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# “Disentangling the separate and combined effects of privatization and cooperation on local government service delivery”

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## *Abstract*

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Inter-municipal cooperation is often regarded as an alternative to privatizing local public services. But cooperation and privatization can also be combined into a composite reform package, where several municipalities jointly issue contracts relating to multiple jurisdictions. Evaluating these 'hybrid' reforms rests on disentangling the separate and combined effects of cooperation and privatization. This we undertake for the case of solid waste collection in the Spanish region of Catalonia, using environmental protection as our focal performance metric. Drawing on two waves of data (for 2000 and 2019) for a sample of 186 municipalities that mix public and private with cooperative and autonomous service delivery, we show that superior performance among reformed municipalities is initially confined to those cooperations involving public production. But latterly, any form of cooperation, using public or private production, resulted in significant gains. This reinforces the need for evaluators to isolate the (changing) 'active ingredient' in hybrid reforms.

*JEL classification:* L33, H44, H76, H83.

*Keywords:* Collaboration, Privatization, Inter-municipal cooperation, Shared services local government.

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## 1. Introduction

Local government reform has been on the policy agenda of many countries for decades. Two of the most common reform strategies are *privatization*, in which public services are produced under contract by for-profit organizations (Levin & Tadelis, 2010; Alonso et al., 2016; Petersen et al., 2018), and *inter-municipal cooperation*, where two or more local governments provide one or more service jointly across their jurisdictions (Hulst & van Montfort, 2012; Teles & Swianiewicz, 2018; Dixon & Elston, 2020; Bel & Sebó, 2021; Rubado, 2023). In the research literature, privatization and cooperation are typically regarded as “either/or” alternatives. Governments using these strategies *either* opt for private contractors, *or* they work cooperatively with other municipalities. The possibility of engaging in both privatization and cooperation simultaneously is rarely considered. Indeed, inter-municipal cooperation, whose popularity rose globally just as faith in privatization was beginning to wane, is often regarded as a learned response to the high transaction costs, incentive incompatibility and quality shading that earlier contracting experiments sometimes brought. That is, cooperation is typically seen as something to be tried *instead of* privatization, rather than *alongside* it.

Nonetheless, cooperation and privatization are not incompatible reforms; and in practice they do co-occur, especially in Southern Europe (see Álvarez & Bel, forthcoming). Such cases involve groups of cooperating municipalities issuing joint contracts to outsource all or part of their shared service to a private operator. Empirical research on local reform that treats cooperation and privatization simply as incompatible alternatives thus lags some way behind reform practice, where ‘hybrid’ cooperation-privatization schemes are both part of the ‘choice set’ confronting would-be reformers and have been implemented in a non-trivial number of cases. We know little, for instance, of how and why composite reform packages arise in the first place, or what elements of privatization and cooperation are retained or suppressed when the two are combined in a single scenario. And, most importantly, we have yet to assess whether these hybrids succeed in outperforming unitary reforms by somehow managing to combine, say, the cost advantages of competition with the quality protections of cooperation. It is to this latter problem of evaluating cooperation-privatization hybrids that we turn in this article.

The theory behind both privatization and cooperation is well established and, increasingly, well tested [for recent systematic reviews and/or meta-analyses, see: Silvestre et al. (2018) and Bel and Sebó (2021) on cooperation and costs; Petersen, et al. (2018) on privatization and costs; and Brogaard and Petersen (2022) on privatization and service quality]. But the issues involved in combining the two approaches are far less certain. On the one hand, hybridization may help to remedy some of the recognized deficiencies in each separate approach to public service reform. Joint contracting by multiple local governments might dilute the high transaction costs involved in engaging a firm to do public tasks, for example. And the addition of competition to cooperative arrangements might make available performance gains that, due to diminishing returns to scale, tend to be less forthcoming when larger municipalities engage in collaborative up-scaling (Niaounakis

& Blank, 2017; Elston, Bel, et al., forthcoming). On the other hand, combining several distinct reform logics into a single approach may prove complex and counterproductive. Bargaining between multiple principals or duplicative monitoring may actually increase, rather than reduce, transaction costs; or, conversely, contract monitoring may be undersupplied (increasing contractor discretion and risk of quality shading) due to free-riding among the multiple principals of a “common agent” (Voorn et al., 2019).

In this article, we shed light on these issues by disentangling the separate and combined effects of cooperation and privatization on local service performance for the case of solid waste collection in the Spanish region of Catalonia. Our focal performance metric is environmental protection, primarily measured as the proportion of waste diverted from landfill through recycling, and total waste collected. Using two waves of data (for 2000 and 2019) on a sample of 186 municipalities, among which the four possible combinations of cooperation and privatization are all represented, we show that, initially, only cooperations involving public production is associated with higher quality, in line with the “quality shading” thesis (see, for example, Elkomy et al., 2019). In contrast, two decades later, all forms of cooperation enhanced environmental protection, with public and private production no longer producing distinct results.

Our article makes three contributions to the existing literature. First, our analysis joins an emerging wave of new studies assessing the effect of cooperation on service quality, not just costs. Second, we distinguish between all four possible combinations of production and provision options (single and public, single and private, cooperative and public, cooperative and private) with a sample large enough to obtain robust results on the effect of these reform choices on performance – thereby disentangling the effects of production and provision. Third, our findings reinforce the need for evaluators to isolate the “active ingredient” in hybrid reform packages, and to attend to shifts in the “potency” of these ingredients over time.

## **2. Hybridizing privatization and cooperation in local government**

Figure 1 depicts four reform scenarios with which we are concerned, each distinguished by either the presence or absence of privatization and cooperation. Although there are of course other means of reforming local services that are not depicted by the matrix, the principal omitted approach –amalgamation of separate municipalities to form larger jurisdictions (Andrews, 2015; Reingewertz & Serritzlew, 2019; Galizzi et al., forthcoming)– is typically externally imposed by a higher tier of government (regional or national), rather than being a local choice. Inter-municipal cooperation and privatization, on the other hand, are more commonly implemented through local initiative. Our study thus focuses on the more voluntaristic local government reform options, in which municipal boundaries are taken as fixed; while also acknowledging the overt and latent constraints that national or regional government can impose on lower tiers.

**Figure 1. Matrix of reform options**

		Mode of production	
		<i>Public</i>	<i>Private</i>
Provider Jurisdiction	<i>Single</i>	1. Conventional local service delivery	2. Privatized local services
	<i>Multiple</i>	3. Inter-municipal cooperation	4. Cooperation-privatization hybrid

### 2.1 Conventional local service delivery

The first of the four options depicted in Figure 1 is what might be termed ‘conventional’ service delivery. Here, the responsibilities assigned to, or assumed by, the local government are fulfilled by public employees working in a single municipal jurisdiction. So, discretionary choices about service specifications (i.e., those aspects of policy design that are not standardized in regional or national statutes and regulations) apply only to that single jurisdiction; and a workforce is directly employed by that local authority to enact those decisions. For our purposes, this approach can be regarded as the baseline, default or “do nothing” option; although, again, “conventional” does not necessarily mean “traditional,” since examples of inter-municipal cooperation can be dated at least from early 20<sup>th</sup> Century (Hasluck, 1936), and the use of the private sector in government service delivery was never as original to “new public management” era as was sometimes implied (see Hood, 1998).

### 2.2. Privatized local services

The second option in Figure 1, “privatized local services,” involves the full or partial replacement of the public workforce and/or publicly-owned assets with private sector workers and/or privately-owned infrastructure (Levin & Tadelis, 2010; Alonso, et al., 2016; Petersen, et al., 2018). Crucially, as Vickers and Yarrow (1991, p.112) explain, privatization inheres in the fact that “rights over any financial surplus arising from the activities concerned are transferred to the private contractor.” And in this first version of privatization reforms (Box 2 in Figure 1, rather than Box 4), the maximum scope of the private contract is spatially limited by the municipal boundary (even though a single firm may serve multiple jurisdictions under separate contracts, thus generating some economies of scale).

