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The global economic and regulatory determinants of household food waste generation: A cross-country analysis

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ABSTRACT

Food is generally wasted all along the supply chain, with an estimated loss of 35 percent generated at the consumer level. Consequently, household food waste constitutes a sizable proportion of the total waste generated throughout the food supply chain. Yet such wastes vary drastically between developed and developing countries. Using data collected from 44 countries with various income levels, this paper investigates the impact of legislation and economic incentives on household food waste generation. The obtained results indicate that well-defined regulations, policies and strategies are more effective than fiscal measures in mitigating household food waste generation.

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1. Introduction

According to the Food and Agriculture Organization (2011) 1.3 billion tons of edible foodstuffs produced for human consumption – a third of the global food production – are wasted every year (Gustavsson et al., 2011). This is enough to lift one eighth of global population out of under-nourishment (FAO, WFP & IFAD, 2012) and mitigate global pressure on increasing food production to meet the projected increase of 50–70 percent in demand by 2050 (FAO, 2009). Moreover, the FAO (2014) estimates that 3.49 billion tons of CO₂-equivalent of greenhouse gases is generated by lost or wasted food along the supply chain. The same report estimates that the annual bulk-trade value of produced and unconsumed food is as high as \$936 billion.

Food wastage occurs at all stages along the supply chain, with 35 percent occurring at the level of final consumption (Lipinski et al., 2013). It varies drastically across countries, mainly depending on income, industrialization and developmental levels. In developing countries, more food (two thirds) is lost at the post-harvest and processing levels. This is mostly attributed to poor agricultural practices, technological, financial and labor restrictions, in addition to poor infrastructure for storage, processing and transport. On the other hand, in developed countries, a considerable fraction of food wastage rather occurs at the level of

consumption largely driven by consumers' values, behaviors and attitudes (Bond et al., 2013). Most of the food is wasted either after excessive cooking, preparation or serving (along with improper storage), as well as not being consumed in due time, a direct result of over-shopping that is driven by poor planning and impulse and/or bulk purchasing (Priefer et al., 2013; Bond et al., 2013; WRAP, 2007).

1.1. Economic incentives, legislations, food redistribution programs and awareness campaigns: solutions to fight food wastage

Various governmental, regional and local authorities around the globe have introduced regulatory and economic measures in an attempt to mitigate food wastage at the household level. In countries including the United States, Canada, Japan, Taiwan, Korea, Thailand, Vietnam and China 'Pay-as-you-throw' (PAYT) schemes are implemented (Herszenhorn et al., 2014). Such schemes involve a fee that is charged to consumers/households in proportion to their generated waste upon collection designed as a monetary incentive to reduce this waste. In Japan, a law to encourage reduction and recycling of food waste was enacted in 2001 (Herszenhorn et al., 2014). In a similar vein, in 2011 the European Commission set a target to reduce avoidable food waste by 50 percent by 2020 (Priefer et al., 2013). Furthermore, as part of the EU's Waste Framework Directive, member states are required to set mandatory targets for food waste reduction and devise prevention plans (Priefer et al., 2013).

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1.1.1. Awareness campaigns

Consumer's behavior regarding food and waste is affected to a great extent by the level of knowledge and education one has on these issues. For this reason, many civil societies have collaborated with governments and private actors to launch active awareness campaigns that aim to inform the public opinion on the problematic nature of food waste and useful prevention practices.

One of the most successful in Europe is the British "Love Food Hate Waste" campaign, operated by WRAP, a private non-profit company sponsored by governments across the United Kingdom and Europe. For the aim of providing consumers with tools to lower waste, WRAP works with a range of partners, such as private UK retailers and businesses, local authorities and communities (Priefer et al., 2013). Since its launch in 2007, the campaign claimed to have reached out to two million households in two years and helped them reduce waste, hence preventing 137,000 tons of food waste (Priefer et al., 2013). More recently, the LFHW campaign in West London contributed towards the reduction of avoidable food waste by 14 percent at the household level, in six months (from October 2012 until March 2013) (Priefer et al., 2013). WRAP has achieved a reduction of household food waste by 13 percent nationwide in the period 2007–2011, through public campaigns, in-depth research and services oriented to the recycling, reduction and reuse of food waste (Priefer et al., 2013).

1.1.2. Food redistribution programs

Redistributing surplus food that is still fit for human consumption contributes to reducing food waste and fighting food scarcity for underprivileged people around the globe. Charities such as 'Fareshare' in the UK, 'Fondazione Banco Alimentare' in Italy or 'Die Tafeln' in Germany and Switzerland channel food donated by producers, manufacturers, retailers or actors in the food services to vulnerable people in need. In Australia, the non-profit organization 'Second Bite' links farmers and retailers with food banks and community groups, redirecting 3000 metric tons of fresh food in 2012 (Lipinski et al., 2013).

