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Factors related to municipal costs of waste collection service in Spain

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ABSTRACT

Actual cost of services of local entities (CESEL, in Spanish) is the name of a new official source of statistics in Spain, provided by Ministry of Finance and Civil Service, which intends to bring some transparency to a very obscure question: the real costs of local public services, in this case, the collection costs of municipal solid waste (MSW). The study analyzes the factors that determine solid waste collection costs in 2014, using a cross-sectional dataset of municipalities of the Spanish Mediterranean Arch and Madrid, with special reference to urban development. The results of the regression reveal a positive relation between waste collection costs and factors such as higher wages, coastal municipalities, tourist areas, population and separated collection; in contrast, the increase in urban population density contributes to lower costs of MSW collection, as well as indirect management of the service is cheaper than direct public delivery.

1. Introduction

Spain is one of the world's most fiscal decentralized countries that has suffered the brunt of the crisis most acutely, which could have prompted greater competition for scarce revenues and placed global financial stability in question (Lago-Peñas et al., 2017). After this global (and, consequently, local) financial crisis, Spanish governments – central, regional and local – proposed new legislative formulas to promote the economic recovery and greater transparency. Linking with that, the reading of the "Ley Orgánica 2/2012, de 27 de abril, de estabilidad presupuestaria y sostenibilidad financiera" (2/2012 Organic Act, dated 27 April, of budgetary stability and financial sustainability), in conjunction with the "Ley 27/2013, de 27 de diciembre, de racionalización y sostenibilidad de la Administración Local" (27/2013 Act, dated 27 December, of rationalization and sustainability of local administration), establishes the concept of actual cost of local services and the obligation to provide this information in public platforms.

The administration of waste legislation in Spain is carried out by the relevant authorities at different levels (Dizy-Menéndez and Ruiz-Cañete, 2010): at the national level, the Ministry of Agriculture and Fishing, Food and Environment is responsible for the national plans; at the regional level, the autonomous regions are responsible for issuing strategic waste management plans for each specific region; and, at the local level, the municipal authorities are responsible for the management of the urban waste (domestic, industry and commerce, offices and services), including separate collection and transportation of municipal solid waste (hereinafter, MSW).

To complement national administrations involved, in terms of provision of information, data regarding actual cost of local services is published by Ministry of Finance and Civil Service of Spain, with data provided by local governments. In this database, there are files with disaggregated information on costs and details about all local public services, namely: water supply, sewerage collection, wastewater treatment, urban development, public parks, street paving, cleaning and lighting, etc. In this context, it should be possible for users to be informed of the real costs of services, which is recognized as one of the greatest concerns of such users (Pérez-Blanco et al., 2011).

In recent years, many municipalities have been forced to assess their solid waste management programmes, with specific emphasis given to the rise in costs (Greco et al., 2015). In this

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sense, the proposal for a Directive of the European Parliament and of the Council, amending the Waste Framework Directive, EU Directive 2008/98/EC on waste (EC, 2015), establishes that MSW is amongst the most complex ones to manage, and the way it is managed generally gives a good indication of the quality of the overall waste management system in a country. Moreover, the challenges of MSW management result from its highly complex and mixed composition, direct proximity of the generated waste to citizens, and a very high public visibility. The highly complex MSW management system, which is the main concern to be addressed in the aforementioned proposal, includes an efficient collection scheme, a need to actively engage citizens and businesses, a need for infrastructure adjusted to the specific waste composition, and an elaborate financing system. It is the latter element of management that is going to be addressed in this work.

There are different forms of levying charges for MSW (Chamizo-González et al., 2016): undesignated funds system, which is based on funding the service from general city funds with no attempt to relate the cost of the service; flat fee system (the form that prevails in Spain), with no formal attempt to relate to the cost of the service; or variable fee system, whose levy of the fee is overtly tied into quantifiable aspects of waste generation or measurable factors different to the waste generated, such as water consumption, for example.

Most of the Spanish municipalities do not relate the full cost of the MSW service to the required fees, which entails serious imbalances in local public funds and this would imply that the mismatch should be offset against the transfers of other government levels. This problem is heightened where tourism activity is an essential support for the local economies, because tourists generate income for local people, but they also may increase costs of providing some public services. Thus, until now, only two regional governments in Spain have implemented new taxes to cope with this additional expenditure, such as Catalonia and Balearic Islands.

