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Effects of unit-based pricing on household waste collection demand: A meta-regression analysis

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ABSTRACT

Reducing the quantity of waste is an objective pursued by an increasing number of governments. Pricing waste has been one of the most important tools used for that purpose, and the literature on the demand for household waste disposal shows a wide diversity of price elasticity calculations. We explore this issue by means of a meta-analysis on a database of 25 studies. This allows us analyzing which is the effect on the results of different data, model specification and (statistical) methods. We find no evidence that either treating prices as exogenous or including curbside recycling effects in the model influence price elasticity. There are some indications that price elasticities in the USA are more elastic, and that municipal data provide higher estimates than household data. We find that much of the variation in elasticities is associated with substantial methods; in particular it can be explained by the use of a weight-based system and by the pricing of compostable waste. In contrast, the bag-based system does not present a significant relation with elasticity. Finally, our results do not find evidence of publication bias, while they do indicate some evidence of the existence of a true empirical effect.

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1. Introduction

The unit-based pricing (UBP) of residential solid waste collection has been implemented in many parts of the world, including municipalities in the United States, the EU, Japan and South Korea. Skumatz (2008) reports that these UBP-programs are available to about 25% of the US population and about 26% of communities in the US – including 30% of the largest cities in the US. Dijkgraaf and Gradus (2014) record that the percentage of Dutch municipalities using this system raised from 15% in 1998 to 36% in 2010, and Riezenkamp (2008) presented similar increases for other countries in Continental Europe. In Japan unit-charging programs for waste were available in 30% of municipalities in 2003 and, interestingly, South Korea initiated a nationwide pay-as-you-throw (PAYT) program back in 1995 (see Sakai et al., 2008).

The increasing shortage of space and growing environmental awareness have forced many local governments to adopt such measures as UBP to reduce the amount of unsorted waste and to promote recycling.[1] But whether UBP yields a large effect on the waste amount remains a somewhat contentious issue. While households may recycle more, compost more, and require less packaging from the stores than without price programs, UBP might also encourage them to burn their garbage or to dump it on the roadside. But this has not happened in the Netherlands, or apparently elsewhere, and as such there is no evidence, according to Allers and Hoeben (2010), of municipalities having become disillusioned with the effects of UBP programs. Yet, in some countries, there is evidence that supports the hypothesis that illegal dumping has become more prevalent. Fullerton and Kinnaman (1996) estimate that for a UBP system in Charlottesville (Virginia, US), illegal dumping constitutes 28% of the total reduction in waste collected at the curb. Likewise, Hong (1999) shows that dumping became substantial after the adoption of a UBP system in Korea. In this regard, social norms and the associated sanctions differ, so the extent of illegal dumping may be related to cultural issues.

The key questions that policymakers seek a response to therefore are: Does UBP reduce quantities of waste and increase recycling, and if so, by how much? In most papers conducted to date this question is answered by estimating price elasticity for unsorted waste (and a cross-price elasticity for recycled waste); however, the estimates reported differ markedly. For example, based on a survey at the municipal level, Allers and Hoeben (2010) found a high price elasticity (−1.77) for biodegradable or compostable waste and the weight-and bin-based systems used by Dutch municipalities. For the subscription system in Portland (Oregon), Hong et al. (1993) reported a non-significant elasticity close to zero.

Despite the fact that the effects of unit-based pricing of waste have been widely debated in public economics, no systematic analysis has been conducted to date to explain why the reported impact of UBP differs so much in the literature. In other fields, meta-regression analyses have been used to explain divergences in results in the empirical literature, thus providing new insights, for example, into the relationship between labor supply and wages (Evers et al., 2006), price and income elasticities of water demand (Dalhuizen et al., 2003), climate change (Alló and Loureiro, 2014), the limits to world population (Van den Bergh and Rietveld, 2004), privatization and costs (Bel et al., 2010) and determinants of inter-municipal cooperation (Bel and Warner, 2016). In addition, these papers also provide a summary of the research results on these issues.

In this paper, we seek to fill the gap in the empirical literature on the effects of UBP by conducting a meta-regression analysis for the unit-based pricing of waste. Specifically, we use a sample of 66 price elasticities obtained from the literature on which to perform our meta-analysis, i.e., we regress the elasticities on the underlying study characteristics. In this way, we are able to analyze whether pricing policies are effective in reducing the amount of waste generated, and also to present a systematic analysis of the impact of various factors on the empirical estimates reported. Our results provide some useful insights for policy makers seeking to use waste management policies to improve environmental conditions.

The rest of this paper is organized as follows. Section 2 presents an overview of the issues raised in the empirical literature regarding unit based pricing and elasticities. Section 3 describes our sample.

[1] Other policies, such as a tax on landfill, a landfill ban and an incineration tax, have been important in this respect.