.022	(0.021)
JOB2	0.033**	(0.014)	0.037***	(0.014)	0.037***	(0.014)	0.051***	(0.015)
JOB3	-0.022	(0.024)	0.018	(0.024)	0.017	(0.024)	-0.023	(0.025)
STUDENT	0.044***	(0.011)	0.026**	(0.011)	0.026**	(0.011)	0.048***	(0.011)
D6_METROP	0.064***	(0.014)	0.089***	(0.014)	0.075***	(0.016)	0.069***	(0.014)
D6_URBAN	0.060***	(0.012)	0.061***	(0.012)	0.065***	(0.012)	0.043***	(0.012)
O.D6_CAMPAGNA	Ref		Ref		Ref		Ref	
MINDED LAW	0.015	(0.011)	-0.006	(0.011)	-0.006	(0.011)	-0.000	(0.011)
MINDED COLLECTIOIN	0.017	(0.011)	-0.003	(0.011)	-0.004	(0.011)	-0.005	(0.012)
GREEN_ATTITUDE	0.062***	(0.014)	0.019	(0.014)	0.018	(0.014)	0.056***	(0.015)
INTRISIC MOTIVATION	0.026*	(0.016)	0.031**	(0.015)	0.034**	(0.015)	0.033**	(0.016)
TOBUY1	0.072	(0.063)	0.077	(0.061)	0.077	(0.061)	0.119*	(0.062)
TOBUY2	0.122**	(0.062)	0.109*	(0.060)	0.109*	(0.060)	0.169***	(0.061)
TOBUY3	0.236***	(0.075)	0.227***	(0.072)	0.232***	(0.072)	0.236***	(0.074)
TOBUY4	0.090	(0.063)	0.070	(0.060)	0.070	(0.060)	0.148**	(0.061)
EASTERN_EUROPE	-0.211***	(0.016)						
NORTHERN_EUROPE	0.052***	(0.013)						
SOUTHERN_EUROPE	0.058***	(0.016)						
WESTERN_EUROPE	Ref							
FRANCE			-0.123**	(0.048)				
BELGIUM			-0.076	(0.047)				
THENETHERLANDS			0.033	(0.045)				
GERMANY			0.114***	(0.044)				
ITALY			0.126***	(0.045)				
LUXEMBOURG			0.251***	(0.045)				
DENMARK			0.219***	(0.043)				
IRELAND			0.285***	(0.046)				
UNITED_KINGDOM			0.163***	(0.046)				
GREECE			0.181***	(0.048)				
SPAIN			0.040	(0.047)				
PORTUGAL			-0.086*	(0.049)				
FINLAND			-0.013	(0.044)				
SWEDEN			0.100**	(0.043)				
AUSTRIA			0.042	(0.045)				
REPUBLIC_CYPRUS			0.476***	(0.054)				
CZECH_REPUBLIC			-0.487***	(0.051)				
ESTONIA			-0.187***	(0.050)				
HUNGARY			0.004	(0.049)				
LATVIA			0.068	(0.051)				
LITHUANIA			-0.013	(0.058)				
MALTA			-0.187***	(0.051)				
POLAND			-0.144***	(0.046)				
SLOVAKIA			-0.421***	(0.052)				
SLOVENIA			-0.044	(0.047)				
BULGARIA			0.038	(0.051)				
REGIONAL DUMMIES					Yes			
POLICY2006							-0.232***	(0.026)
_cons	1.527***	(0.080)	1.574***	(0.086)	1.668***	(0.138)	1.543***	(0.079)
sigma								
_cons	0.691***	(0.007)	0.672***	(0.007)	0.668***	(0.007)	0.689***	(0.007)
N	17636		17636		17636		16629	

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

Table A3: National policy indicator in 2006

Country	Waste policy index 2006
Austria	0.75
Belgium	0.95
Cyprus	0.35
Czech Republic	0.65
Denmark	0.95
Estonia	0.60
Finland	0.80
Portugal	0.80
Germany	0.85
Greece	0.10
Hungary	0.65
Ireland	0.30
Italy	0.45
Latvia	0.45
Lithuania	0.80
Portugal	0.60
Malta	0.30
Netherlands	0.75
Poland	0.65
Portugal	0.45
Slovakia	0.65
Slovenia	0.70
Spain	0.45
Sweden	0.85
United Kingdom	0.55

Source : Our elaboration on EIONET (EEA) country factsheets.

