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The ratio of EPR compliance fees on sales revenues of electrical and electronic equipment in Italy. A circular economy perspective

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The ratio of EPR compliance fees on sales revenues of electrical and electronic equipment in Italy. A circular economy perspective

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1. Introduction

Extended Producer Responsibility (EPR) has been widely implemented in the EU throughout the last 20 years (EC, 2014). A recentstudy by Tasaki and colleagues published in 2015, defines EPR as "one of the most important ideas for waste management policy in the worldfor the last two decades " (Tasaki et al., 2015). But what is EPR? In 2001, the OECD defined it as "a policy approach in which producersaccept significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products ". Manufacturers typically join compliance organizations (schemes) to act on behalf of producers to meet their responsibility in exchange for a payment (EPR fees). In Europe, the EPR principle has been applied to waste electrical and electronic equipment (WEEE or e-waste) since 2003 as a result ofthe first WEEE Directive (2002/96/EC) (3) and its revision (the WEEE Recast Directive 2012/19/EU) (4) in 2012. In December 2015, theEuropean Commission launched the EU action plan for the Circular Economy (1). The Circular Economy Package reports that "EPR schemes form an essential part of efficient waste management " and "they should provide incentives for producers to take better into account recyclability and reusability when designing their products " (2). According to a broad literature review on WEEE carried out between 1992 and 2014 by Pérez-Belis et al. (2015), most of the research on WEEE deals with management issues, quantities of WEEE generated, WEEE characteristics, social aspects and technical aspects of reuse and recycling. Only a limited number of studies analyse its economic aspects. The original idea behind the EPR system was twofold: the shifting of responsibility towards producers and away from municipalities and to provide incentives to producers to incorporate environmental consideration in the design phase (OECD, 2001). According to Lindhqvist and Lifset (1998, 2003) the core rational for EPR is lost without the design incentives. Toffel (2003), Sander and co-authors (2007), Özdemir et al., 2012, Mayers and colleagues (2011, 2013) Mayers et al. (2011, 2013), Castell and colleagues (2004)Castell et al. (2004), Webster and Mitra (Webster et al., 2007) and Smith (in OECD, 2005) agree that collective responsibility does not provide incentives to manufacture to design more recyclable and reusable products. Therefore, it is important to understand how waste management costs are allocated among producers (Plambeck and Wang, 2009) and it is also important to quantify these costs. Fees differentiation based on end-of-life costs can provide "green design" incentives (Sander et al., 2007). For example, manufacturers can use the measuring method developed by Zeng et al. (2016) to assess the recyclability of a product in the initial manufacturing phase as well as in the end-of-life phase. Using this method, producer 's eco-design rating can be scientifically determined (Zeng et al., 2016) and the EPR fees can be defined accordingly. Several studies (Mayers et al., 2013; EC, 2012; OECD, 2015; INSEAD, 2013) show that most of the WEEE compliance organizations charge members on a simple mass-based allocation of costs, usually based on the weight or quantity of products put on the market. Despite these precious insights, there is still a paucity in the literature regarding the economic consequences of these policies for these producers. In other words, we still poorly understand if compliance fees on WEEE, modulated on the real end-of-life costs, could be sufficient to stimulate a proactive behaviour towards the Circular Economy.In this paper, we aim at partially close this gap by studying the Italian case and its economic implications. The first WEEE directive was transported at the beginning of 2005 with the decree 151/2005. This decree has been repealed by Legislative Decree n. 49/2014 which transposed the recast WEEE directive. The collection of household WEEE is performed by the municipal collection points. These collection centres are financially supported by national clearinghouse (CDCRAEE), which funnels the resources from the

compliance organisations. Producers (which delegate their responsibilities to compliance organisations) have the responsibility of WEEE from the collection centres onwards. Individual compliance for B2C is a possible option but it is de facto hardly feasible. The main aim of this paper is to study the economic outcomes of the Italian household sector of WEEE by quantifying the EPR fees paid by producers in relative terms i.e. in terms of sales revenue. Needless to say, WEEE technical results (such as the WEEE collection rate) are linked to economic burdens. Therefore, we

can use the former to account for the latter. This article is structured as follows: after this introduction, we present a detailed methodological section to discuss material and methods used, followed by the results and discussion. We conclude with the main findings, the limitation of the study and raising a call for more research on the economic consequences for producers and on the stimuli needed to trigger proactive behavior in the Circular Economy

