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Direct and indirect effects of waste management policies on household waste behaviour: The case of Sweden

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ABSTRACT

Swedish legislation makes municipalities responsible for recycling or disposing of household waste. Municipalities therefore play an important role in achieving Sweden's increased levels of ambition in the waste management area and in achieving the goal of a more circular economy. This paper studies how two municipal policy instruments – weight-based waste tariffs and special systems for the collection of food waste – affect the collected volumes of different types of waste. We find that a system of collecting food waste separately is more effective overall than imposing weight-based waste tariffs in respect not only of reducing the amounts of waste destined for incineration, but also of increasing materials recycling and biological recovery, despite the fact that the direct incentive effects of these two systems should be similar. Separate food waste collection was associated with increased recycling not only of food waste but also of other waste. Introducing separate food waste collection indirectly signals to households that recycling is important and desirable, and our results suggest that this signalling effect may be as important as direct incentive effects.

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1. Introduction

The purpose of this paper is to analyse two important municipal policy instruments for waste management in Sweden, namely the tariff schedule for waste management and special systems for the separate collection of food waste. More specifically, we study how these two instruments affect the total amount of waste collected as well as how they affect the waste streams heading for recycling, biological treatment and incineration. The findings suggest that the indirect effects of waste management policies on attitudes towards recycling are important, possibly as important as their direct incentive effects on the perceived cost of additional waste.

The increased policy attention being given to waste management in Europe is evident in a number of new legislative proposals on waste management presented by the European Commission in 2015 and the advocacy of a “circular economy” (COM (2015) 595), among other measures. Existing European Union (EU) waste management policies prioritise, in descending order, the prevention, reuse, materials recycling (including biological recycling), energy recovery (mainly through incineration), and disposal of waste. This waste management hierarchy plays a central

role in achieving a circular economy. In many EU countries, local governments are responsible for waste management, effectively making them responsible for achieving the goals of the EU's waste management policies.

In Sweden, municipalities are legally obliged to provide sanitation services at cost-recovery prices to their citizens. While dealing with certain forms of waste is the regulated responsibility of those who produce it, ensuring the recovery or disposal of household waste is chiefly the responsibility of municipalities.¹ Thus, municipal waste policies are crucial for encouraging Swedish waste producers to move up the waste management hierarchy.

2. Waste tariffs and special systems for collection of food waste in sweden

In terms of tariff-based waste management systems in Sweden, local municipalities have the right to charge a fee for the collection,

¹ Arvidsson and Stage (2012), studying waste management in a Swedish municipality, found that the environmental gains from shifting from energy recovery to materials recycling were negligible in practice. However, this is likely to vary between municipalities, and there is a widespread assumption among policymakers at the EU level, the national level, and in most municipalities that moving up the waste management hierarchy is either desirable in practice already or will become desirable with future improvements in waste treatment technologies.

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transport, recovery and disposal of waste. This charge is not permitted to exceed the overall planning, operating and capital costs related to refuse collection (Swedish Environmental Code, Chapter 27, Section 4). Most municipalities use a volume-based tariff system, where the volume of the waste container (and the interval at which the waste is collected) affect the tariff that households pay (SWMA, 2015a). Some municipalities use a weight-based tariff instead, where households pay for each kilogram of waste they throw away (sometimes differentiated by type of waste). In 2014, 30 of the 290 municipalities in Sweden used such weight-based waste tariffs (up from 24 in 2007), while the others used volume-based tariffs, and we compare the impact of these two tariff systems.²

In respect of other systems of waste collection, e.g. special systems for food waste, Swedish municipalities vary. While some municipalities do not collect food waste separately from other forms of waste³, others dictate the use of special containers or bags for food waste. The number of municipalities that collect food waste separately has increased progressively since the early 1990s: by 2014, for example, 190 of the 290 municipalities had some kind of separate collection of food waste (SWMA, 2015b). In some municipalities, there are systems for food waste collection for single-owner dwellings, apartment buildings, commercial kitchens, and restaurants. In other municipalities, there are separate food waste collection systems only for some of these market segments (SWMA, 2015a). Swedish municipalities also differ with respect to whether separate food waste collection is mandatory or optional, and whether or not the waste tariff differentiates between food waste and other types of waste. Moreover, there are variations in the availability of kerbside collection of packaging and in whether there are multi-compartment containers provided that make it possible to sort material by type of waste for targeted collection by the municipality.

Although households are required by law to sort out certain types of waste, compliance is rarely enforced or monitored and is based largely on households' voluntary sorting (Hage et al., 2009; Miliute-Plepiene et al., 2016). The waste management decisions made by households themselves will therefore determine how weight-based waste tariffs and the separate collection of food waste affect different waste streams. In the next section, we discuss how households decide how to manage their waste.

