



The Displacement Effect of Convenience: The Case of Recycling



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ABSTRACT

In light of increasingly ambitious recycling targets it is important to analyse the potential displacement effect of improving access to kerbside provision on other forms of recycling. Do households view the different modes of recycling as substitutes or complements of each other? Does this perceived relationship depend on the type of material recycled? Using data for all of the UK's local governments from 2004Q2 to 2013Q3 we analyse the nature of the relationship between the two main channels of recycling. In the case of dry recycling, the empirical findings are ambiguous on the trade-off between kerbside and non-kerbside recycling. On the one hand, the findings suggest that there is no trade-off when considering the effect of expanding kerbside provision. On the other hand, the findings also suggest that there is a trade-off when we focus on the effect of expanding non-kerbside provision. However, putting together the empirical findings with theory (in particular, the symmetry property of the Hicksian substitution effect) suggests that there is a trade-off irrespective of whether we consider expansion of kerbside or non-kerbside provision. In the case of green (compost) recycling the empirical findings on their own or together with theory unambiguously suggest that there is a trade-off.

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1. Introduction

From a household perspective the single biggest factor contributing to the convenience of recycling has been the improved provision of recycling services at the kerbside. However, local drop-off recycling centres still remain an important component of the recycling infrastructure. Therefore, an interesting question to ask is to what extent households view these different channels of recycling service provision as substitutable or complementary. The total proportion of waste recycled and the split between the various channels can change, depending on the recyclability of materials and households' propensity to undertake recycling. Propensity to recycle via a particular channel may be affected positively or negatively by recycling behaviour through other channels. Such positive and negative effects can be due to enhanced awareness or due to subtractability and moral licensing (Merritt et al., 2010). Subtractability relates to the physical constraint that a single container cannot be recycled simultaneously through different channels. Moral licensing occurs across different domains of behaviour. For example, in relation to recycling and public transport, individuals may hold the view that because they recycle they are entitled not to use public transport.

Likewise, within a single domain like recycling, individuals may feel they do enough recycling at the kerb so that any further waste separation is not required.

A key factor in explaining recycling behaviour appears to be the provision of kerbside collection schemes (e.g. Callan and Thomas, 1997; Dahlén et al., 2007; Jenkins et al., 2003; Kinnaman and Fullerton, 2000; Larsen et al., 2010; Sidiqie et al., 2010a). Also important are the specific attributes of the scheme, such as convenience (Ando and Gosselin, 2005) and the size of the recycling container or the frequency of recycling and residual waste collections (Abbott et al., 2011; WRAP, 2009, 2010; WYG Environment, 2012). Other contributions have sought to examine the nature of spillovers between various policies to enhance recycling or reduce waste. Jenkins et al. (2003) find a positive marginal effect for recycling at both the kerbside and local drop-off centres for a range of materials, with the incremental effect being smaller for materials where alternative recycling options are already in place. Using data from California's Department of Conservation, Beatty et al. (2007) consider the marginal effect of expanding kerbside provision on quantities recycled by households at the kerb, at recycling centres and on overall recycling quantity. The overall benefits of kerbside recycling are found to be small, since improved recycling volumes from providing kerbside collections are offset by lower returns at recycling centres. Sidiqie et al. (2010a, b) find contradictory evidence of a trade-off, where in one case they hypothesise a complementary relationship

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between kerbside and non-kerbside recycling (Sidique et al., 2010a), whereas in another, they find no evidence of any relationship between them (Sidique et al., 2010b).

In this paper, we develop a theoretical model to understand better the interactions between different recycling behaviours. We complement the approach taken by D'Amato et al. (2016), who examine the relationship between waste reduction and recycling behaviours.¹ We provide a bridge between the notion of a substitution/complement relationship and empirically available data on volumes of recycling. Although the context is recycling, our analysis has a broader policy reach. Whatever the policy domain, to accurately assess the contribution of interventions, they should be assessed for their potential to compete with existing measures. If the degree of substitutability between various interventions is found to be high, policymakers would do well to reappraise their policy mix. Our analysis complements the strand of literature that explains the motivation for recycling (e.g. Abbott et al., 2013; Berglund, 2006; Cerere et al., 2014), as well as contributing to research that explains behavioural spillovers (e.g. Bratt, 1999; Dolan and Galizzi, 2015; Truelove et al., 2014).

Using three-stage least squares (3SLS) estimation (Zellner and Theil, 1962) of a system of equations, where each of the dependent variables is also an explanatory variable in the other equations, we provide new empirical evidence for all of the UK's local governments (authorities), over the period 2004Q2 to 2013Q3. This approach accounts for any endogeneity, whereby unobserved effects are correlated with one other.² Somewhat unique to the UK is the absence of monetary incentives directed at the household to reduce waste or to increase recycling. This allows us to undertake a more direct analysis of the trade-off between recyclables collected at the kerbside and those materials collected from recycling centres, such as from civic amenity and bring sites, which we define as non-kerbside recycling.³

The focus of our study is on understanding the existence, or otherwise, of a trade-off between kerbside and non-kerbside provision. If households perceive kerbside to be substitutable for non-kerbside, either existing modes may be crowded out, as recycling is diverted away or, the expansion of either mode will not make a significant net contribution to the overall level of recycling. On the other hand, if households perceive them to be complementary, activities directed at the promotion of either kerbside or non-kerbside recycling will translate into a similar increase in the overall level of recycling.