Privatization reforms typically proceed from the belief that, in the absence of competition and the “survival imperative,” opportunities for reducing the cost and/or improving quality of organizational outputs will remain untaken, or even unimagined. In other words, and similar to the situation facing monopolistic firms operating in uncompetitive markets, incentives for implementing performance-enhancing innovations under the ‘conventional service delivery’ model are believed to be impaired because continuity of operations, budgets and employment are all assured

irrespective of the effort expended on improvement. The result is said to be an abundance “X-inefficiency,” which describes the gap between the organization’s actual performance (typically conceived as average unit costs) and what could optimally be achieved if all possible avenues of innovation were pursued (which is ultimately unknowable, hence the “X”) (Leibenstein, 1978; Lane, 2000, ch. 3). And the remedy would be to find ways of injecting competition into the protected public sector, to stimulate the incentives thought to be necessary for innovation.

Critics of this reasoning argue that, normatively, allowing private shareholders to accrue profits from producing public goods is morally objectionable; and, empirically, the idea that *only* survival pressures can adequately incentivize performance misunderstands the prevalence and potency of public service motivation, or the potential to displace or “crowd out” those intrinsic inducements through the imposition of harder incentives (on the key debates, see Walsh, 1995; Le Grand, 2003). From within economics, the account of privatization provided thus far is widely recognized as incomplete. In particular, it fails to take account of the added “transaction costs” (Williamson, 1985) involved in setting up, monitoring and enforcing, or the risk that private managers will obtain cost savings by “cutting corners” rather than through genuine (and difficult) service innovation (Hart, Shleifer and Vishny, 1997). Indeed, the higher the chance of this “quality shading” (Elkomy, et al., 2019) –perhaps because of the difficulty of measuring performance or of anticipating and contractually forestalling all the methods by which corners could be cut– the higher the transaction costs incurred.

Privatization grew significantly in incidence and scope during the 1980s and 1990s, and is still very much in evidence today (Anguelov and Brunjes, 2023). But there has also now emerged evidence of what some scholars have termed “re-municipalization,” whereby formerly privatized local assets and services are returned to public ownership (Clifton et al., 2021). This change is not necessarily to the *status quo ante*; as Voorn et al. (2021) show, service delivery is often still undertaken at “arm’s-length” to municipalities, albeit in a more public form. Nor is there yet sufficient evidence to regard re-municipalization as a definite trend (Clifton, et al., 2021). Still, such reversals do not appear to be primarily motivated by changed ideological preferences. Rather, pragmatic reasons –like disappointing results of privatization- are driving these decisions (Clifton, et al., 2021; Voorn, et al., 2021).

### *2.3 Inter-municipal cooperation*

Inter-municipal cooperation, the third option in Figure 1, involves two or more local governments providing one or more public service jointly across their jurisdictions (Hulst & van Montfort, 2012; Teles & Swianiewicz, 2018; Dixon & Elston, 2020; Bel & Sebó, 2021; Rubado, 2023). Also known as “shared services” or “inter-local agreements,” inter-municipal cooperation (hereafter IMC) is a subtype of collaborative public management, generally adopted in the hope of securing cost savings or quality improvements in local public services through the generation of economies of scale (Bel and Warner, 2015, 2016). Improved regional coordination and management of common-pool resources and externalities are also common reform justifications,

especially in the US with its particularly fragmented local system (Klok et al., 2018; Tavares & Feiock, 2018).

On the one hand, IMC can be described as a more subdued form of municipal amalgamation. It involves the *partial* merger of only *parts of*, or departments within, the local government, rather than of entire organizations (Andrews & Entwistle, 2013; Dixon & Elston, 2019). As such, IMC can be both more selective of those services most likely to benefit from “up-scaling” or “regionalizing,” and more easily reversed or reconfigured to involve different participants (see Elston, Rackwitz, et al., forthcoming). On the other hand, IMC is also regarded as an alternative to, or even reaction against the problems of, local privatization policies (Brown, 2008). Specifically, if involvement of for-profit organizations leads to a mixture of performance gains and losses, can IMC achieve similar gains with fewer losses?

Privatization and IMC overlap somewhat in the mechanisms by which improvements are obtained, although depend on very different emphases. Like privatization, IMC may involve a degree of competition—for instance, among municipalities vying to be selected as partner in a new cooperation, to be admitted to an established, reputable one, or to be retained at the point of agreement renewal. This is easier for more populated and more fragmented local government systems, as well as for administrative than for capital-intensive services, since the range of possible partners is greater (Dixon and Elston, 2020). However, the main ‘active ingredient’ in IMC reforms is scale, and the cost and quality advantages that should come from amalgamating demand for a public service across multiple jurisdictions. In particular, by delivering the same service on a larger scale than the individual constituent members of the IMC can achieve, IMCs hope to dilute fixed costs of management or indivisible equipment, achieve volume-enabled specialization of workforce and processes, make pooled investments in new technologies that exceed the purchasing power of any individual partner, and/or secure bulk-buy discounts from suppliers.

Empirical evidence on the financial effects of IMC has now amassed in a wide range of contexts (see Silvestre, et al., 2018; Bel & Sebó, 2021). Overall, the projected economies tend to be realised in practice only when smaller municipalities participate in the cooperation, when the cost function for the ‘shared’ service is conducive to up-scaling (e.g., when the service is capital, rather than labour-intensive), and when the governance arrangements are successful in minimizing principal-agent problems. Beyond cost saving, multivariate studies assessing the effects on service quality are still relatively scarce, with Holum and Jakobsen (2016), Blåka et al. (2017, 2023), Klok, et al. (2018), Arntsen et al. (2021), Elston et al. (2023) and Elston, Bel, et al. (forthcoming) representing the emerging literature, the latter two using quasi-experimental estimates on administrative measures of service quality. Finally, research on the reversal or reconfiguration of IMC reforms is far less developed than that on re-municipalization, though it is unclear whether this is because the incidence of policy reversal remains relatively low, or because scholars have yet to catch up (see Aldag & Warner, 2018; Zeemering, 2018; 2022; Elston, Rackwitz, et al., forthcoming).



#### *2.4. Cooperation-hybridization hybrid*

The fourth and final box in Figure 1, and the one largely absent from current studies of local government reform, is the cooperation-privatization hybrid. The concepts of hybrids and hybridity are used in a range of ways by social scientists, particularly in institutional economics and organizational sociology (e.g. Skelcher & Smith, 2015). Here, we invoke the term in its most straightforward sense, to mean “situation[s] of mixed origin or composition of elements” (Denis et al., 2015, p.275). In our case, this denotes the mixing of two distinct reform strategies – privatization and cooperation. Such cases involve groups of cooperating municipalities issuing joint contracts to outsource all or part of their shared service to a private operator.

According to Álvarez and Bel (forthcoming), the combination of inter-municipal cooperation and privatization in local service delivery is most prevalent in countries of the French legal origin in Western Southern Continental Europe, including Spain, France, Italy and Portugal. Examples include the Spanish region of Aragon, where 65% of the municipalities engaged in cooperation also opted for privatization (whereas 35% used public production) (Bel, Fageda and Warner, 2014). Countries in Central Europe that are of the German legal origin also use the combination of privatization and cooperation, but to a lesser extent (although precise figures on the prevalence are unavailable). Even if cooperation is also frequent in Scandinavian countries, privatization is rare; and in European countries with an English legal system, cooperation is typically rare (though less so in the wake of austerity), as is its combination with private production.

At present, little theory has been developed to predict the likely effects, desirable or undesirable, of combining cooperation and privatization into a single reform package. But using the current state of knowledge about the effects of each separate approach, it is possible to derive several potential arguments:

On the positive side, hybridization may help to remedy some of the recognized deficiencies in each separate approach to public service reform. In particular, joint contracting by multiple local governments might dilute the high transaction costs involved in engaging a firm to do public tasks – which institutional economics identifies as a determining factor in realizing benefits from a strategy of “making” rather than “buying” organizational tasks (Williamson, 1985). For example, when two or more municipalities undertake a joint tendering exercise, the indivisible costs of writing specifications, soliciting and evaluating bids, undertaking due diligence on short listed suppliers, etc. can all be shared out among members of the consortium, diluting the effect on any one individual government. In addition, the injection of competition to cooperative arrangements involving larger municipalities might help this group of reformers to obtain positive reform outcomes that, due to diminishing returns to scale, have traditionally proven elusive. For example, in the case of IMCs that collect property taxes, both Niaounakis and Blank (2017) and Elston, Bel, et al. (forthcoming) report that the benefits of up-scaling lapse for IMCs delivering services above about 46,000 and 40,000 households, respectively; and in the latter case the vast majority of councils already exceed this threshold, meaning that IMC provides no benefit.

