



Household food waste behaviour in EU-27 countries: A multilevel analysis



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ABSTRACT

A large amount of food is lost along the entire food supply chain, causing serious environmental, economic and social impacts and most food is wasted during the final consumption phase especially in industrialized countries. Starting from the analysis of the main regulations and initiatives at various administrative levels and by introducing a two-level framework for modelling complex household food waste behaviour, this paper aims at investigating the behaviour of EU-27 citizens towards food waste by referring to the 2013 Flash Eurobarometer survey (n. 388).

The multilevel statistical perspective enabled us to jointly consider factors at both individual and contextual levels as potential variables associated with food waste.

Firstly, by analysing territorial variability it was possible to identify groups of countries characterized by similar behaviour patterns and therefore target them according to the need and exigency of public policy interventions.

Secondly, at individual level it was observed that people living in towns and large cities tend to produce more waste thus emphasizing the need of diversifying policy interventions at local level according to the extent of urbanization. Moreover, education level, sorting practices, attitudes and concern regarding food waste proved to be associated with individuals' behaviour towards food waste.

Thirdly, public–private partnerships as well as targeting community-based interventions to address food waste should be encouraged.

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Introduction

In recent years there has been increasing awareness worldwide towards the loss of food (Kummu et al., 2012; Beretta et al., 2013; Evans et al., 2012; Quested et al., 2013; Jørrissen et al., 2015) and it has been estimated that as much as one third of edible food is thrown away each year (Steinfeld et al., 2006; Gustavsson et al., 2011) due to losses that occur during the various phases of the Food Supply Chain (FSC). However, while in developing countries food loss occurs mainly during the earlier stages of the FSC – i.e. production and industrial transformation – and are due to a lack of financial, technical and managerial resources, in developed countries loss usually occurs in the final stages of the FSC because of the cultural, social or economic decisions made by producers and final consumers (Dorward, 2012).

Food waste is defined as the loss of food at the end of the FSC, i.e. distribution, retail and final consumption (Griffin et al., 2009; Parfitt et al., 2010; Gustavsson et al., 2011). By focusing on households, which are responsible for most of the food wasted in developed countries (Parfitt et al., 2010), we can divide food waste into: (1) avoidable and possibly avoidable waste referring to “edible” food thrown away and (2) unavoidable food waste which is waste deriving from food preparation that is not and was not edible (WRAP, 2009; Parfitt et al., 2010) such as bones, shells and skins.

The avoidable and possibly avoidable waste of food has various environmental, economic and social impacts as shown in previous studies (Graham-Rowe et al., 2014; Göbel et al., 2015).

From an economic point of view, loss of food in the consumption stage represents a cost for households which was estimated as being equal to £420 a year for an average UK household or approximately €454 in the case of an average Italian household according to Segre and Falasconi (2011).

Secondly, several studies have emphasized the environmental impact of food waste (Beretta et al., 2013; Garrone et al., 2014) in terms of Greenhouse Gas (GHG) emissions (WRAP, 2008a, 2009; Venkat, 2011) or water wastage (Lundqvist et al., 2008). In

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2011, the British Waste and Resources Action Programme (WRAP, 2011a, 2011b) calculated that the average carbon footprint of avoidable household food waste is approximately equal to 330 kg CO₂ equivalent per person per year, corresponding to one third of the CO₂ emissions associated with household electricity use per person in the UK.

Lastly, it was observed that the average amount of food wasted in developed countries every year (220 million tons) is almost equal to the total net food production of Sub-Saharan Africa (Gustavsson et al., 2011) thus underlining the social impacts of food waste.

According to the European Commission, in Europe as much as 42% of all food produced in the FSC is wasted during the final consumption stage, without considering the agricultural phase (Monier et al., 2011). Two thirds of this amount refers to avoidable and possibly avoidable food waste (WRAP, 2009).¹

In terms of weight, it has been estimated that at household level, EU-27 citizens throw away approximately 76 kg of edible food per capita per year according to BIO Intelligence Service data (Monier et al., 2011). From the same source – which represents the only current reference concerning the amount of food wasted (in terms of weight) in the EU-27 countries – the minimum value equal to 25 kg per capita was observed for the Czech Republic and Slovakia while the highest values were observed for households located in Luxembourg (113 kg per capita) and the United Kingdom (133 kg per capita).

Considering the magnitude and importance of the phenomenon, there is much debate on this issue in Europe at central, national and sub-national levels with the aim of reducing household food waste.

At EU regulatory level, the European Parliament debated on how to avoid food wastage and approved (19 January 2012) a resolution recommending that the European Commission should take practical measures in order to halve food waste by 2025.

