



## Changing prices after the reform of local public services: remunicipalization versus privatization

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### Abstract

Privatization and remunicipalization have been used as alternative options to reform the delivery of local public services; in both cases, mainly because of disappointment with the service performance, although ideological preferences might also play a role. The drivers and effects of water privatization have been widely studied, whereas little empirical evidence is available for remunicipalization, particularly regarding its effects. Using a sample of Spanish municipalities, this paper assesses the change in the price of urban water following remunicipalization as compared to privatization. The main finding is that remunicipalization leads to smaller increases in price; this outcome is, however, due to a few atypical municipalities with abnormally low prices before the policy reform. Once these influential observations are controlled for, whether the reform consists of remunicipalization or privatization makes no difference regarding price changes. It is also found that remunicipalization is much more likely in cities governed by extreme left-wing parties.

**Keywords** Local public services · Prices · Privatization · Remunicipalization · Urban water

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## 1 Introduction

The goal of improving performance is the main driver of the reorganization and restructuring of public services (Pollitt and Bouckaert, 2000), although governments may also undertake reforms for purposes of social approval or legitimacy (Dowling & Pfeffer, 1975). Regarding local public service provision, privatization and remunicipalization of delivery have been used as opposing reform alternatives by mostly pragmatic policymakers (Warner, 2023).

Privatization enjoyed an almost absolute hegemony in the last decades of the 20th century, but in the first decades of the 21st century privatization and remunicipalization have been simultaneously occurring phenomena. The privatization of the delivery of urban water has generated more controversy than any other local service. In this regard, urban water shares some of the features of merit goods—at least up to a certain level of consumption. In addition, the water industry is organized around local natural monopolies. Both features were employed as arguments against privatization or, at least, to advise extreme caution when opting to privatize. In this respect, legislation in some developed economies did not allow for the privatization of urban water delivery. At the opposite extreme, in countries such as England and Wales the urban water service has been entirely privatized, while in the Czech Republic and Chile private utilities deliver the service to the entire urban population. In France, Spain and Hungary private utilities deliver urban water to around half the population.

Remunicipalization of the urban water service has been an increasingly prevalent policy reform in the last two decades, as numerous municipalities around the world have returned to public delivery. They include large cities such as Berlin, Naples and Paris in Europe, Buenos Aires, La Paz-El Alto and Cochabamba in Latin America, Atlanta and Hamilton in North America, and Dar es Salaam in Africa, in addition to Malaysia in Asia. However, empirical evidence on the actual effects of remunicipalization of the urban water service is still rather limited, and mainly focuses on case studies: e.g., Paris (Le Strat, 2010; Turri, 2022a), Berlin (Lobina et al., 2019b) or Naples (Turri, 2022a). In particular, the impact of remunicipalization on the price of urban water has received scant attention and has also been limited to case studies—e.g., the papers mentioned above document that in Paris and Berlin prices dropped following remunicipalization, and there was also less investment in the network.

As far as the authors are aware, the only multivariate analysis of the effect of remunicipalization on water prices to date is that by Porcher (2012), who analyzed the variation in the price of urban water in a sample of French cities after changing the delivery mode, using difference-in-difference techniques and discontinuous data for the years 1998 to 2008. In the analysis, the change in prices in cities switching either from public to private management or from private to public management were compared to changes in municipalities that did not alter the delivery mode—i.e., Porcher separately compared each reform outcome with non-reform.

Against this background, this paper assesses the change in the price of urban water following remunicipalization as compared to the change after privatization, using a

sample of 136 Spanish municipalities that either remunicipalized (52 cases) or privatized (84 cases) the delivery of the service in the period 2003–2020. It is worth noting that this objective is different from that addressed by Porcher (2012), as price changes after remunicipalization and privatization are compared to each other, rather than comparing both to price changes in cities that do not alter the delivery mode. Put simply, this research is not about reforms versus non-reforms, but about the choice of different reform alternatives. Moreover, unlike Porcher's approach, the year of the policy reform is precisely identified in this research, in addition to the price of water (and other relevant variables) in the year previous to the reform and 1 and 4 years later.

Consistent with expectations and existing evidence on the relationship between ownership and water pricing, the central finding is that the price of urban water increases less after remunicipalization than after privatization. However, this result is entirely driven by a few cases belonging to municipalities with extremely low prices before the policy reform, mostly privatizations. Once these influential observations are excluded from the sample, the question of whether the policy reform consists of remunicipalization or privatization makes no difference regarding the change in prices. These trends are largely consistent with the hypothesis that one of the reasons behind the privatization of local public services is to ensure users cover a greater share of delivery costs, as Bel and Miralles (2010) found for waste collection. Moreover, a process of convergence in prices after policy reforms is also observed, regardless of the direction of the reform. Concerning the drivers of remunicipalization, it is found that the likelihood of the service returning to public hands is larger when pre-reform water prices are high. Ideological issues also play a role, as return to public management is much more likely when the local council is governed by an extreme left-wing party.

The remainder of the paper is organized as follows. Since research on remunicipalization is scarcer than that on privatization, Sect. 2 describes the theoretical background and empirical evidence on remunicipalization and urban water pricing, and sets out the hypotheses to be tested in this research. Section 3 outlines the main features of the process of remunicipalization of the urban water service in Spain. Section 4 describes the data and the econometric strategy. Section 5 presents the results, and they are discussed in Sect. 6, which also concludes.