On the downside, combining several distinct reform logics into a single approach may prove complex and counterproductive, as the sociological literature on institutional logics and hybridity cautions (Battilana & Dorado, 2010). In the case of cooperation-privatization hybrids specifically, bargaining between multiple principals –for instance, over the content or terms of the contract, the shortlisting or selection criteria, etc.– could increase rather than reduce transaction costs. This is what Hood (1976) refers to as “multi-organization suboptimization.” Another possibility could be that, constrained by their sense of democratic responsibility to local constituents and/or aware of the increased risks and interdependences that arise from both outsourcing and collaboration (Elston et al., 2018; Terman et al., 2020), municipalities engage in duplicative monitoring –being unwilling to cede control lest something should go wrong and they be accused of being “absent on duty.” Again, transaction costs will rise, not fall. Lastly, and alternatively, it may instead be the case that, hard-pushed for time or resources, monitoring of the joint supplier is *undersupplied* –in a kind of collective-action dilemma in which each municipality “free rides” on others within the cooperation to undertake the necessary contractor oversight (Voorn, et al., 2019). This would increase agent discretion and so potentially increase quality shading.

Empirical research into either the causes or the consequences of cooperation-privatization hybrids is inchoate. All four combinations described above were present in Bel, Fageda and Mur’s (2014) analysis of waste collection costs, but the number of cases combining single & private (seven) and single & public (three) was too small to allow a complete separation of cooperation and privatization effects. Three of the four combinations (no cases combining standalone and private options existed) also were examined in Bel and Belerdas (2022) to explain costs of fire protection. Below, therefore, we set out to investigate the following hypotheses:

H1: Cooperation is associated with higher quality services.

H2: Private management is associated with lower quality services.

H3: Cooperation combined with public production is associated with higher quality than any other reform combination.

H4: Standalone combined with private production is associated with lower quality than any other reform combination.

### **3. Geographical and institutional context**

#### *3.1 Local government in Catalonia*

Our analysis to disentangle the effect of privatization and cooperation choices on service quality is conducted on data for the region of Catalonia in North-East Spain, with a population of eight million. Catalan local government is structured in a three-tier arrangement, consisting of four provinces, 42 counties and 947 municipalities. Counties (*‘comarques’*) were established by a law passed in 1987 by the Catalan

parliament. Each municipality sits within one county, and counties are governed by a county council (except for *El Barcelonès*). County councils are formed according to the results of the municipal elections in the county's municipalities (indirect election), based on which political parties appoint their respective fraction of city county councillors. These elect the county's president, who appoints the members of the county's government from among the county councillors.

Counties exert powers delegated by the Catalan parliament, are funded by regional transfers, and do not have taxing powers. They also manage a variety of municipal-level public services in cases where constituent municipalities voluntarily choose to delegate these functions upwards, and have become the predominant method of inter-municipal cooperation in Catalonia –the other form being mancommunities “*mancomunitats*”,<sup>1</sup> which are voluntary associations of municipalities that are jointly governed by members, similar to voluntary unions in other countries (e.g. *unione di comuni* in Italy; see Bocchino and Padovani, 2021). Mancommunities play minor role in Catalonia (unlike elsewhere in Spain; see Zafra-Gómez et al. (2013); Pérez-López et al. (2015)).

### **3.2. Solid waste management**

Spanish Law requires municipalities to collect and transport (hereafter: collection) and treat solid waste. Treatment is usually managed at a higher government level (county, inter-county, and Environment Metropolitan Entity-AM Barcelona). But waste collection remains a municipal responsibility, which municipalities can choose to fulfil either as a single municipality (“stand-alone” provision) or through either the counties or voluntary associations (inter-municipal cooperation). In both cases, governments can further choose between public, private, or mixed public-private delivery (with participant municipalities jointly deciding in the case of mancommunities).

Regulation of waste management is a regional power in Spain, subject to European directives on environmental policies. The Catalan regional regulator is the *Agència de Residus de Catalunya* (ARC), and so all municipalities in our study are subject to the same regulatory framework.

The two main environmental quality indicators of waste collection management used in our study are: (1) Selective collection (involving the sorting of waste) facilitates recycling and the avoidance of landfill; and (2) The volume of waste generated is directly related to the need for transportation to facilities for disposal or for valorisation; therefore, it influences emissions of CO<sub>2</sub> and other types of pollutants. Data from ARC shows that within our study period selective collection increased from 14% in 2000 to 45% in 2019. Volume collected/inhabitant decreased from 570.6 kilos per capita (1,257 pounds) in 2000 to 527.2 kilos per capita (1,162 pounds) in 2019.

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<sup>1</sup> Pano Puey et al (2018) offer a detailed explanation of how IMC is organized in Catalonia.

## 4. Empirical strategy

### 4.1 Data and variables.

We study the effect of IMCs on environmental quality in solid waste collection in Catalonia between 2000 and 2019, focusing on selective collection and collected (total) volume per inhabitant. Additional indicators have been obtained on waste treatment facilities, socio-economic, demographic and politics, all of them from administrative sources. Information on cooperation and privatization was obtained by means of two surveys conducted on Catalan municipalities above 1,000 inhabitants. Our baseline comes from the survey SLSP-UB used in Bel and Costas (2006). We administered a new and equivalent survey (Survey-2019) specifically directed at those 186 municipalities for which information for 2000 was available. We obtained data for 2019, enabling a comparison over the space of two decades. [Details on methodology and timeline of both surveys are provided in the online appendix]. Table 1 displays the mix of provision and production for both 2000 and 2019, based on the structure of figure 1 above.

**Table 1. Mix of provision and production forms, 2000 and 2019 (n= 186 in both years)**

Provision	Production	Public	Private
Single Municipality		2000: 6 2019: 12	2000: 110 2019: 88
Intermunicipal Cooperation		2000: 28 2019: 28	2000: 42 2019: 58

We aim to explain how cooperation and privatization choices influence the environmental quality of waste collection, and its dynamics over two decades. We use two dependent variables: (1) selective collection -percentage of, *PcSel*- (destined for recycling), positively related with environmental effects; and (2) volume of (total) waste collected per inhabitant -*VolxCap* -, negatively related to environmental effects. Table 2 summarizes our variables and sources. Our initial explanatory variables are:

*Cooperation (Coop)*: Our key independent variable is a dummy, taking the value 1 when waste collection is provided inter-municipally, and 0 otherwise. We expect cooperation to positively influence environmental quality.

*Private production (Priv)*. Production choices may influence costs. IMC is compatible both with public and with private *production*. *Priv* is a dummy variable that takes value 1 when service delivery is by private firm(s),<sup>2</sup> and 0 otherwise. We expect private collection to be negatively related to environmental quality.

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<sup>2</sup> In a few cases, waste collection is managed by a mixed public-private firm. We therefore define private control as when the private firm holds the majority of shares in the mixed firm.

**Table 2: Variables: definition and sources**

Variables	Definition	Source
DepVar		
<i>PcSel</i>	Percentage of waste selectively collected	ARC
<i>VolxCap</i>	Waste collected per inhabitant (kilos)	ARC
IndVars		
<i>Vol</i>	Volume of waste collected (Tons)	ARC
<i>PopDens</i>	Density of population (inhabitants/km <sup>2</sup> )	INE & Idescat
<i>Tou</i>	Tourism Index	La Caixa Statistical Yearbook & Idescat
<i>WRFac</i>	Waste reception facilities	ARC
<i>Left_Wing</i>	Left-wing Mayors.	Official registries and municipal webs.
<i>Priv</i>	Dummy variable with value 1 if the service is privately managed, and 0 otherwise.	SLSP-UB & Survey-2019
<i>Coop</i>	Dummy variable with value 1 if the service is cooperatively provided, and 0 otherwise.	SLSP-UB & Survey-2019

Note: ACR (Agència de Residus de Catalunya); INE (Instituto Nacional de Estadística); Idescat (Institut d'Estadística de Catalunya)

*Volume of waste collected (Vol)*, as it has been found as primary factor on different outcomes of the waste collection service in the empirical literature.

*Density of population (PopDens)*: Number of inhabitants per square kilometre. Empirical literature provides on this is mixed. Greater dispersion makes it costly and difficult to use logistics for waste separation, but it can also facilitate lower waste generation (e.g., with more organic waste used for composting).