1.1.3. Economic incentives

The incentives being investigated in this paper are the landfill tax, incineration tax and "Pay-as-you-throw" PAYT schemes.

Landfill Tax is an environmental tax incurred by any company, local authority or other waste generators in exchange for the disposal of waste by landfilling. Most commonly, landfill operators are subject to the tax and costs are passed on to end users in the form of higher charges; local authorities—such as HM Customs and Excise in the UK—collect the tax. The main purpose of this tax is to shift waste away from landfills and promote more sustainable practices like recycling, through embedding the environmental costs of landfilling in its price.

In conjunction with the present landfill tax, incineration tax is a market-based solution that would first prevent the automatic switch from landfilling into incinerating waste and promote separation at source and recycling practices. In the absence of incineration tax where this disposal method is applied, efforts to recycle are often limited since authorities have liabilities to provide guaranteed waste quantities to incineration operators (Ares and Bolton, 2002).

PAYT charges fees according to the weight or volume of municipal waste upon collection. It gives households and businesses financial incentives to minimize the amount of food and drinks they waste, hence cutting down their expenses. These measures are best implemented by municipalities, at the level of local authorities or taken in charge by contracted private waste management companies. Nonetheless, prerequisites for these actions to be efficient are supportive public opinion that recognizes the

rationale of the fees they are paying. Also, fee rates should be carefully set, because if charges are too high they might encourage illegal dumping or burning of waste (Priefer et al., 2013).

As part of an EU-funded PAYT project, a study was carried out in 157 local authorities in the Czech Republic, with the participation of 2.6 million participants. Authorities were given the freedom to choose whether they will implement PAYT or a flat fee on waste collection in their areas. The 92 authorities that implemented PAYT system witnessed 12.1 percent recycling rate while it was only 6.9 percent with those who adopted the flat fee approach (Herszenhorn et al., 2014).

Economic instruments are counted as present in the model when either of the landfill tax, incineration tax and Pay-As-You-Throw scheme is in use.

To test for causality in the model, the occurrence of economic incentives is accounted for only if they have been set/put in practice before the estimation date of household food waste.

1.1.4. Policy and legislations

The impact of policies on food wastage is sensitive and complicated. Regulations and legislations can advocate and even impose food waste reduction strategies to achieve food waste prevention and reduction. For policy to be effective it needs to be comprehensive and flexible enough to involve all stakeholders in the food chain (FAO, 2013). On a more practical level, setting food waste, time-bound targets could raise awareness and mobilize institutional efforts into formulating and monitoring strategies regulated by legislations.

As we are interested in evaluating the impact of the effective policy actions on food wastage, we looked beyond the simple presence of waste and food waste related legislations to check for countries' defined targets, strategies or plans to stimulate and support the general legal framework in fighting household food waste. To this end, legislations are counted as present in the model whenever the general legal framework represented by waste-related laws or national acts or decrees is supported by specific actions such as strategies or targets or waste management plans, related either directly or indirectly to food waste (i.e. targets to reduce the land-filling of biodegradable waste). To test for causality in the model, the occurrence of legislations is accounted for only if they have been set/put in practice before the estimation date of household food waste.

This section presents examples of enacted legislations and strategies directed to lower food wastage.

Japan issued in 2001, the Law for the Promotion of Recycling and Related Activities for the Treatment of Cyclical Food Resources that targets the reduction of food waste generation and the promotion and support of food waste recycling into animal feed and fertilizers. To better monitor such action, data was collected from food manufacturing, wholesale, retail and services; businesses producing food waste of more than 100 tons, whereby they are required to report regularly the amount of food wasted as well as food that was recycled as feed, fertilizer, etc.; as for those producing less than the before mentioned amount are required to answer a sample survey to supplement the national data (Herszenhorn et al., 2014).

South Africa's Draft Waste Classification and Management Regulations of 2010 promotes composting of organic waste and aims to ban the landfilling of organic waste by setting criteria for the progressive restriction on waste disposal mechanisms (FAO, 2013).

Tackling another side of the food value chain, many countries enacted laws that protect food donors from civil and criminal responsibility regarding the food they donate, except where there is considerable negligence or intentional mishandling of food (FAO, 2013). The best known regulation of this kind is the United States of America's Bill Emerson Good Samaritan Food Donation

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