## 2 Theoretical background and empirical evidence

### 2.1 Theory and evidence on remunicipalization of local public services

Government reforms in the production of local public services are often choices between private and public forms of delivery. The literature has dedicated extensive theoretical and empirical work to the analysis of the drivers of privatization of public services (see for a review Bel & Fageda, 2017). Privatization theories can be used to illustrate the main theoretical ideas behind remunicipalization (Young & Macinat, 2012).

The primary reason for remunicipalization is the failure to achieve the cost savings that were expected from privatization. Concerns about the quality of the service might

also drive remunicipalization, particularly in sectors where quality is not easily measurable and it is seen as crucial by policymakers (Levin & Tadelis, 2010). Indeed, the early empirical literature on remunicipalization in the United States (e.g., Hefetz & Warner, 2012; Warner & Hebdon, 2001), otherwise referred to as ‘reverse privatization’, considers it a pragmatic decision in response to disappointment with the results of privatization.

Besides pragmatic reasons, ideological and partisan motivations have also been suggested as drivers of remunicipalization; Young and Macinati (2012) argue that significant changes in the external environment in which relationships between governments and private companies occur offer opportunities to reorganize the services—in particular, to bring production back under public control. This point of view is emphasized by scholars who are against the involvement of private agents in the delivery of public services and support stronger community control over these services (e.g., Lobina et al., 2019a; McDonald, 2016). Cumbers and Paul (2022) warn, however, about the prospects of real control being placed in the hands of institutions rather than the community as such.

Research on the drivers of remunicipalization has increased substantially in recent years, drawing on both case studies and big data studies (e.g., Albalate & Bel, 2021; Gradus & Budding, 2020; Gradus et al., 2021; Mayol & Saussier, 2023; Turri, 2022b; Warner & Aldag, 2021). Voorn et al. (2021) review the existing empirical literature and conclude that while ideological reasons might explain remunicipalization in some cases, most evidence suggests that pragmatic managerial motivations drive governments’ decisions on remunicipalization. In the same vein, a meta-analysis by Lu and Han (2023) finds that remunicipalization is driven by a combination of both political and pragmatic factors, with the latter being more relevant.

The evidence from multivariate empirical studies is quite consistent with the descriptive information provided in the Public Futures database from the University of Glasgow, which is by far the most extensive repository of remunicipalization cases worldwide—with more than a thousand documented cases between 2000 and 2022. In 9 out of every 10 cases, the information includes the main motivation given for the remunicipalization decision. The most frequent reason for remunicipalization is ‘cost reduction’ (26% of cases), while the goal of ‘democratization-public control’ ranks third (16% of cases).

Evidence on the economic effects of remunicipalization is much scarcer than that on the drivers and is usually limited to case studies based on anecdotal evidence, in the context of a debate largely dominated by politically tainted assessments. This is particularly true in the case of remunicipalization of the urban water service (Bel, 2020). While the higher prices associated with private delivery have influenced remunicipalization, the effects of this policy on prices are difficult to estimate, beyond circumstantial evidence—e.g., the evidence reported by Le Strat (2010) for the case of Paris, as mentioned in the Introduction. Using a large database of French municipalities, Porcher and Saussier (2017) finds that water prices are significantly higher under private delivery, but there are significantly fewer leaks. This suggests that lower prices in public delivery might reflect insufficient investment and could therefore be unsustainable over time. Moreover, Porcher (2017) studies prices in water delivery

in France and finds that although they are higher under private management, the difference disappears when the ‘hidden costs’ derived from future debt repayments are considered. In other words, with private management the criterion of total cost recovery is applied, whereas public management is associated with lower prices but higher indebtedness.

As explained in the Introduction, the only study related to the research in this article is that by Porcher (2012), in which changes in the price of urban water after altering the production mode are analyzed in a sample of French cities, using difference-in-difference techniques and discontinuous sets of data for years 1998 to 2008. Porcher compared price changes in cities that went from public to private management or from private to public management with changes in municipalities that did not alter the mode of delivery. Results obtained were not systematic, and heavily dependent from the period being analyzed.<sup>1</sup>

Existing literature on the determinants of water pricing—particularly the effect of ownership on prices—is further reviewed below, which helps to establish the framework within which to conduct the empirical analysis in this research.

## 2.2 Urban water pricing

The cost of delivering the service is the main determinant of the price of urban water. Costs are influenced by several factors, most notably the features of the environment in which the supplier operates (González-Gómez & García-Rubio, 2018). For example, the question of whether water comes from surface or groundwater influences energy costs; also, the size and geographical distribution of the population might allow the exploitation of economies of scale and density. In this regard, a regulation that strongly conditions urban water pricing in the European Union—and therefore in Spain—is the Water Framework Directive passed in 2000 (European Commission, 2000), which mandates the principle of cost recovery in urban water pricing. Additionally, ideological and political factors may also play a role in intervened pricing. In this respect, left-wing parties are less likely to increase water prices and pass on the costs of producing the service to consumers (Hellwig & Polk, 2021; Martínez-Espíñeira et al., 2012). Likewise, the political cycle may explain price containment in municipal election years, as opposed to sharper increases just after elections (Klien, 2014; Picazo-Tadeo et al., 2020).