While recent literature has been able to identify a positive effect arising from the introduction and expansion of a kerbside scheme (Ando and Gosselin, 2005; Jenkins et al., 2003), our analysis is sophisticated enough to account for the 'quality', as well as, the quantity of kerbside provision. Our measure of 'quality' relates to the type of container offered and its size, as well as the frequency of recycling collection. The new dataset that we use has the advantage of providing a full classification of recycling schemes of varying characteristics. Woodward et al. (2005) note the importance of providing a dedicated container as part of the kerbside scheme but do not elaborate on how differences in the characteristics of containers may elicit different responses in terms of recycling rates. Abbott et al. (2011) demonstrate that the UK dry recycling rate is sensitive to the method of collection, with wheeled storage bins, that provide the greatest opportunities for recycling, improving the

¹ D'Amato et al. (2016) state that substitutability/complementarity between waste reduction and recycling behaviours depends on the sign of the cross partial involving recycling and waste reduction efforts but do not elaborate further. In this paper, we provide a clear link between the theoretical and empirical analysis and use the theory to explain the empirical results we obtain.

² Kinnaman and Fullerton (2000) were the first to note the importance of controlling for endogeneity within the recycling context.

³ Civic amenity sites are provided by local authorities and are facilities where households typically travel to dispose of recyclable materials. They are large-scale facilities and receive a number of materials in potentially large volumes. Bring sites are smaller scale facilities which concentrate on the collection of fewer materials e.g. paper, glass, clothing. These would be located, for example, in supermarkets or in public car parks.

Table 1

A summary of UK household waste policy.

Waste hierarchy
50% household waste recycling target for the UK.
70% by 2025 for Scotland and Wales.
60% by 2020 for Northern Ireland.
Individual targets set by English local authorities.
£80/t landfill tax
Recycling rewards schemes
Producer Responsibility (Packaging Waste) Regulations 2007 (amended in 2016)
5p charge for single use bags distributed by large retailers.
Courtauld Commitment 2025

recycling rate. Moreover, they show that the less frequent the residual waste collection is, the more improved will be the rate of recycling.

Section 2 outlines the policy background for the UK, Section 3 presents our theoretical model and its implications, Section 4 considers the empirical model and data; Section 5 presents the estimation results, Section 6 provides a further discussion based on the Slutsky analysis, while Section 7 provides concluding remarks.

2. Policy Background

A key environmental objective of the UK government is to reduce the amount of residual waste sent to landfill and to raise the quantity of recycling. UK waste policy has evolved since the publication of the Waste Strategy for England and Wales in 2000 and in response to relevant legislation from the European Union, such as the revised Waste Framework Directive (2008) and the Landfill Directive (1999/31/EC). The key features of UK household waste policy are presented in Table 1. The waste hierarchy, which underpins the UK approach to waste management, adopts waste prevention, reuse and recycling, waste recovery and waste disposal in descending order of priority. The only monetary incentive applied to household waste is the landfill tax which is payable by local authorities/organisations that dispose of the waste. The recycling rewards scheme, adopted by a few authorities, rewards households/community organisations with vouchers, which are redeemable in local supermarkets. The producer responsibility regulations require producers to recover and recycle a certain proportion of packaging. Complementing these regulations is a voluntary initiative between Waste Resources Action Programme (WRAP) and the grocery sector (Courtauld Commitment). The rationale underlying these policies is that the recovery and disposal of waste imposes externalities, ranging from greenhouse gas emissions arising from landfilling waste to the potential health impacts of disposing of hazardous waste.

Funding for environmental services comes from two revenue streams: i) a block grant given by the central government, which funds all services; ii) local taxes levied on households and businesses. Since the taxes charged are uncorrelated with waste generation, households and businesses perceive a marginal price of zero for every unit of waste disposed beyond the first one (Callan and Thomas, 2006). At the moment, the landfill tax represents the closest attempt of the UK government to introducing market-based instruments in waste management.⁴ Even so, the landfill tax does not incentivise households to control their waste generation. Since the landfill tax is levied on aggregate household waste, even if householders make the link between council tax rises and the landfill tax, many households are responsible and so the free-rider effect is likely to be present.

The outcome of these efforts has been to move the UK from a position where it was recycling <1% of its household waste in the 1980s to about 45% in 2014 (DEFRA, 2015). Amongst the EU(27) it has moved

⁴ The government has also introduced recycling credits in local authorities where responsibilities for waste collection and disposal are separated. The waste disposer pays the credits, equal to savings accrued from diverting waste from landfill, to the collectors to encourage recycling collections.

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