3. Waste management decisions at household level

There is an extensive literature examining household waste behaviour and the effect of different waste management policy instruments. In the discussion below, we highlight a few studies of particular relevance for our work.

² Notably, all Swedish municipalities apply some form of unit-based waste management tariff, and had already started doing so long before the period that we study. Kinnaman (2006) and Bel and Gradus (2016) note that unit-based tariffs are becoming more widespread throughout the western world (though, in most cases, still far less widespread than in Sweden), and have incentive effects on the quantities of collected waste; we do not study this transition but, rather, the difference between two different unit-based systems.

³ Separate collection of paper became widespread in the 1980s and 1990s, and separate collection of plastic in the 1990s, but separate collection of food waste began later in most municipalities (in 2007, the beginning of the period that we study, only some 40% of the municipalities in our sample had separate food waste collection; during the period that we study the share grew by between 1 and 3% per year and reached 58% by 2014). A reviewer suggested studying whether cumulative differences in local environmental policies might be having additional impacts, in line with what Nicolli and Vona (2016) find at the national level; however, although the time at which a new policy is introduced may vary substantially between different Swedish municipalities, there are no clear cumulative differences of this kind between different Swedish municipalities' waste management policies.

To understand how households make their waste management decisions, consider a person who chooses between leaving some waste for recycling (including biological treatment) or throwing it all in the trash (where the waste goes to incineration, possibly for energy recovery; the share of household waste going to landfills is negligible in Sweden). The benefit for the individual of leaving the waste for recycling comes partly from the ensuing improvement in environmental quality, and partly from the improved self-esteem and well-being that stem from acting not only as a morally responsible person, but also altruistically, for the good of society as a whole. However, recycling is also associated with a cost to the individual in terms of the time involved. For simplicity, assume that the benefit of throwing waste in the mixed waste bin is zero, and that the cost of doing so consists of the fee that the municipality charges for collecting household waste and the bad conscience associated with not recycling. The individual then weighs the two options – whether or not to recycle a specific waste item – against each other and selects the one with the highest net benefit. In line with this, Bruvoll et al. (2002) noted that households spend considerable time and energy on sorting waste (185 h per tonne, on average) and, therefore, ask why households engage in waste sorting per se. Through a survey of 1132 Norwegian households, they found that 97% engaged in waste separation because they wanted to contribute to a better environment; 73% did so because they wished to see themselves as responsible people; and 88% stated their motivation as being “*I should act the way I want others to act*”. Nyborg (2003) interpreted the last answer to mean that households see sorting waste as being based on a moral position that conforms to what they believe is best for society. Sterner and Bartelings (1999), studying Varberg municipality in Sweden, similarly found that attitudes to the environment affected the level of recycling.

For an individual who lives in a municipality that levies a volume-based tariff to collect waste, s/he selects the size of bin and the collection frequency before deciding on whether or not to recycle a specific waste item. Once the disposal volume and frequency have been decided, there is no extra financial cost to the individual for throwing an additional waste item in the bin, giving only weak economic incentives for recycling.

On the other hand, if a municipality has a weight-based waste rate where the individual pays for every kilogram of waste, the net disutility of throwing an additional item of waste in the trash will be higher, and therefore it is more likely that the individual will choose to recycle and thus that materials recovery will be higher. In Sweden, Ålander (2013) studied the effect of weight-based waste tariffs on mixed household waste, while Hage et al. (2018) investigated, among other things, how existing tariffs affected the collection of plastic waste. Both studies used data on Swedish municipalities. For the two decades between 1992 and 2012, Ålander (2013) tracked 20 Swedish municipalities that used weight-based waste tariffs and 20 that used volume-based tariffs. Hage et al. (2018) used cross-sectional data from 282 Swedish municipalities. The results of these two studies indicated that weight-based waste tariffs led to less mixed waste and an increased amount of collected plastics. Furthermore, Ålander (2013) found that collecting food waste separately seemed to lead to less mixed household waste. Hage et al. (2018) also found that the amount of plastics collected in one municipality correlated positively with the amount collected in a neighbouring municipality, and that kerbside collection and an increased number of recycling stations per square kilometre increase the recycling rate.

In a study conducted by the Swedish Waste Management Association in 2009, it was found that the additional cost of the equipment required to implement weight-based waste tariffs amounted to some 60–70 SEK (approx. 6–7 Euros) for each subscriber each year (SWMA, 2009). This can be compared with the average tariff

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