Beyond the abovementioned determinants of the price of urban water, managers’ ownership has received particular attention. Most empirical studies have concluded that prices are higher under private management (e.g., Romano & Guerrini, 2014; Zhang et al., 2022).<sup>2</sup> One possible reason for this finding is that, in addition to recovering production costs, private utilities seek to make a profit. Failures in public tenders

<sup>1</sup> Porcher (2012) was updated in Porcher (2019), but the analysis related to our research did not differ in any respect. Also related to this research, Chong et al., (2015) compared water prices in France between municipalities that renewed private contracts and those that remunicipalized, to assess whether earlier price differences could explain the change from private to public management. However, the actual effect of changing the delivery mode on urban water prices was not analyzed.

<sup>2</sup> Beyond the dilemma of pure public versus pure private management of the urban water service, it is worth noting the analysis by Porcher (2016) that associates concurrent sourcing in the water sector in France with

such as insufficient competition, collusion, and corruption could also lead to higher urban water prices (Chong et al., 2006). Furthermore, the prices set by private utilities might be higher simply because municipalities tend to privatize the service when its management is more complex and, therefore, costlier (Ruester & Zschille, 2010); or because of higher investment by private firms to improve the service (Zhang et al., 2022). Finally, higher water prices under private management as compared to public could also be due to public providers setting tariffs that do not allow the full recovery of the costs of producing the service (Alguacil-Duarte, 2020), as prices in strictly regulated sectors are often not cost-reflective.

There are, however, studies that find no empirical evidence that water prices are significantly different between private and public utilities (e.g., Romano et al., 2015; Silvestre & Gomes, 2017). It has also been suggested that there is no systematic difference in efficiency between public and private utilities (see review in Bel & Warner, 2008). In fact, De Witte and Marques (2010) point out that it is not so much the ownership of the operator that matters in determining urban water prices, but rather the regulation they face, their incentives, and the control mechanisms implemented by public administrations.

### 2.3 Hypotheses

On the basis of the arguments presented above on both the theoretical background and empirical evidence regarding the remunicipalization of the urban water service, as well as the relationship between the price of water and the management of the service, several hypotheses are posed in this research. Two of them are related to the drivers of policy reforms regarding the management of the urban water service—either remunicipalization or privatization. The first hypothesis refers to the role played by water prices prior to the reform. Consistent with the argument regarding the disappointment with private management as a driver of remunicipalization, the hypothesis is:

**Hypothesis 1 (H1)** The probability of remunicipalization of the urban water service is larger in municipalities with high prices for water.

The second hypothesis concerns the ideology of the political party governing the city council at the time of the policy reform, and is formulated as follows:

**Hypothesis 2 (H2)** The remunicipalization of the urban water service is more likely in municipalities ruled by left-wing parties.

The central hypothesis posed in this research relates to the role played by the direction of the policy reform in the change in the price of water. In accordance with the literature on water pricing, this hypothesis is stated as follows:

**Hypothesis 3 (H3)** The increase in the price of urban water is smaller when the management of the service is transferred from private to public ownership—remunicipalization—than when it is transferred from public to private ownership—privatization.

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Footnote 2 continued

higher quality, but also with higher prices. Esteve et al. (2023) find that private management of water services delivers higher quality when the service is financed through user fees.

Finally, a fourth hypothesis is also formulated. The 2000 Water Framework Directive mandates the application of the principle of cost recovery in urban water pricing in the European Union member states. This implies that any existing practices aimed at subsidizing urban water supply should be discontinued. Accordingly, the last hypothesis is:

**Hypothesis 4 (H4)** Regardless of the direction of the policy reform—either remunicipalization or privatization—urban water prices tend to converge over time as a result of the application of the cost recovery principle.

### 3 Remunicipalization of the urban water service in Spain

#### 3.1 Institutional and legal framework

Reforms in the mode of delivery of urban water services have a long tradition in Spain. By way of example, the city of Terrassa had private delivery of water dating back to 1841, until the service was remunicipalized in 2017; Valladolid privatized water delivery in 1864, remunicipalized it in 1959, privatized it again in 1997, and remunicipalized the service in 2017; Huelva privatized the service in 1925, before it was remunicipalized in 1958, and then privatized again in 2010; similarly, Montornès del Vallès privatized the urban water delivery in 1964 and remunicipalized it in 2014.

In 1985, Law 7/1985 Regulating the Bases of the Local Regime introduced a crucial regulation significantly increasing the autonomy of local governments to adopt organizational reforms in the delivery of local services, especially by contracting out to private companies. Further regulations on public procurement were passed from the mid-1990s on, establishing that concession contracts for the delivery of urban water can last for up to 25 years (see Government of Spain, 2017).

This regulatory reform facilitated a wave of privatizations of the urban water service, with a notable rise recorded at the end of the last century. As many contracts came to an end in the early years of the current century, remunicipalization has gained prominence as a policy reform and its frequency has increased. Indeed, the vast majority of the cases of remunicipalization of urban water services in Spain have occurred after the expiry of the concession contract, to avoid lengthy legal proceedings or compensation costs linked to unilateral termination of the contract.

#### 3.2 Time and geographical trends

Following the approval of Law 7/1985, as mentioned, many Spanish municipalities opted to privatize the delivery of urban water, joining the cities that had already done so (Ruiz-Villaverde et al., 2015). In the 1990s, the wave of privatization spread to the Mediterranean regions of Catalonia, Valencian Community and Murcia, in addition to Castile-la Mancha and some parts of Andalusia (González-Gómez et al., 2014). The durations of concessions ranged between 10 and 25 years, the maximum allowed by law if the contract did not include the building of infrastructure. As such, most of the

early contracts in this wave began to expire in the 2000s, with growing numbers in the second half of that decade.