2. Materials and methods

For the purpose of this study, we need to collect data on EPR fees and sales revenues. The EPR contributions are computed using the fees paid by producers to compliance organizations. This approach reflects the methodology adopted by the European Commission in its study of 2014 (EC, 2014) and they are calculated in a previous article (Favot et al., 2016). The sales revenues are the value of household EEE placed on the Italian market. These revenues are calculated in three steps: first of all, we compute the sales of electrical and electronic products to Italian households. Secondly, we add a figure for imported goods and subtract the figure for exported goods. In the last step, we subtract the sales of the business sector.

The data provided by ISTAT is the same data reported by Eurostat in the harmonized survey called SBS – Structural Business Statistics according to the 4-digit NACE classification. NACE is a French acronym which means "Statistical classification of economic activities in the European Community " (5). We use the SBS data because it refers to the turnover of companies that sell EEE and that are subject to the EPR legislation. We select these EEE categories from the group of manufacturing: C26 "Manufacture of computer, electronic and optical products " and C27 "Manufacture of electrical equipment ". First of all, we add up the turnover of C26 and C27 products that are considered "dual use " (products that might be used by both households or businesses, such as PC 's) and we exclude EEE that are B2B (i.e. business to business) only (such as vending machines). The "dual-use " product categories are: "Manufacture of computers and peripheral equipment " (C262); "Manufacture of communication equipment " (C263); "Manufacture of consumer electronics audio e video " (C264); sub category "watches and clocks " (C2652); "Manufacture of optical instruments and photographic equipment " (C267); "Manufacture of electric lighting equipment "(C274); sub category "electrical electronic domestic appliance " (2751); "Manufacture of other electrical equipment " (C279). The other six categories or sub-categories (C261; C2651; C266; C271; C272; C273) are excluded as they refer to products that are specific to the B2B market (such as category C266 "Manufacture of irradiation, electro-medical and electrotherapeutic equipment ").

We then add the imports and subtract the exports, since the costs of WEEE management are borne in the country where the final product is sold. Import and export data is provided by ISTAT. Since the value of the products includes "dual use " items which could conceivably be used by businesses or by consumers, it is necessary to subtract the value of goods sold to the B2B market. Eurostat provided the data for the total tonnes placed on the market and the national clearinghouse provided the quantities sold to the household sector, with the quantity of B2B products being the difference between the two values. We then multiply the quantity of B2B EEE by its value (which should have a value comparable to that of household EEE). The result is the value of the household EEE put on the Italian market (in other words the sales revenues sold to B2C sector). In Italy, producers of EEE externalize

their EPR duties to compliance organizations. Consequently, it is possible to consider EPR fees as a cost for an activity which has been outsourced.

This externalization allows a more precise computation of the WEEE management costs in comparison to the computation of the same costs if the activity were performed internally. Once these calculations have been done, we compare the sales revenue of EEE sold with the EPR fees of WEEE collected. The result is the ratio of EPR fees for the management of WEEE on revenues from sales of EEE.