At national and sub-national levels, numerous initiatives have been implemented in EU countries to reduce the accumulation of food waste by raising citizens' awareness through campaigns, information, training and improving logistics.² Moreover, many retailers have started activities aimed at reducing household food wastage, i.e. the Spanish supermarket chain Eroski donates damaged perishable food products while the UK Tesco supermarket chain created the “buy one, get one free later” initiative, aimed at cutting down food wastage of perishable products deriving from 2X1 promotions by allowing customers to take home the second free product at a later date (BCFN, 2012).

Although much effort has been made to tackle this issue at the various levels – mainly by preventing food waste through recommendations, regulations, reduction targets and research programs – and to identify factors that motivate citizens to minimize household food waste, the available information for Europe is extremely heterogeneous and the lack of common and harmonized methodologies for gathering food waste data have hindered global surveys at EU level and have made it difficult to carry out comparisons between the results obtained from existing studies and statistics at national level (Bräutigam et al., 2014). Unique, harmonized and complete surveys are required for investigating the roles

played by the economic, social and environmental factors of the citizens' place of residence (Southerton et al., 2011; Quested et al., 2013) in shaping individual behaviour towards food waste.

Two recent Flash Eurobarometer surveys (n. 316 in 2011 and n. 388 in 2013) provided statistically representative information at EU-27 level concerning citizens' attitudes and behaviour towards resource efficiency, household waste management as well as towards food waste. By considering edible food waste at household level, these surveys collect the individuals' estimation of the percentage of food wasted³ through self-administrated questionnaires, which is an indirect method of gathering data previously used in the context of food waste (Møller et al., 2014). The representativeness of the surveys for EU-27 countries makes it a valuable source of information for analysing individuals' food waste behaviour by controlling for the context in which they live.⁴

Bearing in mind the hierarchical structure of the most recent Flash Eurobarometer data (survey n. 388), this study aims at exploring the phenomenon of household food waste at European level, within the multilevel statistical model framework, from a twofold perspective.

Firstly, by modelling the unobserved heterogeneity at country-level with multilevel models, we will determine whether and to what extent differences in individuals' behaviour towards food waste are associated with the socio-economic context in which they reside thus obtaining statistical information concerning the territorial variability across countries as well as adjusting individuals' behaviour for their country of residence.

Secondly, we will assess if and to what extent the strong association between the demographic and socio-economic characteristics of individuals and their behaviour towards food waste, which were highlighted in previous studies carried out at national or sub-national level, is confirmed. Moreover, the role of individuals' motivations, attitude and values is explored.

The remainder of the paper is structured as follows. A review of the main regulations, initiatives and policies implemented at the various administrative levels for the prevention, management and reduction of food waste are reported in the next section followed by our conceptual framework which includes both individual and contextual variables as potential factors associated with household food waste behaviour. The ‘Household food waste behaviour at European level’ section focuses on the 2013 Flash Eurobarometer (n. 388) survey regarding the EU-27 countries by providing descriptive analyses and addressing the reliability of these data. The random effect model is discussed in the ‘Method’ section as well as the variables to be included in the estimation process at both individual and country levels. Our findings concerning territorial variability and the association between individual and area-level covariates and food waste are reported in the ‘Results’ section. Lastly, we discuss the results, propose some implications and put forward suggestions for future research.

Management policies and initiatives towards food waste reduction

The management of food waste involves several policy areas including sustainable resource management, climate change, energy, biodiversity, habitat protection, agriculture and soil

¹ According to Gunders (2012) US families throw away approximately 25% of the food and beverages purchased. The estimated cost of food wasted by an average family of four members ranges from \$1365 to \$2275 annually.

² For example, in 2009 the Bruxelles Environment (IBGE) organized a training program for citizens aimed at helping households to reduce their food waste production by means of cooking courses. Several countries (e.g. Austria, France, Italy, UK, Spain) have launched food bank programs in order to distribute surplus food to people in need and in Italy the Last Minute Market project puts retailers, stores and producers who have unsold food, which would otherwise be discarded, in touch with charities and people in need.

³ By asking the respondents “Can you estimate what percentage of the food you buy goes to waste?”, this study focuses on edible food waste at household level, which includes home-grown food and beverages, food purchased from shops and takeaways and consumed within the home (WRAP, 2009).

⁴ As further explained in the following pages, a comparison between the statistics at EU-27 country level obtained from the Flash Eurobarometer source of data and the BIO Intelligence Service data was carried out in order to test the concordance of the two sources of data and therefore the reliability and robustness of the analysis carried out in the paper.

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