Spain has 8,131 municipalities but there is no official register of how they manage the delivery of the urban water service. Some regional administrations, such as Catalonia and Andalusia, provide information on this issue, although not on a regular basis. It is thus difficult to know the exact number of cases of remunicipalization of the service. In this respect, the information provided by the Public Futures Database indicates that between 2000 and 2020 there were 39 processes of remunicipalization of water services in Spain—a few of them affecting several municipalities simultaneously. However, this research identifies a total of 75 remunicipalizations; and this figure could even be an underestimate of the real number of cases occurred in these two decades. Geographically speaking, as detailed in Sect. 4.1, most remunicipalizations took place in Catalonia, Andalusia and Castile-la Mancha, which are also the regions most affected by privatizations (Bel et al., 2013).

### 3.3 The influence of political and social issues

In the early 2000s, there was no significant political or social movement in Spain supporting the remunicipalization of the urban water service. In those years, the conservative Partido Popular (PP) and the social-democrat Partido Socialista Obrero Español (PSOE) held a dominant position in Spanish politics, alternating in power at different levels of administration. Although the PSOE leadership was on the ideological left, it was not openly opposed to the privatization of urban water services; in fact, many municipalities governed by this party adopted a pragmatic stance and initiated privatization processes (González-Gómez et al., 2011; Picazo-Tadeo et al., 2012). Only the post-communist party Izquierda Unida (IU) defended the public management of basic services, including the distribution of urban water; however, its position at that time—which coincided with certain citizen movements—was against further privatizations, but without yet advocating for remunicipalization.

Political and social movements in favor of the remunicipalization of the urban water service did not reach public attention in Spain until the second half of the 2010s, following the eruption on the political scene of the extreme left-wing party Podemos—its parliamentary caucus in those years included IU members. The remunicipalization of urban water distribution loomed large in the political debate of the 2015 municipal elections, in which different left-wing coalitions gained notable representation. This resulted in growing demands for remunicipalization, although in most cases the measures aimed at making this policy reform effective were not implemented. In fact, the largest cities won by Podemos and its regional allied parties already had public management of water delivery (e.g., Madrid and Cádiz), or failed to remunicipalize the service (e.g., Barcelona). And the largest cities where the service was remunicipalized in this period (Valladolid in 2015, and Terrassa in 2017) were governed by socialist parties.

Beyond the political sphere, the main stakeholder in favor of the remunicipalization of urban water services is the Spanish Association of Public Water Supply and Sanitation Operators (AEOPAS). This association strongly supports public water

management and advocates the recovery of the concessions granted to private utilities before contracts expire. In spite of the increasingly intense political rhetoric surrounding remunicipalization proposals and the proactive attitude of AEOPAS in favor of the early recovery of the public management of the urban water service—together with the pressure exerted by different platforms and citizens' movements at local level—remunicipalizations continue to take place mostly at the end of the concession, as explained previously.

## 4 Empirical strategy

### 4.1 Data and variables

The database built to conduct this research includes information from a sample of 136 Spanish municipalities where the urban water service was either remunicipalized—52 cases—or privatized—the remaining 84 municipalities—between 2003 and 2020. Most cases of change of management occurred in the Southern region of Andalusia (34.2%), Catalonia in the Northeast (21.3%) and the inland region of Castile-la Mancha (20.6%) (see Map SM1 in supplementary materials; also available on request). Other regions with significant number of cases are the Valencian Community in the East (9.6%), the central region of Castile-Leon (5.1%) and Galicia in the Northwest (4.4%). Remunicipalizations mostly took place in small and medium-sized cities—the average number of inhabitants is 17,972—and are particularly well represented in Andalusia (51.9%) and Catalonia (25%). The average size of municipalities that opted for privatization is somewhat smaller—11,914 inhabitants—and they are mostly concentrated in Castile-la Mancha (27.4%), Catalonia (20.2%) and Andalusia (20.2%).

In terms of when they occurred, 36.5% of remunicipalizations took place until 2010, and the remaining 63.5% after that year—of which nearly 6 out of every 10 occurred after 2015. The corresponding figures for privatizations are 40.5% and 59.5%, respectively. Noticeably, contracts for privatizations increased from the second half of 1980s onwards as legal reforms increased municipalities' autonomy, and usually lasted about 20–25 years. Therefore, many remunicipalizations emerged as contracts were expiring in the second half of the 2000s and particularly from the year 2010.

Gathering the sample and building the dataset involved several steps. In the first stage, the cases of remunicipalization and privatization in Spain between 2000 and 2020 were identified. Given that there are no official statistics on this issue, the starting point has been the data in Albalate et al., (2017, 2022a, 2022b), which have been updated with information from several sources. These include the official websites of municipal councils, utilities' websites and management reports; specialist sites for public tenders; the abovementioned Public Futures database; and the economic press. As a result, 75 cases of remunicipalization and 501 of privatization—576 in total—were identified which, statistically speaking, constitute the population of this research.