Table 2
Ratio of B2B EEE POM on total EEE POM in Italy (years 2009–2014).
*Source: *Eurostat; **CdC RAEE.*

	2009	2010	2011	2012	2013	2014
Total tonnes POM*	973,713	1,117,406	993,997	892,910	846,720	883,883
B2C POM tonnes**	935,881	956,786	894,782	781,623	760,320	794,897
B2B POM tonnes	37,832	160,620	99,215	111,287	86,400	88,986
% of B2B on total (round figure)	3.89%	14.37%	9.98%	12.46%	10.20%	10.07%

3. Results and discussion

The initial step involves calculating the value of EEE sold to households in Italy using the turnover data for these products acquired from the National Statistical Institute (ISTAT). The total turnover almost reached 26,000 million Euros in 2009 and 2012; above 27,000 million Euros in 2010 and 2011, almost 25,000 million Euro in 2013 and above 24,500 million euros in 2014 (see Table 1). Secondly, we consider imports and exports. Note that overall Italian imports of EEE are higher than EEE exports except for two classes of products: the "Manufacture of domestic appliances " (cat. C275) and the "Manufacture of electric lighting equipment " (cat. C274). Therefore, the balance between the import and export of these products has remained positive from 2009 to 2014. This results in an increased value of the sales of EEE in Italy as shown in Table 1.

Subsequently, we subtract the value of products that are sold to the B2B sector. For this calculation, we apply the quantities (in terms of weight) as provided by the Italian national clearinghouse (CdC RAEE) and Eurostat, and the sales revenues as the value of EEE put on the market. The percentage of the B2B tonnes put on the market (POM) out of the total tonnes POM varies between 3.89% in 2009 – 14.37% in 2010. These calculations are reported in Table 2.

Therefore, the sales value of B2C EEE put on the Italian market between 2009 and 2014 ranges around 22 –25 billion Euros per year (see Table 3). The total EPR fees paid by producers during the same period are decreasing quite steadily over time from 125 million in 2009 –83 million in 2014. These data are reported in Table 3, The ratio of EPR fees on sales revenues is displayed on Figure n. 1. It is also important to compute the technical performance of the EPR schemes because the collection rate can influence the EPR fees (in general terms a higher volume of waste collected implies higher total fees). However from Table 4, we can see that after the first year, the collection rate is quite stable at around 27%.

We can see from Fig. 1 that the ratio of EPR contribution on the revenues from sales of EEE diminished over time after the first year, and was almost stable in the last two years. Both the sales of B2C products

and the EPR fees diminished during the time frame but the last ones declined more that the sales revenues. The decrease of the fees is possibly due the start-up costs being gradually absorbed by the compliance organizations as well as the competition between them and the increased efficiency.

Table 1
Value of EEE put on the Italian market (years 2009–2014).
*Source: ISTAT (thousand Euros).*

	2009	2010	2011	2012	2013	2014
National production of EEE	€ 25,907,889	€ 27,662,916	€ 27,120,550	€ 25,750,944	€ 24,840,145	€ 23,596,007
+ import − export	€ 471,732	€ 675,840	€ 524,840	€ 679,286	€ 652,044	€ 931,842
Value of EEE	€ 26,379,621	€ 28,338,756	€ 27,645,390	€ 26,430,230	€ 25,492,189	€ 24,527,849

Table 3
Sales of B2C EEE and total EPR fees in Italy (years 2009–2014).
Source: *elaboration from previous data (thousand Euros). **Favot et al., 2016 (thousand Euros).

	2009	2010	2011	2012	2013	2014
Sales of B2C EEE	€ 25,354,685	€ 24,265,240	€ 24,885,988	€ 23,136,123	€ 22,890,945	€ 22,058,478
Total EPR fees	€ 125,828	€ 131,787	€ 132,895	€ 108,873	€ 82,615	€ 83,369

Table 4
Technical performance of the WEEE regime in Italy (years 2009–2014).
Source: Eurostat.