*Tourism (Tou)*: Tourism is a relevant economic activity in Catalonia. It is geographically concentrated and heavily seasonal. Waste collection in high season can disrupt regular services, making it more difficult to implement environmentally friendly measures and increasing the quantity of waste.

*Waste Reception Facilities (WRF)*: Having waste reception facilities within the municipal boundary can facilitate the separation of waste (particularly that of bigger size), thus benefiting environmental management. We use a dummy with value 1 for municipalities with a waste reception facility, and 0 otherwise.

*Left\_Wing Mayor*: As in other countries, left-wing elected officials and parties in Catalonia have tended to place more emphasis than conservatives on environmental management. We identified as left-wing (=1) those belonging to *Partit dels Socialistes de Catalunya* (PSC), *Esquerra Republicana de Catalunya* (ERC), *Iniciativa per Catalunya/Comuns* (ICV/Comuns) and *Candidatures d'Unitat Popular* (CUP).<sup>3</sup> The variable *Left\_Wing* takes value 1 for left from the centre mayors, and 0 otherwise.

<sup>3</sup> When a mayor did belong to a local group, we decide based on the adhesion to a larger-scale partisan coalition (for county councils), or (exceptionally) based on the ideological affiliation of the main opposition in the municipality.

## 4.2. Methods

To test the separate and combined effects of cooperation and privatization on environmental quality, and the dynamics of any effects over time, we specify the following equations 1 and 2:

$$PcSel_{it} = \beta_0 + \beta_1 Vol_{it} + \beta_2 PopDens_{it} + \beta_3 Tou_{it} + \beta_4 WRF_{it} + \beta_5 Left\_wing_{it} + \beta_6 Priv_{it} + \beta_7 Coop_{it} + \varepsilon_{it} \quad (1)$$

$$VolxCap_{it} = \beta_0 + \beta_1 Vol_{it} + \beta_2 PopDens_{it} + \beta_3 Tou_{it} + \beta_4 WRF_{it} + \beta_5 Left\_wing_{it} + \beta_6 Priv_{it} + \beta_7 Coop_{it} + \varepsilon_{it} \quad (2)$$

Where sub-script  $i$  represents the municipality, sub-script  $t$  represents year (2000 and 2019), and  $\varepsilon$  is a heteroscedasticity-robust error term. Table 3 provides descriptive statistics. From here we follow two different technical paths. The values for  $PcSel$  are percentages (bounded between 0 and 1), so we conduct a logit estimation (we check robustness of results with a linear estimation). Instead,  $VolxCap$  is a continuous unbounded variable, so we apply regular lineal techniques, and decide based on corresponding tests.

Turning now to statistical issues, we conduct robust estimations to control for heteroskedasticity when advised by the Breusch-Pagan/Cook-Weisberg test. The average Variance Inflation Factor (VIF) is 1.46, and all single variables have low individual VIF, below 2.1. Hence, we do not have relevant issues of multicollinearity. Our database has a panel structure. The Breusch and Pagan's LM test for random effects was not significant when using  $PcSel$  as dependent variable, but it was at 1%, when  $VolxCap$  was used as dependent variable. Therefore, in that case panel estimation is preferred to pooled OLS. We controlled for time effects by including a year dummy (which takes value 1 for 2019, and value 0, otherwise).

**Table 3. Descriptive Statistics**

Variables	Observations	Mean (count)	Standard Deviation (%)	Minimum	Maximum
<i>PcSel (%)</i>	372	0.3010	0.2279	0.0001	0.9219
<i>VolxCap (kilo)</i>	372	566.61	262.57	213.50	2052.93
<i>Vol (Tons)</i>	372	14130.40	58323.17	236.34	791618.40
<i>PopDens</i>	372	1281.81	2904.60	14.68	21382.00
<i>Tou</i>	372	3.48	16.83	0.00	276.58
<i>WRF</i>	372	(146)	(39.25)	0	1
<i>Left_wing Mayor</i>	372	(232)	(62.36)	0	1
<i>Priv</i>	372	(298)	(80.11)	0	1
<i>Coop</i>	372	(156)	(41.94)	0	1

## 5. Results

Table 4 shows the results from the estimations for the full sample (2000 and 2019). Column 1 presents the logit estimation for selective collection (column 2 presents the results from the OLS clustered estimation). All estimations are robust and explanatory capacity is high, as expected. In the estimation for the complete sample (column 1), population density and tourism show a negative and significant effect ( $p < 0.001$  and  $p < 0.01$ , respectively) on selective collection. Municipalities with left wing mayors have more selective collection, although significance of the coefficient is weaker in this case ( $p < 0.10$ ). Other control variables are not significant.

Regarding our key explanatory variables, private production is not significant, but cooperation has a positive and significant association ( $p < 0.05$ ) with selective collection. The signs and significance of the coefficients in the pooled and clustered OLS estimation (column 2) are identical to those obtained in the logit estimation.

Turning now to estimations for volume/inhabitant, column 3 of table 4 presents the GLS random estimation (column 4 presents the results of the OLS clustered estimation, for robustness check). Again, the estimations are robust, and explanatory capacity is relevant, although lower than in the case of selective collection. Total waste volume and tourism have a positive and significant association ( $p < 0.05$  and  $p < 0.001$ , respectively) with volume per inhabitant. In contrast, population density and waste reception facilities significantly decrease volume per inhabitant ( $p < 0.001$  and  $p < 0.01$ , respectively). The rest of the control variables are not significant. Regarding our key explanatory variables, private production is not significant, but cooperation has a negative and significant association ( $p < 0.001$ ) with volume per inhabitant. The signs and significance of the coefficients in the pooled and clustered OLS estimation (column 4) are very similar to those obtained in the GLS estimation, except for left-wing mayor, which is now associated with a lower volume per inhabitant.

**Table 4: Results for the complete sample (2000 & 2019). Dependent variables: Selective collection -percentage- (1 & 2) and volume -kilos- per inhabitant (3 & 4)**

	Selective collection (%)		Volume/Inhabitants (kilos)	
	Column 1 Xtlogit clustered	Column 2 Pooled and clustered OLS	Column 3 GLS random and clustered	Column 4 Pooled and clustered OLS
Volume	2.48e-07 (3.57e-07)	4.30e-08 (5.44e-08)	0.0002* (0.0001)	0.0002* (0.0001)
Pop_Density	-4.27e-05*** (9.95e-06)	-7.21e-06*** (1.57e-06)	-0.0175*** (0.0041)	-0.0170*** (0.0040)
Tourism	-0.0022** (0.0008)	-0.0005** (0.0002)	4.3573*** (0.8986)	6.3194*** (0.7778)
WR_Facility	0.1158 (0.1054)	0.0225 (0.0230)	-65.7811** (25.1067)	-53.1137* (26.8184)
Left-wing Mayor	0.1310† (0.0790)	0.0250† (0.0136)	-21.5924 (20.9476)	-55.6150† (26.6974)
Private	-0.0916 (0.0914)	-0.0160 (0.0176)	19.5379 (21.1284)	14.4356 (25.5622)
Cooperation	0.1987* (0.0884)	0.0354* (0.0160)	-87.5804*** (25.1602)	-136.9339*** (32.1009)
Year2019	1.9216*** (0.1086)	0.3566*** (0.0219)	-114.5237*** (22.3269)	-105.5763*** (23.9326)
Constant	-2.0970*** (0.1186)	0.1067*** (0.0208)	636.6852*** (39.3907)	676.4821*** (48.6823)
Time	Yes	Yes	Yes	Yes
VIF	1.46	1.46	1.46	1.46
BPL Multiplier Test	0.4943	0.4943	0.0000***	0.0000***
Groups	186	186	186	186
Observations	372	372	372	372
R <sup>2</sup>		0.7034	0.2932	0.3056
Chi2	803.43***		86.79***	
F-Test		119.83***		15.50***

Notes: Standard Errors in parentheses. \*\*\*p<0.001; \*\*p<0.01; \*p<0.05; †p<0.10

Overall, we observe that, while private production does not appear to influence the quality of environmental management, cooperation is positively associated with environmental quality in both cases: it has a positive association with selective collection and a negative association with volume per inhabitant.