Efforts in the second stage focused on obtaining information on urban water prices in the year preceding the policy reform (remunicipalization or privatization), one year

later, and four years later. The main source of information in this regard was the Official Gazettes of the provinces to which municipalities in the population belong. The institutional framework for the water industry in Spain does not regulate the structure of urban water tariffs. The only feature common to most municipalities is the application of a nonlinear tariff consisting of a fixed charge for the delivery of the service, and a variable rate that increases with blocks of consumption. A lack of information about the distribution of consumption, however, makes it difficult to build a variable representing the price of urban water. To overcome these difficulties, municipalities' tariff structures—fixed and variable components—have been employed to calculate the price of a representative monthly bill with a consumption of 12 m<sup>3</sup> of water (see Chong et al., 2006; Bel et al., 2015).<sup>3</sup> Since water prices are not systematically available, after a highly demanding search for information on all 576 cases of remunicipalization or privatization recorded, the water tariffs needed to perform this analysis have been successfully calculated for 52 remunicipalizations and 84 privatizations which belong to the period 2003–2020. Notably, water tariffs were not regularly published by some Official Gazettes in the early 2000s, which helps to explain the lower representativeness of the sample of privatizations as compared to remunicipalizations, which mostly occurred from the mid-2000s onwards.<sup>4</sup> For the purpose of the statistical analyses carried out in this research, water prices have been deflated using regional Consumer Price Indexes, base year 2021, from the Spanish Statistical Office.

In addition to the price of urban water, other variables have been built representing political, socioeconomic and demographic issues. The choice of these variables is based on previous literature on public services management and water pricing, and is also conditioned by the availability of statistical information. A detailed description of these variables, including measurement units and sources is provided in Table 1.

Table 2 shows some simple descriptive statistics differentiating remunicipalizations from privatizations. Concerning the main variable of interest, the average deflated price of water was €10.30 before the policy reforms and €11.30 4 years after in the case of remunicipalizations; the corresponding figures for privatizations are €8.85 and €11.17, respectively. A convergence trend in the price of water is thus observed after the reforms. Furthermore, changes in water prices after the policy reforms are not the result of previous observed trends; rather, they are unequivocally associated with the reforms.

Another relevant matter is the relationship between water prices and ideological issues. In this regard, Table 3 displays the average deflated price of water before and after the policy reforms according to the direction of the reform and the ideology of the political party that conducted it. Considering all 136 observations in the sample,

<sup>3</sup> According to the Spanish Statistical Office, the average monthly urban consumption of water in Spain was 14 m<sup>3</sup> per household in the early 2000s. This figure had fallen to around 10 m<sup>3</sup> in 2020 due to both a reduction in average consumption per person per day and a fall in average household size. Therefore, 12 m<sup>3</sup> per household per month is considered to be representative of the average consumption in the period 2003–2020.

<sup>4</sup> A further difficulty in obtaining water prices is that not all municipalities review tariffs annually, and there is no official source indicating when tariffs are to be reviewed. Moreover, there are Official Gazettes that fail to provide advanced search engines for performing an automated search, which makes it difficult, when not impossible, to find the required information.

**Table 1** Description of the variables, measurement unit and source

Variable	Description and measurement unit	Source
Policy reform and price equations		
Remunicipalization	Dummy equal to 1 if the policy reform consists of remunicipalization of the urban water service; and 0 if it consists of privatization	Authors
Price of water	Price of a representative monthly bill including both fixed charge and water consumption of 12 m <sup>3</sup> (€)	Official Gazettes, cities and utilities
Change in the price of water	Change in the price of water before and after the policy reform (%)	Authors
Other control variables		
Center left party	Dummy equal to 1 if a center left party (mostly PSOE) was in power in the local government at the time of the policy reform; 0 otherwise	Ministry of Internal Affairs
Extreme left-wing party	Dummy equal to 1 if an extreme left-wing party (IU, Podemos, ICV, BNG and other local extreme left-wing parties) was in power in the local government at the time of the policy reform; 0 otherwise	Ministry of Internal Affairs
Left-wing party	Dummy equal to 1 if a left-wing party, including center left and extreme left-wing parties, was in power in the local government at the time of the policy reform; 0 otherwise	Ministry of Internal Affairs
Same party	Dummy equal to 1 if the mayor's party is the same at the time of reform and four years later; 0 otherwise	Ministry of internal affairs
Majority	Dummy equal to 1 if the mayor's party has an absolute majority at the time of reform; 0 otherwise	Ministry of Internal Affairs
Same majority	Dummy equal to 1 if the same mayor's party has an absolute majority at the time of the policy reform and also four years later; 0 otherwise	Ministry of Internal Affairs
Years to next elections	Number of years remaining until the next municipal elections at the time of the policy reform	Authors
Population	Inhabitants at the time of the policy reform (thousands)	Spanish Statistical Office (INE)

**Table 1** (continued)

Variable	Description and measurement unit	Source
Change in population	Change in the number of inhabitants from the time of the policy reform to $(t + 4)$ (%)	Spanish Statistical Office (INE)
Density of population	Population density at the time of the policy reform (hundreds of inhabitants per $\text{km}^2$ )	Spanish Statistical Office (INE)
Income per capita	Income per capita in the municipality in 2010 (thousands €)	Spanish Tax Agency (AEAT)
Tourist places	Places in tourist accommodation establishments in the municipality at the time of the policy reform (hundreds)	Spanish Statistical Office (INE)

Source: authors

whether remunicipalizations or privatizations, there is no statistically significant difference in the increase of prices after the reform linked to ideology.<sup>5</sup> In spite of this, lower average price increases are observed in remunicipalizations when the policy reform is executed by a right-wing party, while just the opposite happens in the few privatizations conducted by extreme left-wing parties. However, the latter two results seem to be largely driven by the starting levels of water prices.