	2009	2010	2011	2012	2013	2014
B2C EEE POM tonnes	935,881	956,786	894,782	781,623	760,320	794,896
B2C WEEE collected tonnes	216,861	253,666	249,326	219,672	209,173	213,719
Collection rate	23.17%	26.51%	27.86%	28.10%	27.51%	26.89%
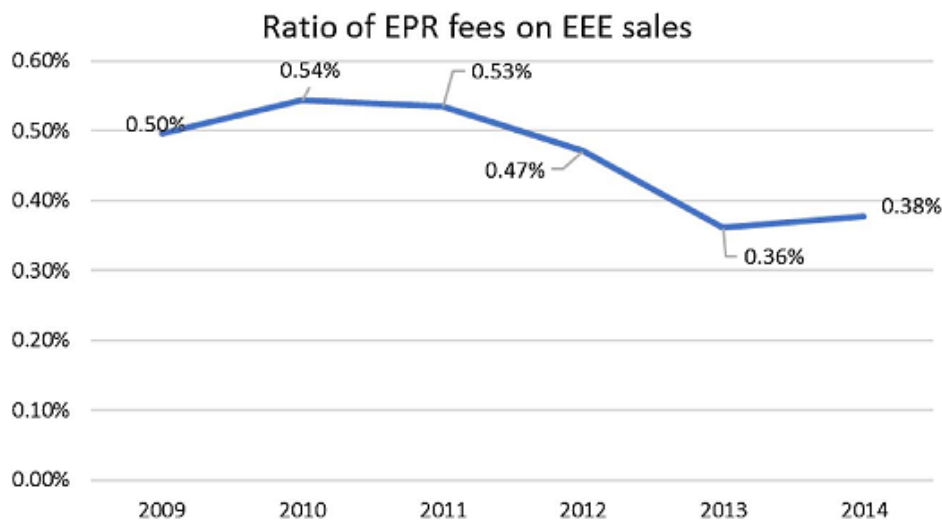
Fig. 1. Ratio of EPR fees on sales revenues (years 2009–20014).
Source: elaboration from previous data

4. Conclusions

The proposal for amending the European Directive on Waste includes the recommendation that Member States shall ensure that the EPR compliance fees are modulated on the real end-of-life costs to take account of their reusability and recyclability. The novelty of our article is that we calculated the ratio of EPR compliance fees paid by producers on their revenues from sales of household EEE in Italy. The ratio was equal to 0.50% in 2009, 0.54% in 2010, 0.53% in 2011, 0.47% in 2012, 0.36% in 2013 and 0.38% in 2014, while the collection rate varied between 23.17% in 2009 –26.89% in 2014. These ratios are decreasing over time after the first year, most likely due to the intake of the startup costs and the competition among compliance organizations. These results are lower than the average product price increase of 2.19% estimated at European level by Favot and Marini (2013). The evaluation of these results should be compared with the profit margins of the sector: if the profit margins are limited even those low ratios could be relevant. Additionally, the new collection and recycling goals set by the WEEE Directive (85% of WEEE generated or 65% of EEE put on the market in the three preceding years) will increase the quantity of waste collected and treated. Therefore, such ratio could conceivable increase in the next years. Therefore, EPR policies should aim at providing incentives to producers for eco-design as originally promoted by its inventors. More precisely, EPR fees should be defined accordingly to producer 's eco-design rating which can be scientifically determined for example by Zeng 's method (2016). The main limitation of this study is the missing distinction between product categories, due to the lack of available data. The quantification of this ratio, even if it is limited to the Italian case study, helps the discussion on the potential financial incentives that EPR policy could provide towards "green design".

Different stakeholders can use this indicator in their decision making. For example, producers can assess this ratio with their profit margins and decide whether to implement or not design changes. More precisely, if the ratio is high compared to their profi t margins, producers could enforce green design changes and demand compliance organization to modulate the ERP fees in accordance. Policy makers, on the other hand, could investigate whether the original goal of shifting fi nancial burden from municipalities towards producers is met and act accordingly. In conclusion, only an EPR implementation which provides incentives to producers to incorporate environmental consideration in the design phase, could really help the transition to a Circular Economy.

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