The present study analyzes, on this basis, factors that imply an impact on municipal costs for solid waste collection services in 2014, using a cross-sectional dataset of municipalities of the Spanish Mediterranean area and Madrid. This paper, in contrast with others previously published, as referred to in section 2, considers the net urban population density in order to test the hypothesis that such urban development variable plays a significant role in reducing provision costs of collection of MSW. Other differentiating elements are the geographic area studied, from which generalized conclusions on urbanized areas of Spain could be drawn, and the considerable number of observations, covering almost 85% of population of municipalities on the Mediterranean area of Spain and Madrid.

Focus on urban development, as a decisive cost determining factor, is due to the significant increase in the urban land area with residential use over the past decades in Spain, which has been particularly exposed to extremely intensive urbanization; specifically, considering the different regions of the Mediterranean area and Madrid, where adverse consequences have appeared with greater intensity (Catalan et al., 2008; Galacho Jimenez and Luque Gil, 2000; García, 2010; Morote and Hernández, 2016; Pons and Rullan, 2014).

Whereas it has been shown in other studies that more compact urban models are particularly suited to improve financial efficiency in the provision and maintenance of local public services (Carruthers and Ulfarsson, 2003; Hortas-Rico and Solé-Ollé, 2010; Fernández-Aracil and Ortuño-Padilla, 2016), evidence on waste management financial implications are yet to be verified.

2. Literature review

Empirical studies of the factors that have an impact on costs of MSW services, could be addressed by means of a series of methodologies, generally parametric or non-parametric methods, nonetheless, the use of non-parametric methods is not included in the scope of this paper, as the latter are more appropriate for efficiency analysis, such as the comparison of the performance of a set of municipalities. Therefore, a complete review of previous empirical studies dealing with factors related to MSW management and their multivariate econometric analysis can be found in Bel and Fageda (2010), Bel et al. (2010) or Bel and Mur (2009). Accordingly, Hirsch (1965) was the first researcher to propose an "ideal" econometric model to analyze five major groups of variables which could affect the cost of residential waste collection service in Missouri (USA), concerning the quantity of service, their quality, the service conditions affecting input requirements, the factor price level, and productivity. His concluding thoughts indicate that pickup frequency and pickup location are statistically significant cost determinants.

From Hirsch (1965) onwards, more parametric studies have been published with a considerably improved availability of data and methodological innovations, as can be seen in Bel and Fageda (2010). Some of these studies, conducted in different parts of the world, confirmed that contracting out residential solid-waste collection is associated with lower costs than those of public provision, for example: Reeves and Barrow (2000) analyzed 88 local authorities in Ireland, McDavid (2001) considered 327 local governments across Canada or Dijkgraaf and Gradus (2003) selected 120 municipalities in the Netherlands, while later, Dijkgraaf and Gradus (2013), gathered data from 548 Dutch municipalities. Conversely, other works show that public costs are lower than private provision costs, such as Ohlsson (2003) with 170 firms in 115 Swedish municipalities, among other authors.

Regarding research close to the geographical area of this study, Bel (2006) and Bel and Costas (2006) were the first authors to determine factors explaining why the costs imposed by the urban solid waste collection service vary in a region of Spain by looking at 186 Catalan municipalities in 2000. They consider the total expenditure on MSW management (including collection, transport, transfer and treatment) as the dependent variable. Their explanatory variables are the quantity of waste for elimination generated in the municipality, the quantity of recycled waste, the wage level in a given province, the frequency of collection, the total population density, the tourism activity index, the existence of a landfill in the municipality, and the mode of production, namely public or private. They find no effect of the mode of production on costs and population density is not significant, but finally, their results suggest that both intermunicipal cooperation and recent privatization are associated with lower costs.

Bel and Mur (2009) and Bel et al. (2012) focus attention on small municipalities in the region of Aragon in 2003 and 2008, respectively. Their results indicate that small towns that cooperate incur lower costs for waste collection service, but the form of production, public or private, does not result in systematic differences in costs. On the one hand, with regard to variables related to urban development in Bel and Mur (2009), no significant relation was found between population density and the municipal costs of the service, however a greater degree of dispersion within a municipal area affects total costs positively (in other words, dispersion contributes to increase costs), as the complexity of the service is necessarily increased. On the other hand, according to Bel et al. (2012), costs increase as the population density or dispersion rises.

In a different geographic area of Spain, Bel and Fageda (2010) analyze the factors that determine solid waste service costs in