Next, we gain insight into the dynamic effects by comparing the results of separate estimates for 2000 and 2019. While the number of cooperating municipalities increased from 70 (2000) to 86 (2019), with seven municipalities leaving cooperation and 23 entering cooperation, there are no cases of more than one change in cooperative status in our sample.<sup>4</sup> This reinforces our confidence in the robustness of

<sup>4</sup> Cooperation almost always takes institutionalized form in Catalonia. Interlocal contracts, which can be more flexible and prone to successive changes of arrangements, are residual (only two municipalities in our sample).



the analysis. Table 5 presents the results of estimations for 2000 and for 2019. We conduct fractional logit estimations for selective collection, and robust OLS estimations for volume per inhabitant.

**Table 5. Results for subsamples 2000 (5 & 7) and 2019 (6 & 8). Dependent variables: Selective collection -percentage- (5 & 6) and volume -kilos- per inhabitant (7 & 8)**

	Selective collection (%)		Volume/Inhabitant (kilos)	
	Year 2000 Column 5 Fractional Logit	Year 2019 Column 6 Fractional Logit	Year 2000 Column 7 OLS Robust	Year 2019 Column 8 OLS Robust
Volume	1.08e-07 (2.21e-07)	1.94e-07 (6.07e-07)	0.0002† (9.08e-05)	0.0001† (5.71e-05)
Pop_Density	6.27e-06 (1.20e-05)	-0.0001*** (1.39e-05)	-0.0153*** (0.0038)	-0.0121*** (0.0030)
Tourism	0.0149** (0.0043)	-0.0021* (0.0087)	26.0412* (12.4766)	5.5886*** (0.3148)
WR_Facility	-0.3201 (0.2128)	0.1582 (0.1075)	100.2181 (77.4513)	46.3404* (23.4016)
Left-wing Mayor	0.2892* (0.1173)	0.1887† (0.1024)	-110.6732** (37.2085)	-52.6138† (30.2925)
Private	-0.3690** (0.1434)	-0.0211 (0.1163)	23.7731 (33.1991)	-15.1714 (34.2797)
Cooperation	-0.1218 (0.1258)	0.2966** (0.1048)	-168.3914*** (35.9369)	-83.8143** (30.9911)
Constant	-1.9118*** (0.1505)	-0.3159† (0.1802)	679.9560*** (55.4516)	572.0240*** (56.8374)
VIF	1.24	1.23	1.24	1.23
Observations	186	186	186	186
BM/CW Test	0.0000***	0.0023**	0.0000***	0.0023**
R <sup>2</sup>	0.0062	0.0135	0.3672	0.4598
Chi2	28.32***	83.89***		
F-Test			6.88***	65.61***

Notes: Standard Errors in parentheses. \*\*\*p<0.001; \*\*p<0.01; \*p<0.05; †p<0.10

Private production was associated with lower selective collection in 2000 (column 5) but is not significant in 2019 (column 6). The opposite happens with cooperation, which was not significant in 2000 but significantly increases selective collection in 2019. Thus, influence on environmental quality switches from production form in 2000 (negative effect of private production) to cooperative provision in 2019 (positive effect of cooperation). Our results for volume per inhabitant are more stable over time: private production never shows influence on generated waste, while cooperation always has a negative association with generated waste, thus suggesting a positive effect of cooperation on environmental quality.

### 5.1. Disentangling the effects of cooperation and privatization

As explained, our database allows us to know the mix of production form (private or public) and provider jurisdiction (cooperation or standalone) options of all municipalities considered. With this information at hand, we can modify our initial modelling by replacing the variables *Private* and *Cooperation* with the combination of forms of production and provider jurisdiction: *Cooperation and Public*, *Cooperation and Private*, *Single and Public*, and *Single and Private*. Below we display the forms of equations 5 and 6 that we estimate.

$$PcSel_{it} = \beta_0 + \beta_1 Vol_{it} + \beta_2 PopDens_{it} + \beta_3 Tou_{it} + \beta_4 WRF_{it} + \beta_5 Left\_wing_{it} + \beta_6 CoopPub_{it} + \beta_7 CoopPriv_{it} + \beta_8 SinPub_{it} + \beta_9 SinPriv_{it} + \varepsilon_{it} \quad (3)$$

$$VolxCap_{it} = \beta_0 + \beta_1 Vol_{it} + \beta_2 PopDens_{it} + \beta_3 Tou_{it} + \beta_4 WRF_{it} + \beta_5 Left\_wing_{it} + \beta_6 CoopPub_{it} + \beta_7 CoopPriv_{it} + \beta_8 SinPub_{it} + \beta_9 SinPriv_{it} + \varepsilon_{it} \quad (4)$$

Where *CoopPub* takes value 1 for municipalities with cooperation and public production and 0 otherwise (and is used as reference category), *CoopPriv* takes value 1 for municipalities with cooperation and private production and 0 otherwise, *SinPub* takes value 1 for municipalities with single provision and public production and 0 otherwise, and *SinPriv* takes value 1 for municipalities with single provision and private production and 0 otherwise.

Tests for homoscedasticity, multicollinearity, panel structure, and robustness of estimation yield almost identical results as we obtained with the previous modelling; we omit details here, for sake of simplicity, and provide this information in the corresponding columns in table 6.

Not surprisingly, all control variables show almost identical results to the previous estimations (table 4), therefore we focus on our key variables. As shown in column 9 (and column 10 for robustness check), cooperation with public production (*CoopPub*) is associated with more selective collection when compared to all other three combinations: *CoopPriv* (negative and  $p < 0.05$ ), *SinPub* (negative and  $p < 0.01$ ), and *SinPriv* (negative and  $p < 0.01$ ). Bilateral comparisons between these last three are never significant. Therefore, the combination of cooperation and public production is the only one that increases selective collection.

The effects on waste generated are shown in column 11. Cooperation with public production is associated with less waste per inhabitant than *SinPriv* (positive and  $p < 0.001$ ). In this case, the pooled OLS estimation also shows *CoopPub* associated with less generated waste than *SinPub* (negative and  $p < 0.05$ ). However, no difference is found between cooperating municipalities with different production forms. Furthermore, the bilateral comparison between *CoopPriv* and *SinPriv* shows that *CoopPriv* is associated with less waste generated than *SinglePriv* (positive and  $p < 0.01$ ). Other bilateral comparisons are not significant. Therefore, it is cooperation that drives better environmental quality (less waste generated), regardless of whether the form of production is public or private.

**Table 6: Disentangling cooperation and privatization. Results for the complete sample (2000 & 2019). Dependent variables: Selective collection -percentage- (9 & 10) and volume -kilos- per inhabitant (11 & 12)**

	Selective collection (%)		Volume/Inhabitants (kilos)	
	Column 9 Xtlogit clustered	Column 10 Pooled and clustered OLS	Column 11 GLS random and clustered	Column 12 Pooled and clustered OLS
Volume	2.74e-07 (3.27e-07)	4.79e-08 (4.95e-08)	0.0002* (0.0001)	0.0002* (6.60e-05)
Pop_Density	-4.42e-05*** (1.00e-05)	-7.54e-06*** (1.59e-06)	-0.0177*** (0.0041)	-0.0169*** (0.0040)
Tourism	-0.0023** (0.0009)	-0.0006** (0.0002)	4.3409*** (0.9066)	6.3221*** (0.7771)
WR_Facility	0.1196 (0.1052)	0.0241 (0.0229)	-66.0495** (25.0568)	52.9643† (26.9579)
Left-wing Mayor	0.1419† (0.07910)	0.0272* (0.0136)	-20.7989 (20.9198)	-55.8229† (29.1823)
Cooperation*Private	-0.2109* (0.1005)	-0.0382* (0.0193)	9.5112 (23.3910)	16.5056 (22.4203)
Single*Public	-0.4929** (0.1836)	-0.0945** (0.0362)	59.1500 (44.7660)	142.4345* (72.0031)
Single*Private	-0.3393** (0.1101)	-0.0613** (0.0198)	103.4544*** (27.8654)	152.2890*** (33.5010)
Year2019	1.9334*** (0.1088)	0.3580*** (0.0212)	-113.3660*** (22.1174)	-105.7089*** (23.8158)
Constant	-1.8382*** (0.0984)	0.1539*** (0.0170)	554.2121*** (28.0349)	538.4487*** (27.1237)
Time	Yes	Yes	Yes	Yes
VIF	1.46	1.46	1.46	1.46
BPL Multiplier Test	0.4072	0.4072	0.0000***	0.0000***
Groups	186	186	186	186
Observations	372	372	372	372
R <sup>2</sup>		0.7034	0.2921	0.3056
Chi2	790.93***		87.39***	
F-Test		119.83***		13.87***

Notes: Standard Errors in parentheses. \*\*\*p<0.001; \*\*p<0.01; \*p<0.05; †p<0.10

Next, we study dynamic effects by comparing the results of separate estimates for 2000 and 2019. Table 7 presents the results of estimations for 2000 and for 2019. We conduct fractional logit estimations for selective collection, and robust OLS estimations for volume per inhabitant.