## 4.2 Econometric approach

The econometric strategy followed to test the hypotheses posed in this research consists of the estimation of two equations: a policy reform equation and a price equation. In the policy reform equation, the probability of remunicipalization is estimated with logistic regression. The dependent variable is the dummy remunicipalization, with value of 1 if the policy reform consists of remunicipalization, and 0 in case of privatization. The covariates include the price of water prior to the reform, a set of variables standing for political issues, and some additional demographic and socioeconomic controls, which are common in the literature on the factors that determine the choice of the mode of water delivery, as shown in Sect. 2.1. Moreover, dummies to account for region-specific common features of municipalities and markets, such as sector regulation and market concentration, are included (see Bel et al., 2013, 2015). Formally:

$$\begin{aligned} \text{Probability} (\text{Remunicipalization}_i = 1) \\ = \alpha + \beta \text{ Price of water} (t - 1)_i \end{aligned}$$

<sup>5</sup> In only 12 cases was the price of water lower four years after the policy reform. Three-quarters of these cases happened after remunicipalizations—twice as much as the share of this policy reform in the sample—and two-thirds were implemented by left-wing parties (either moderate or extreme), which is slightly higher than their share in the full sample.

**Table 2** Descriptive statistics of the variables in the policy reform and price equations

Variable	All observations (136)		Remunicipalization (52)		Privatization (84)	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
<b>Policy reform and price variables</b>						
Remunicipalization (dummy)	0.382	—	1	—	0	—
Price of water in (t-1) (€ at constant 2021 prices)	9.40	4.70	10.30	4.29	8.85	4.88
Price of water in (t + 1) (€ at constant 2021 prices)	10.55	4.90	11.24	4.65	10.11	5.03
Price of water in (t + 4) (€ at constant 2021 prices)	11.22	5.44	11.30	5.18	11.17	5.63
Change in the price of water from (t-1) to (t + 1) (%)	20.4	57.8	11.8	26.7	25.7	70.1
Change in the price of water from (t-1) to (t + 4) (%)	29.3	68.5	11.6	31.4	40.3	81.9
<b>Other variables</b>						
Center left party (dummy)	0.448	—	0.500	—	0.416	—
Extreme left-wing party (dummy)	0.125	—	0.250	—	0.047	—
Left-wing party (dummy)	0.573	—	0.750	—	0.463	—
Same party (dummy)	0.632	—	0.576	—	0.666	—
Majority (dummy)	0.705	—	0.634	—	0.750	—
Same majority (dummy)	0.580	—	0.538	—	0.607	—
Years to next local elections (number of years)	1.52	1.04	1.12	1.12	1.72	0.94
Population (thousands of inhabitants in logs)	1.37	1.48	1.60	1.52	1.23	1.44

**Table 2** (continued)

Variable	All observations (136)		Remunicipalization (52)		Privatization (84)	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Change in population from t to (t + 4) (%)	-0.08	7.34	1.63	5.83	-1.15	7.98
Density of population (hundreds of inhabitants per km <sup>2</sup> )	1.94	3.93	2.35	5.37	1.68	2.69
Income per capita (year 2010, in thousands of €)	18.84	5.07	18.37	4.87	19.13	5.20
Tourist places (hundreds of bed places)	2.36	7.20	2.63	9.09	2.19	5.78

t refers to the year in which the policy reform, either remunicipalization or privatization, takes place; (t-1) refers to the year before the policy reform, while (t + 1) and (t + 4) refer to one and four years after the reform, respectively

Source: authors

**Table 3** Price of water before and after the policy reform according to ideology (€ at constant 2021 prices)

Variable	Ideology of the political party that conducted the policy reform		
	Right-wing	Center left	Extreme left-wing
All observations (136)	(58)	(61)	(17)
Price of water in (t-1)	9.81	8.98	9.51
Price of water in (t + 1)	10.44	10.41	11.38
Price of water in (t + 4)	11.52	10.83	11.61
Remunicipalization (52)	(13)	(26)	(13)
Price of water in (t-1)	11.56	9.52	10.58
Price of water in (t + 1)	11.86	10.67	11.76
Price of water in (t + 4)	12.09	10.61	11.89
Privatization (84)	(45)	(35)	(4)
Price of water in (t-1)	9.30	8.58	6.03
Price of water in (t + 1)	10.04	10.21	10.14
Price of water in (t + 4)	11.36	10.99	10.72

t refers to the year in which the policy reform, either remunicipalization or privatization, takes place; (t-1) refers to the year before the policy reform, while (t + 1) and (t + 4) refer to one and four years after the reform, respectively. Number of observations in each category in parentheses

Source: authors

$$\begin{aligned}
 & + \sum_{p=1}^P \delta_p \text{Political variables}_i \\
 & + \sum_{c=1}^C \phi_c \text{Other control variables}_i \\
 & + \sum_{r=1}^R \theta_r \text{Regional dummies}_i + \varepsilon_i
 \end{aligned} \tag{1}$$

where  $i$  stands for the 136 observed policy reforms and  $\varepsilon_i$  is a heteroscedasticity-robust error.

On the other hand, the price equation investigates the determinants of the change in water prices after the policy reform; particularly, whether the direction of the reform—either remunicipalization or privatization—makes a difference regarding the subsequent change in water prices. The dependent variable is the change in the price of water between year  $(t-1)$ —with  $t$  being the year of the reform—and, depending on the specification, either  $(t+1)$  or  $(t+4)$ . The covariates include the price of water prior to the policy reform—i.e., in year  $(t-1)$ —and the dummy remunicipalization, together with several political, demographic and socioeconomic controls, and also regional dummies. These variables are common in the literature on the factors that determine the price of urban water, as shown in Sect. 2.2.