Figure 1 – waste generation, recycling and composting in main EU countries

source: Eurostat, 1995, 2011

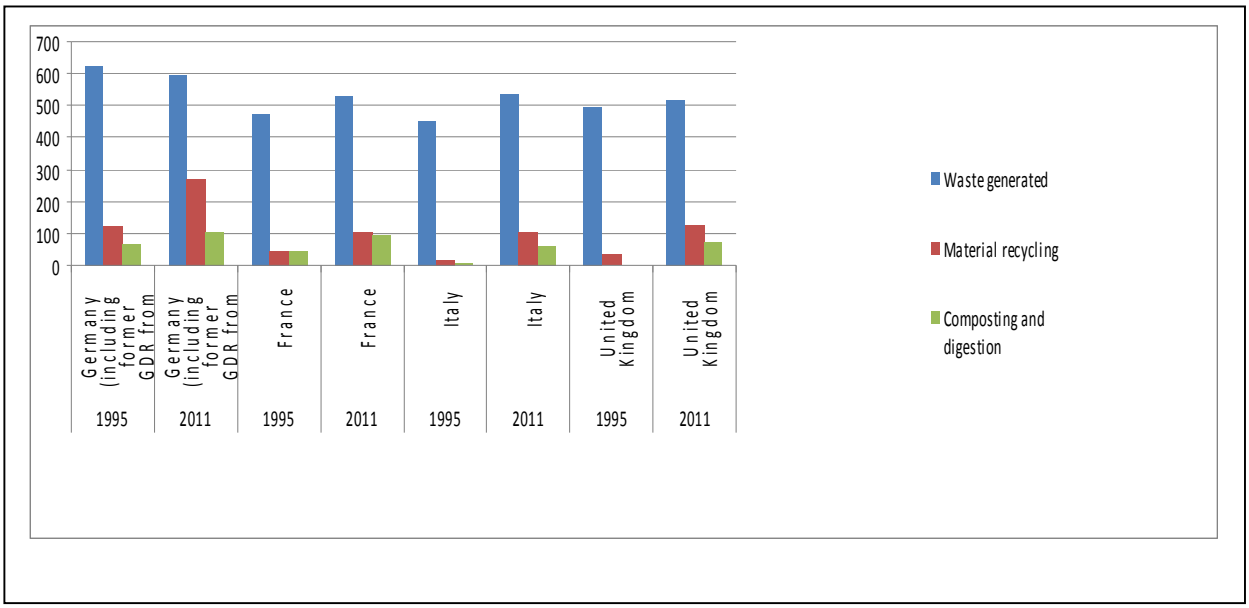
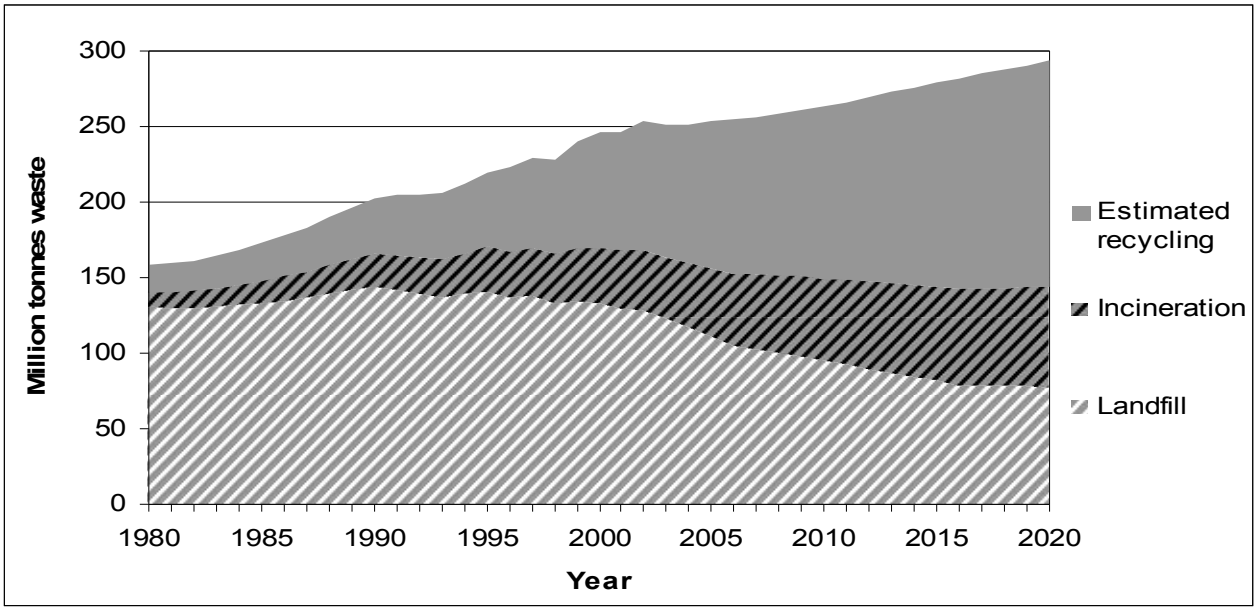


Figure 2 – Waste projections



Source: EEA, 2009

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