**Table 7. Disentangling cooperation and privatization. Results for subsamples 2000 (13 & 15) and 2019 (14 & 16). Dependent variables: Selective collection -percentage- (13 & 14) and volume -kilos- per inhabitant (15 & 16)**

	Selective collection (%)		Volume/Inhabitant (kilos)	
	Year 2000 Column 13 Fractional Logit	Year 2019 Column 14 Fractional Logit	Year 2000 Column 15 OLS Robust	Year 2019 Column 16 OLS Robust
Volume	1.44e-07 (2.43e-07)	2.24e-07 (5.85e-07)	0.0002 <sup>†</sup> (9.63e-05)	0.0001 (6.10e-05)
Pop_Density	5.57e-06 (1.21e-05)	-0.0001*** (1.41e-05)	-0.0155*** (0.0038)	-0.0113*** (0.0029)
Tourism	0.0140** (0.0044)	-0.0022* (0.0089)	25.7714* (12.4152)	5.6381*** (0.3136)
WR_Facility	-0.2424 (0.1984)	0.1543 (0.1068)	122.1958 (76.9615)	47.8186* (22.5268)
Left-wing Mayor	0.2951* (0.1174)	0.1998* (0.1019)	-108.7690** (37.0544)	-56.6418 <sup>†</sup> (29.7180)
CoopPriv	-0.4955** (0.1856)	-0.1292 (0.1408)	-13.3163 (38.6585)	24.0295 (21.8353)
SinPub	-0.2738 (0.2143)	-0.5391* (0.2183)	37.9560 (59.9846)	172.0549* (85.9316)
SinPriv	-0.2943 <sup>†</sup> (0.1701)	-0.3617* (0.1524)	175.0386*** (44.4544)	84.4554** (24.7313)
Constant	-1.9727*** (0.1412)	0.0493 (0.1548)	532.4408*** (40.4616)	463.2481*** (28.0952)
VIF	1.44	1.52	1.44	1.52
Observations	186	186	186	186
BM/CW Test	0.0000***	0.0001***	0.0000*	0.0001***
R <sup>2</sup>	0.0070	0.0141	0.3729	0.4690
Chi2	27.85***	83.71***		
F-Test			6.47***	56.13***

Notes: Standard Errors in parentheses. \*\*\*p<0.001; \*\*p<0.01; \*p<0.05; †p<0.10

The results obtained suggest that private production was associated with worse results in both selective collection (lower) and waste generation (higher) in 2000. On the other hand, in 2019 cooperative status has a most important influence on environmental quality, as shown by the results in column 15 (and 16, to check robustness). This is even clearer when we make bilateral comparisons between cooperation and private production (*CoopPriv*) with *SinPriv* and *SinPub*: we find that *CoopPriv* is associated with more selective collection (p<0.05 for both *SinPub* and *SinPriv*), and with less waste generated (p<0.10 for *SinPub* and p<0.05 for *SinPriv*). Detailed results of all pairwise comparisons are provided in Table 8.

Overall, cooperation and public production tend to perform better (especially in selective collection) than combinations that include non-cooperative or private

production at the beginning of the millennium. At the end of the last decade, however, cooperation was the main driver of better environmental results, regardless of the form of production (whether public or private), and both for selective collection and for waste generated. Hence, the expansion of cooperation between 2000 and 2019 has probably contributed to improving the environmental quality of the waste collection service, dominating the potential differences between public and private production (which were more influential at the beginning of period of our analysis).

**Table 8. Results for pairwise comparisons between different provision and production status**

<b>Selective Collection 2000</b>				
	Coop&Public	Coop&Private	Single&Public	Single&Private
Coop&Public		0.4955** (0.1856)	0.2738 (0.2143)	0.2943† (0.1701)
Coop&Private			0.2217 (0.1924)	0.2012 (0.149)
Single&Public				0.0205 (0.1698)
Single&Private				
<b>Volume/inhabitant 2000</b>				
	Coop&Public	Coop&Private	Single&Public	Single&Private
Coop&Public		13.3163 (38.6585)	-37.9560 (59.9846)	-175.0386*** (44.4544)
Coop&Private			-51.2722 (55.6081)	-188.3549*** (38.5414)
Single&Public				-137.0827** (52.7556)
Single&Private				
<b>Selective Collection 2019</b>				
	Coop&Public	Coop&Private	Single&Public	Single&Private
Coop&Public		0.1292 (0.1408)	0.5391* (0.2183)	0.3617* (0.1524)
Coop&Private			0.4099* (0.1966)	0.2326* (0.1122)
Single&Public				-0.1773 (0.1920)
Single&Private				
<b>Volume/inhabitant 2019</b>				
	Coop&Public	Coop&Private	Single&Public	Single&Private
Coop&Public		-24.0295 (21.8353)	-172.0549* (85.9316)	-84.4554** (24.7313)
Coop&Private			-148.0254† (87.5069)	-60.4259* (29.3401)
Single&Public				87.5994 (86.2412)
Single&Private				

Notes: Standard errors in parentheses; \*\*\*p<0.001, \*\*p<0.01, \*p<0.05; †p<0.10

The coefficients should be read as variables in the first column with respect to the variable in the corresponding row.

## 5.2. Governance of cooperation and environmental outcomes.

Our 2019 survey included a question about the organization within which cooperation was implemented. Most of the municipalities that collaborate are served by a county council, while a minority is served by mancommunities. In county's cooperation, the responsibility for the service is delegated to the county, while in the case of mancommunities, municipalities use joint governance by means of a board that includes all affected municipalities. We can analyse, for 2019, whether delegation to a county or joint governance with a mancommunity offer similar or different environmental quality outcomes in waste collection. To do so, we decomposed *Cooperation* (in equations 1 and 2) in *Coop\_County* and *Coop\_Mancom*. Our results suggest that cooperation via counties is associated with more selective collection ( $p < 0.05$ ) and less waste generated ( $p < 0.01$ ). For mancommunities, better quality is found for selective collection ( $p < 0.05$ ), but the effect on the waste generated is not statistically significant. This suggests that counties could be associated with better environmental quality. Complete results for these estimations are available in table 9.

**Table 9. Organizational form of cooperations. Results for subsample 2019.**  
**Dependent variables: Selective collection -percentage- (17) and volume -kilos- per inhabitant (18)**

	Selective collection Column 17 Fractional Logit	Volume/inhabitants Column 18 Robust OLS
Volume	2.00e-07 (6.09e-07)	0.0001† (5.78e-05)
Pop_Density	-0.0001*** (1.40e-05)	-0.0123*** (0.0031)
Tourism	-0.0021* (0.0009)	5.5885*** (0.3194)
WR_Facility	0.1496 (0.1102)	41.2978† (23.4392)
Left-wing Mayor	0.1879† (0.1024)	-53.0962† (30.2011)
Private	-0.0278 (0.1172)	-19.0885 (34.5224)
Coop_County	0.2773* (0.1123)	-95.3296** (31.5869)
Coop_Mancom	0.3991* (0.1664)	-22.5762 (49.7791)
Constant	-0.3021 (0.1841)	580.2910*** (56.7273)
VIF	1.22	1.22
Observations	186	186
BM/CW Test	0.1436	0.0016**
R <sup>2</sup>	0.0136	0.4653
Chi2	86.76***	-
F-Test	-	55.01***

Notes: Standard Errors in parentheses. \*\*\* $p < 0.001$ ; \*\* $p < 0.01$ ; \* $p < 0.05$ ; † $p < 0.10$

## 6. Discussion and conclusion

Inter-municipal cooperation is often regarded as an alternative or substitute reform to privatization of local public services, rather than a potential complement. It is true that cooperation grew in popularity just as the peak of interest in local privatization was declining, and was often seen as a corrective for some of the problems encountered during the earlier wave of outsourcing, particular in terms of quality shading and high transaction costs. Nonetheless, it is possible for cooperation and privatization to be practiced simultaneously, when municipalities collectively tender for service delivery from a firm. And what is more, this strategy has been adopted in a variety of European countries, sometimes quite extensively.