The price equation is estimated by Ordinary Least Squares (OLS) with robust standard errors to account for the presence of heterogeneity. Two different specifications for the change in the price of water are estimated, the general one being:

$$\begin{aligned}
 & \text{Change in the price of water } (t-1 \text{ to } t+n)_i \\
 & = \alpha + \beta \text{ Remunicipalization}_i \\
 & + \delta \text{ Price of water } (t-1)_i \\
 & + \sum_{c=1}^C \phi_c \text{Control variables}_i \\
 & + \sum_{r=1}^R \theta_r \text{Regional dummies}_i + \mu_i
 \end{aligned} \tag{2}$$

with  $i$  representing policy reforms and  $\mu_i$  being a heteroscedasticity-robust error.

It is worth highlighting that this equation is not intended to explain the level of water prices, which might differ across municipalities due to their characteristics, but rather to investigate the determinants of the change in prices after the policy reform, accounting for its direction.

## 5 Results

This Section briefly describes the results obtained from both the policy reform equation and the price equation, which are interpreted and discussed in Sect. 6. The results for the probability of remunicipalization in the policy reform equation are in Table 4. Interestingly, the price of water in the year prior to the policy reform is positively associated with remunicipalization and, therefore, negatively with privatization. Regarding the political variables, center left and extreme left-wing parties are both positively associated with remunicipalization. Notably, remunicipalization is around 3.1 times more likely than privatization in municipalities governed by center left parties, and no less than 7.6 times larger in municipalities governed by extreme left-wing ones—the odds ratios in the last column of Table 4 are 3.187 and 7.689, respectively. None of the other control variables included in the policy reform equation, apart from some regional dummies, affect the probability of remunicipalization.

Different specifications have been estimated for the change in the price of urban water: from the year prior to the policy reform to (i) one year later, the short-term equation; and (ii) four years later, the medium-term equation, as explained in Sect. 4.2. The explanatory variables are gradually introduced into both equations, starting with remunicipalization (model 1), the pre-reform water price (model 2), regional dummies (model 3), and controls (model 4). Tables 5 and 6 present the results for the short- and and

**Table 4** The policy reform equation. Logistic regression estimates for the probability of remunicipalization

Variable	Estimated parameter	p-value	Odds ratio
Constant	1.075	0.411	—
Price of water in (t-1)	0.105*	0.069	1.111
Political variables			
Years to next local elections	-0.391	0.103	—
Center left party	1.159**	0.027	3.187
Extreme left-wing party	2.039***	0.007	7.689
Majority	-0.684	0.184	—
Other control variables			
Log of population	-0.004	0.988	—
Density of population	0.162	0.105	—
Income per capita	-0.111	0.135	—
Tourist places	0.033	0.355	—
Regional dummies	Yes		
Pseudo R-squared	0.276		
Number of observations	136		

\*\*\*, \*\* and \* stand for statistical significance at 1%, 5% and 10%, respectively. t refers to the year in which the policy reform, either remunicipalization or privatization, takes place, while (t-1) refers to the year prior to the policy reform. Robust standard errors are computed. Odds ratios are only reported for statistically significant variables. Estimated parameters and p-values for the regional dummies are not reported

Source: authors

**Table 5** The short-term price equation. Linear regression estimates (OLS) for the change in the price of urban water from (t-1) to (t + 1)

Variable	Model (1)		Model (2)		Model (3)		Model (4)	
	Estimated parameter	p-value						
Constant	25.763***	0.001	55.997***	0.002	93.021***	0.002	60.330**	0.017
Remunicipalization	-13.892	0.105	-8.933	0.211	-24.531**	0.032	-26.639**	0.022
Price of water in (t-1)			-3.415***	0.005	-3.984***	0.009	-3.818***	0.008
Control variables								
Years to next local elections					6.550*	0.084	6.550*	0.084
Left-wing party					16.954*		16.954*	0.100
Majority					-10.420		-10.420	0.268
Log of population					-17.814*		-17.814*	0.075
Density of population					2.925**		2.925**	0.048
Income per capita					3.073**		3.073**	0.047
Tourist places					-0.663		-0.663	0.373
Regional dummies	No		No		No		Yes	
R-squared	0.013		0.089		0.212		0.316	
Number of observations	136		136		136		136	

\*\*\*, \*\*, and \* stand for statistical significance at 1%, 5% and 10%, respectively. t refers to the year in which the policy reform, either remunicipalization of privatization, takes place; (t-1) refers to the year before the policy reform, while (t + 1) and (t + 4) refer to one and four years after the reform, respectively. Robust standard errors are computed. Estimated parameters and p-values for the regional dummies are not reported

Source: authors

**Table 6** The medium-term price equation. Linear regression estimates (OLS) for the change in the price of urban water from (t-1) to (t + 4)

