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The Portuguese plastic carrier bag tax: The effects on consumers' behavior

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ABSTRACT

Marine litter from lightweight plastic bags is a global problem that must be solved. A plastic bag tax was implemented in February 2015 to reduce the consumption of plastic grocery bags in Portugal and in turn reduce the potential contribution to marine litter. This study analyzes the effect of the plastic bag tax on consumer behavior to learn how it was received and determine the perceived effectiveness of the tax 4 months after its implementation. In addition, the study assessed how proximity to coastal areas could influence behaviors and opinions. The results showed a 74% reduction of plastic bag consumption with a simultaneously 61% increase of reusable plastic bags after the tax was implemented. Because plastic bags were then reused for shopping instead of garbage bags, however, the consumption of garbage bags increased by 12%. Although reduction was achieved, the tax had no effect on the perception of marine litter or the impact of plastic bags on environment and health. The majority of respondents agree with the tax but view it as an extra revenue to the State. The distance to the coast had no meaningful influence on consumer behavior or on the perception of the tax. Although the tax was able to promote the reduction of plastics, the role of hypermarkets and supermarkets in providing alternatives through the distribution of reusable plastic bags was determinant to ensuring the reduction.

1. Introduction

Carrier plastic bags (e.g., grocery bags, shopping bags, carryout bags, and lightweight bags) are emblematic of a consumption society; they are light and are thrown away after a single use (EC, 2013). Plastic bag litter can have various impacts. According to Wagner and Broaddus (2016), direct impacts are costs to collect, remove, and dispose or recycle the litter and impairment of storm collection drains; indirect impacts are related to aesthetics, property values, tourism, and marine litter. Wind can blow plastic bags great distances, where they accumulate in public areas such as streets, recreation sites, and beaches (Ayalon et al., 2009). When littered, plastic bags can photo-degrade and oxidize into microplastics, which are now widespread across all environments. These microplastics are then ingested by low trophic-level fauna, with uncertain consequences (Thompson et al., 2004; Wright et al., 2013). Ensuring appropriate separate collection systems for plastics bags to avoid littering (for example, larger volume containers with covers (Wagner and Broaddus, 2016)) is a determinant to ensure that litter and plastic bags placement in sanitary landfills is reduced, avoiding wind dispersion and subsequent consequences to the environment.

The number of plastic carrier bags consumed every year in European countries recently reached ~100 billion, with 8 billion ending up as litter (EC, 2014). This waste has led to an inefficient use of non-renewable fossil resources, and plastic carrier bag litter results in environmental pollution and threatens aquatic ecosystems worldwide (EU, 2015). Plastic bag marine litter is a symbol of a resource-inefficient economy, whereas a circular economy could ensure that such resources are reused and recycled into new products (EC, 2016). The Circular Economy Action Plan (COM(2015)614 (EU, 2015) presents several solutions to remove plastics from oceans, specifically the application of extended producer responsibility, product design, product bans, legislation, economic incentives on consumption, labelling, waste management, and awareness-raising (ten Brink et al., 2016).

To reduce the number of plastic carrier bags consumed in Europe, Directive 2015/720 was published to require Member States to take measures to achieve sustainable reduction of lightweight plastic carrier bags (wall thickness < 50 μm) consumption within their territories (EU, 2015). The measures proposed by the

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Directive set national reduction targets and implement economic instruments and marketing restrictions. The Directive establishes that Member States can include either or both consumption targets: not to exceed 90 lightweight plastic carrier bags per person annually by December 31, 2019, and/or 40 lightweight plastic carrier bags per person annually by December 31, 2025, or an equivalent target set by weight. It further specifies that plastic bags will not be provided free of charge at the point of sale of goods or products after December 31, 2018 (EU, 2015). Very lightweight plastic carrier bags (wall thickness <15 μm) can be excluded from objectives and charges (EU, 2015).

To date, European Union Member States have already implemented several types of policy instruments to reduce the consumption of plastic bags, including policy instruments applied alone or combined (Table 1). Economic instruments are most common, in addition to voluntary agreements promoted by the Government. In Luxembourg, policy instruments were implemented in phases, which have also led to the reduction of plastic bags. Additionally, initiatives from private sector, such as charging for plastic bags in supermarkets and hypermarkets in France, Germany, Slovakia, have also reduced the consumption of plastics bags (Bio Intellinge Service, 2011). Other countries/regions are only now starting to implement the Directive 2015/720, including Austria, France, Netherlands, and Poland, by banning free plastic bags or through taxes.