Our empirical analysis decomposed the effect of the type of cooperation and privatization on the environmental quality of solid waste collection. Our results are consistent with H1 (cooperation is associated with higher quality), but are less systematic for private production (H2, private production is associated with lower quality). While cooperation with public production tended to be associated with higher quality at the beginning of the millennium (consistent with H3), cooperation appears to be the main driver of environmental quality two decades later. In fact, cooperation (regardless of public or private production) has better results in terms of environmental quality than standalone provision (regardless of public or private production), both for selective collection and for the waste generated (this partially contradicts the H4). Finally, our comparison between cooperation with private and standalone with public showed non-significant results for 2000, but better results for cooperation with private production in 2019.

The main explanation for our results may be related to the way environmental policies are designed and implemented. Top-down design and implementation is characteristic of locally implemented environmental policies (e.g., Xing and Xing, forthcoming). In this sense, political ambition can differ between 'provider jurisdictions' (cooperation versus standalone). More particularly, intermunicipal cooperation is more likely to seek more ambitious environmental outcomes than standalone provision, also because of spillovers across contiguous municipalities (not accounted for in standalone provision). Our explanation is consistent with findings in Bel and Elston (forthcoming) that cost savings from cooperation lost strength in the same jurisdictions and period we analysed here, and their subsequent suggestion that the main explanation for the decline over time in the impact on cost savings may be the stronger emphasis that the cooperation placed on environmental quality.

Therefore, both the higher priority gained by environmental policies in recent decades and the expansion of cooperation between 2000 and 2019 have likely contributed to improving the environmental quality of the waste collection service. Thus dominating the potential differences between public and private production (which were more influential at the beginning of the century).

Our study has limitations in fully understanding the dynamics of these effects over time. Most importantly, data are available for only two years, at the beginning and end

of the study. Having longer and more complete data series for institutional and organizational information (i.e., provider jurisdiction and production forms) would facilitate a more robust analysis, thus achieving a better understanding of dynamic changes. Future research should address this question.

## References

- Aldag, A.M., & Warner, M. (2018). Cooperation, not cost savings: explaining duration of shared service agreements. *Local Government Studies*, 44(3), 350-370.
- Alonso, J.M., Andrews, R., & Hodgkinson, I.R. (2016). Institutional, ideological and political influences on local government contracting: Evidence from England. *Public Administration*, 94(1), 244-262.
- Álvarez, M., & Bel, G. (forthcoming). Provision and production of public services by local governments. In C.N. Avellaneda & R. Bello-Gómez (Eds.), *Handbook of Subnational Governments*. Cheltenham: Edward Elgar.
- Andrews, R. (2015). Vertical consolidation and financial sustainability: evidence from English local government. *Environment and Planning C: Government and Policy*, 33(6), 1518-1545.
- Andrews, R., & Entwistle, T. (2013). *Public Service Efficiency: Reframing the Debate*. Abingdon, Oxon: Routledge.
- Anguelov, L.G., & Brunjes, B.M. (2023). A replication of “Contracting out: For What? With Whom?”. *Public Administration*, 101(3), 1163–1197.
- Arntsen, B., Torjesen, D.O., & Karlsen, T.-I. (2021). Asymmetry in inter-municipal cooperation in health services – How does it affect service quality and autonomy? *Social Science & Medicine*, 273, 113744.
- Battilana, J., & Dorado, S. (2010). Building Sustainable Hybrid Organizations: The Case of Commercial Microfinance Organizations. *Academy of Management Journal*, 53(6), 1419-1440.
- Bel, G., & Belerdas-Castro, A. (2022). Provision and production reform of urban fire services: privatization, cooperation and costs. *Public Management Review*, 24(9), 1331-1354.
- Bel, G. & Elston, T. Forthcoming. When the time is right: Testing for dynamic effects in collaborative performance. *Public Management Review*  
[doi.org/10.1080/14719037.2023.2214784](https://doi.org/10.1080/14719037.2023.2214784)
- Bel, G., Fageda, X., & Mur, M. (2014). Does Cooperation Reduce Service Delivery Costs? Evidence from Residential Solid Waste Services. *Journal of Public Administration Research and Theory*, 24(1), 85-107.
- Bel, G., & Sebó, M. (2021). Does Inter-Municipal Cooperation Really Reduce Delivery Costs? An Empirical Evaluation of the Role of Scale Economies, Transaction Costs, and Governance Arrangements. *Urban Affairs Review*, 57(1), 153-188.
- Bel, G. & Warner, M. (2015). Inter-municipal cooperation and costs: Expectations and evidence. *Public Administration*, 93(1), 52–67.
- Bel, G. & Warner, M. (2016). Factors explaining inter-municipal cooperation in service delivery: A Meta- regression analysis., *Journal of Economic Policy Reform*, 19(2), 91-115.
- Blåka, S. (2017). Service Quality, Inter-municipal Cooperation and the Optimum Scale of Operation. In J. Trondal (Ed.), *The Rise of Common Political Order* (pp.233-250). Cheltenham: Elgar.
- Blåka, S., Jacobsen, D.I., & Morken, T. (2003). Service quality and the optimum number of members in intermunicipal cooperation: The case of emergency primary care services in Norway. *Public Administration*, 101(2), 447-462
- Brogaard, L. & Petersen, O.H. (2022) Privatization of Public Services: A Systematic Review of Quality Differences between Public and Private Daycare Providers, *International Journal of Public Administration*, 45:10, 794-806



- Brown, T.L. (2008). The Dynamics of Government-to-Government Contracts. *Public Performance & Management Review*, 31(3), 364-386.
- Clifton, J., Warner, M.E., Gradus, R., & Bel, G. (2021). Re-municipalization of public services: trend or hype? *Journal of Economic Policy Reform*, 24(3), 293-304.
- Denis, J.-L., Ferlie, E., & Van Gestel, N. (2015). Understanding hybridity in public organizations. *Public Administration*, 93(2), 273-289.
- Dixon, R., & Elston, T. (2019). Should Councils Collaborate? Evaluating Shared Administration and Tax Services in English Local Government. *Public Money & Management*, 39(1), 26-36.
- Dixon, R., & Elston, T. (2020). Efficiency and legitimacy in collaborative public management: Mapping inter-local agreements in England using social network analysis. *Public Administration*, 98(3), 746-767.
- Elkomy, S., Cookson, G., & Jones, S. (2019). Cheap and Dirty: The Effect of Contracting Out Cleaning on Efficiency and Effectiveness. *Public Administration Review*, 79(2), 193-202.
- Elston, T. (forthcoming). Understanding and Improving Public Management Reforms. Bristol: Policy Press.
- Elston, T., Bel, G., & Wang, H. (2023). The effect of inter-municipal cooperation on social assistance programs: Evidence from housing allowances in England. *Rebuilding Macroeconomics Working Paper*. London.
- Elston, T., Bel, G., & Wang, H. (forthcoming). If it ain't broke, don't fix it: When collaborative public management becomes collaborative excess. *Public Administration Review*, n/a(n/a). doi: <https://doi.org/10.1111/puar.13708>
- Elston, T., MacCarthaigh, M., & Verhoest, K. (2018). Collaborative Cost-Cutting: Productive Efficiency as an Interdependency between Public Organizations. *Public Management Review*, 20(12), 1815-1835.
- Elston, T., Rackwitz, M., & Bel, G. (forthcoming). Going separate ways: Ex-post interdependence and the dissolution of collaborative relations. *International Public Management Journal*.
- Galizzi, G., Rota, S., & Sicilia, M. (forthcoming). Local government amalgamations: state of the art and new ways forward. *Public Management Review*, 1-23. doi: 10.1080/14719037.2023.2177327
- Hasluck, E.L. (1936). *Local Government in England*. Cambridge: Cambridge University Press.
- Holum, M.L., & Jakobsen, T.G. (2016). Inter-Municipal Cooperation and Satisfaction with Services: Evidence from the Norwegian Citizen Study. *International Journal of Public Administration*, 39(8), 597-609.
- Hood, C. (1976). *The Limits of Administration*. London: Wiley.
- Hood, C. (1998). *The Art of the State: Culture, Rhetoric, and Public Management*. Oxford: Oxford University Press.
- Hulst, J.R., & van Montfort, A.J.G.M. (2012). Institutional features of inter-municipal cooperation: Cooperative arrangements and their national contexts. *Public Policy and Administration*, 27(2), 121-144.
- Klok, P.-J., Denters, B., Boogers, M., & Sanders, M. (2018). Intermunicipal Cooperation in the Netherlands: The Costs and the Effectiveness of Polycentric Regional Governance. *Public Administration Review*, 78(4), 527-536.
- Lane, J.-E. (2000). *New Public Management: An Introduction*. London: Routledge.
- Le Grand, J. (2003). *Motivation, Agency, and Public Policy: Of Knights & Knaves, Pawns & Queens*. Oxford: Oxford University Press.
- Leibenstein, H. (1978). On the Basic Proposition of X-Efficiency Theory. *The American Economic Review*, 68(2), 328-332.
- Levin, J., & Tadelis, S. (2010). Contracting for government services: Theory and evidence from U.S. cities. *The Journal of Industrial Economics*, 58(3), 507-541.

- Lindholst, A.C., & Hansen, M.B. (Eds.). (2020). *Marketization in Local Government: Diffusion and Evolution in Scandinavia and England*. Basingstoke: Palgrave Macmillan.
- Niaounakis, T., & Blank, J. (2017). Inter-Municipal Cooperation, Economies of Scale and Cost Efficiency: An Application of Stochastic Frontier Analysis to Dutch Municipal Tax Departments. *Local Government Studies*, 43(4), 533-554.
- Pano Puey, E., Magre Ferran, J., & Puiggròs Mussons, C. (2018). Beyond size: Overcoming fragmentation by inter-municipal associations in Spain? The case of Catalonia. *International Review of Administrative Sciences*, 84(4), 639–658
- Pérez-López, G., Prior, D., & Zafra-Gómez, J.L. (2015). Rethinking New Public Management Delivery Forms and Efficiency: Long-Term Effects in Spanish Local Government. *Journal of Public Administration Research and Theory*, 25(4), 1157-1183.
- Petersen, O.H., Hjelm, U., & Vrangbæk, K. (2018). Is contracting out of public services still the great panacea? A systematic review of studies on economic and quality effects from 2000 to 2014. *Social Policy & Administration*, 52(1), 130-157.
- Reingewertz, Y., & Serritzlew, S. (2019). Special issue on municipal amalgamations: guest editors' introduction. *Local Government Studies*, 45(5), 603-610.
- Rubado, M.E. (2023). Collaborating with the competition? A study of interlocal partnership choices. *Public Administration*, 101(2), 640-654.
- Silvestre, H.C., Marques, R.C., & Gomes, R.C. (2018). Joined-up Government of utilities: a meta-review on a public-public partnership and inter-municipal cooperation in the water and wastewater industries. *Public Management Review*, 20(4), 607-631.
- Skelcher, C., & Smith, S.R. (2015). Theorizing hybridity: Institutional logics, complex organizations, and actor identities: the case of non-profits. *Public Administration*, 93(2), 433-448.
- Tavares, A.F., & Feiock, R.C. (2018). Applying an Institutional Collective Action Framework to Investigate Intermunicipal Cooperation in Europe. *Perspectives on Public Management and Governance*, 1(4), 299-316.
- Teles, F., & Swianiewicz, P. (Eds.). (2018). *Inter-Municipal Cooperation in Europe: Institutions and Governance*. Basingstoke: Palgrave Macmillan.
- Terman, J.N., Feiock, R.C., & Youm, J. (2020). When Collaboration Is Risky Business: The Influence of Collaboration Risks on Formal and Informal Collaboration. *The American Review of Public Administration*, 50(1), 33-44.
- Vickers, J., & Yarrow, G. (1991). Economic Perspectives on Privatization. *The Journal of Economic Perspectives*, 5(2), 111-132.
- Voorn, B., Van Genugten, M. & Van Thiel, S. (2019). Multiple principals, multiple problems: Implications for effective governance and a research agenda for joint service delivery. *Public administration (London)*, 97(3), 671-685.
- Voorn, B., Van Genugten, M.L., & Van Thiel, S. (2021). Re-interpreting re-municipalization: finding equilibrium. *Journal of Economic Policy Reform*, 24(3), 305-318.
- Walsh, K. (1995). *Public Services and Market Mechanisms: Competition, Contracting and the New Public Management*. Basingstoke: Macmillan.
- Williamson, O.E. (1985). *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. New York: Free Press.
- Xing, P & Xing, H. (forthcoming) Environmental inter-local collaboration under meta-governance: the trade-off between collective and selective benefits. *Local Government Studies*, doi: 10.1080/03003930.2022.2148662
- Zafra-Gómez, J.L., Prior, D., Plata-Díaz, A.M., & López-Hernández, A.M. (2013). Reducing costs in times of crisis: Delivery forms in small and medium sized local governments' waste management services. *Public Administration*, 91(1), 51-68.
- Zeemering, E. (2018). Why Terminate? Exploring the End of Interlocal Contracts for Police Service in California Cities. *The American Review of Public Administration*, 48(6), 596–609.

## Appendix

### Baseline survey (SLSP-UB)

The baseline survey was completed by municipalities between May 2001 and October 2002. Variables obtained included -among others- the service provider (municipality or an IMC) and service producer (public, private, or mixed public-private). Information on provision and production forms was collected for 186 municipalities with a population > 1,000 inhabitants in the year 2000. That sample represented 44.2% of municipalities > 1,000, and 78.9% of the Catalan population.

### Methodology and timeline of the new survey (Survey-2019; UB&UO).

We administered a new and equivalent survey specifically directed at those 186 municipalities for which information for 2000 was available. In addition, the survey asked what type of organization governs cooperation when the municipality participates in an IMC, and also whether the municipality had been involved in previous experiences of cooperation (and which, if so). Furthermore, we obtained supplementary data on service provision and production from counties and four mancommunities (Cardener, Penedès-Garraf, La Plana, and Urgellet) and the Environment Entity of the Metropolitan Area of Barcelona (AMB).

Covid-19 delayed the start of data collection to September 2020 and lengthened the process due to the on-going burden of the pandemic on councils. But, since the observation year is 2019, Covid-19 disruption did not distort the data reported. The new survey was mailed in September 2020 to the 186 target municipalities. Several reminders were sent in the first half of 2021. In July 2021 formal requests were sent to around 50 municipalities that had not yet responded, with reminders sent in September. In November 2021, the Catalan Commission for the Guarantee of the Right to Access to Public Information (GAIP) issued a deadline for the remaining 20 municipalities. Data for all 186 municipalities were available in February 2022.

In all, our database comprises 186 municipalities, for which we have data for 2000 and 2019. Our database includes municipalities in 34 counties (81% of the 42 Catalan counties). Population in the eight counties without any municipality in the database is less than 1% of total population in Catalonia and they include 110 municipalities (11.6% of total). Most municipalities in these eight counties have extremely low population. Table SM1 shows representativeness of Catalan municipalities (above 1,000 inhabitants).

**Table SM1: representativeness of the sample (data for 2019)**

Municipalities included in the analysis				
Inhabitants	1,000-9,999	10,000-10,999	≥ 20,000	Total ≥ 1,000
Municipalities	107	30	49	186
% Total Municipalities	31.6	54.5	72.7	40,4
Population	450,775	440,507	4,781,127	5,672,409
% Total Population	36.8	55,8	74.2	75.8
Total municipalities (≥1,000 inhabitants) and population – 2019				
Inhabitants	1,000-9,999	10,000-19,999	≥ 20,000	Total ≥ 1,000
Municipalities	339	55	66	460
Population	1,224,647	789,005	5,468,797	7,482,449

Note: Municipalities with <1,000 inhabitants are 487. These include 192,768 inhabitants, which is about 2.5% of total population of Catalonia.

Source: Authors' survey, INE (Spanish Statistical Institute) and IDESCAT (Catalan Statistics Institute)

The logo for UBIREA, featuring the text 'UBIREA' in a bold, sans-serif font. The 'U' and 'B' are white, while 'I', 'R', 'E', and 'A' are blue. The text is set against a white rounded rectangular background.


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