Portugal anticipated the Directive 2015/720, mainly based on the report from Eunomia (2012) that estimated a consumption of 466 plastic bags per person per year, more than the double of average European consumption. The estimated plastic bag consumption posed a considerable problem, indicating that the producer responsibility organization for implementing the extended producer responsibility principle for managing bags over their life cycle (the Green Dot System) in Portugal was neither able to promote environmentally friendly packaging, including their ecodesign (Pires et al., 2015), nor ensure that the bags do not become waste litter during their management cycle. These limitations of extended producer responsibility principle and their implementing organizations were raised by Watkins et al. (2012) for packaging waste in general. Law no. 82-D/2014, the Green Taxation Reform (in Portuguese: Reforma da Fiscalidade Verde) (AR, 2014), was published in December 31, 2014, and enforced in February 2015, and included a tax of €0.10 per bag (including value added tax) on lightweight plastic bags (very lightweight plastic bags were excluded). Consequences of the plastic bag regulations were noteworthy for the different stakeholders. Plastic bag producers claimed that they had to fire workers, had loss of income, and had to adapt machinery to produce garbage bags or higher thickness bags in an unreasonably short time (Silva, 2015a). The distribution sector was more open to compliance because they were able to provide alternatives to plastic bags, namely reusable plastic bags (Silva, 2015b). Consumers were also able to adapt easily to the tax, with the help of consumers associations that provided tips to avoid the tax.

Plastic bag taxes (PBTs; a product tax) belong to a broader definition of environmental taxes, 'whose tax base is a physical unit (or a proxy of it) of something that has a proven, specific, negative impact on the environment' (Eurostat, 2016). They are not fully Pigouvian taxes because they are not internalizing the externalities from environmental damage from plastic bags and can therefore be designated as indirect environmental taxes (Nellor, 1995). To improve acceptability and efficiency, the revenues from these taxes are earmarked for environmental purposes and not used as a pretext to raise fiscal revenues (Baranzini and Carattini, 2017).

The intent of a PBT is to encourage pro-environmental behavior (i.e., to reduce the consumption of plastic bags) and to raise awareness of litter problems and high consumption of lightweight plastic bags by citizens as a strategy to reduce the amount of plastic marine litter. In terms of the plastic waste reduction, however, their effect is marginal because the plastic bags accounted for only 0.7% by weight of all municipal solid waste generated in European Union in 2008 (Bio Intelligence Service, 2011). From an environmental psychological perspective, the effectiveness of the tax should be verified not only by changes in behavior, environmental quality, and quality of life of individuals, but also by the perceived effectiveness and acceptability of the tax (Steg and Vlek, 2009). In general, most results related to the effectiveness of the PBT are devoted to behavioral changes and revenues reached through the economic instrument. The Chinese plastic bag charge led to a 49% reduction (He, 2010). The Wales plastic bag charge increased personal bag reuse, a measure supported by the citizens (Poortinga et al., 2013). In South Africa, the plastic bag levy implemented for 24 L plastic bags had a short run of success, probably because the levy was reduced over time (Dikgang et al., 2012). The effects of a charge implemented in Buenos Aires for bigger and stronger bags led to an increase in consumers' personal bag use, most of which have a 2 month reuse period (Jakovcevic

Table 1
Policy instruments applied in some European countries for plastic bags.

Country	Policy instruments	Outcomes	References
Belgium (2007)	Tax or levy with voluntary agreement	60–80% of reduction	Bio Intelligence Service (2011)
Denmark (1994)	Tax or levy (also for paper bags)	A reduction of 50% on the amount of plastic bags	OECD (2001), The Danish Ecological Council (2015)
Ireland (2002)	Tax or levy	Reduce use by more than 90% and raised revenues around €12–14 million for an environment fund	Convery et al. (2007)
Luxembourg (2004, 2007)	Voluntary agreement to sale 'Eco-sac'carrier bag in 2004. Bags started to be charged in 2007, including single use bags	Saved about 560 million single-use shopping bags until 2013	Valorlux (2014)
Malta (2009)	Tax or levy	Saved around 25 million plastic bags (i.e. more than 50%, corresponding to roughly 150 tonnes of plastic) in the first two years after introducing the tax	Hermann et al. (2011)
Spain (2009)	Voluntary agreements in Catalonia	A reduction of 40% were achieved in 2010	Bio Intelligence Service (2011)
Romania (2009)	Tax or levy	An increase of plastic bags was verified between 2009 (27 millions bags) and 2010 (60 millions of bags)	Pre-waste (2011)
UK (Wales in 2011, Northern Ireland in 2013, Scotland in 2014, England in 2015)	Tax or levy with awareness campaigns and voluntary agreement	Wales: 71% reduction in 2015; Northern Ireland: 72% in 2014; Scotland: around 80% in 2015; England: 85% in 2016	BBC (2015), Bio Intelligence Service (2011), DAERA (2016), Howell (2016), Poortinga et al. (2013), The Guardian (2015, 2016)