Variable	Model (1)		Model (2)		Model (3)		Model (4)	
	Estimated parameter	p-value						
Constant	40.339***	0.000	75.102***	0.000	119.690***	0.000	72.626*	0.059
Remunicipalization	-28.723***	0.005	-23.022***	0.008	-40.674***	0.003	-38.126***	0.003
Price of water in (t-1)			-3.927***	0.004	-4.974***	0.003	-4.750***	0.002
Control variables								
Years to next local elections							7.719*	0.097
Left-wing party							12.303	0.349
Same party							4.180	0.762
Same majority							-7.315	0.571
Log of population							-16.394	0.108
Change in population t to (t + 4)							-0.704	0.631
Density of population							2.408	0.123
Income per capita							3.559	0.164
Tourist places							-1.213	0.195
Regional dummies	No		No		Yes		Yes	
R squared	0.041		0.112		0.237		0.313	
Number of observations	136		136		136		136	

\*\*\*, \*\* and \* stand for statistical significance at 1%, 5% and 10%, respectively. t refers to the year in which the policy reform, either remunicipalization of privatization, takes place; (t-1) refers to the year before the policy reform, while (t + 1) and (t + 4) refer to one and four years after the reform, respectively. Robust standard errors are computed. Estimated parameters and p-values for the regional dummies are not reported

Source: authors

medium-term price equations, which are consistent with expectations, particularly in the medium-term. The parameter associated with remunicipalization remains negative and significant once the pre-reform water price, the regional effects and the controls have been included in the estimations (model 4). This means that there is a smaller increase in the price of water after remunicipalizations than after privatizations.

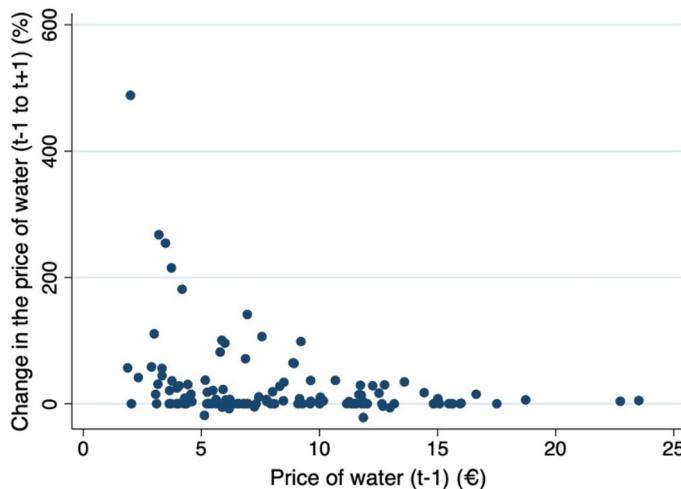
Furthermore, a negative parameter for the variable capturing the price of water before the reforms is consistently estimated in both equations, indicating that the lower the starting price the higher its growth. This result suggests the existence of a process of price convergence after the policy reforms. Some controls are also statistically significant, including the years to the next local elections, left-wing party, population, density of population and income per capita in the short-term equation; and years to the next local elections in the medium-term equation.

The finding that the increase in the price of water is smaller after remunicipalizations than after privatizations, however, depends crucially on a few influential observations in the sample. In this regard, using a rule based on the deviation from the interquartile, 17 influential observations have been identified in which the pre-reform price of water was abnormally low, and so the price increase after the policy reform was especially marked (Fig. 1). A distinctive feature of these observations worth mentioning is that they mostly belong to privatizations—76.5%, which is higher than the share of this policy reform in the full sample (61.8%). Concerning ideology, 23.5% of influential cases are reforms carried out by right-wing governments, which is lower than share of this ideology in the full sample (42.7%); the opposite occurs for far-left governments, whose representation among influential observations (18%) is higher than the 12.5% in the sample.

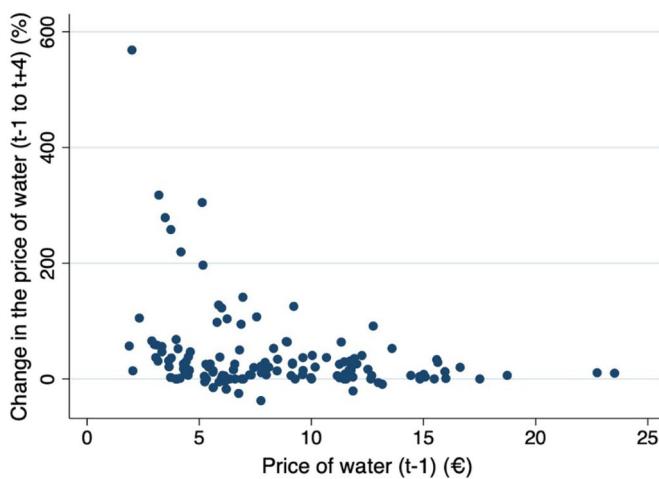
To remove the effect of these influential observations, short- and medium-term price equations have been re-estimated excluding them from the sample. The results are shown in Table 7, which directly includes the most comprehensive models with regional effects and controls. Remarkably, when these extreme observations are excluded from the estimations, the question of whether the policy reform consists of remunicipalization or privatization makes no difference regarding the change in the price of water in either the short- or the medium-term; i.e., the parameter associated with remunicipalization is no longer significant in either equation. The only result that holds in this scenario is the price convergence after the reforms.

Lastly, in order to test the robustness of these results, all equations and models have been re-estimated using a monthly bill for the price of water with an average consumption of  $10 \text{ m}^3$ —instead of  $12 \text{ m}^3$  as in the baseline estimations; this price includes both fixed and variable rates. This is a sensible alternative price, since in recent decades there has been a downward trend in Spain in the average monthly household consumption of water. The results are robust regarding the effect of the main variables of interest (see Tables SM1 and SM2 in supplementary materials; also available on request). In the policy equation, on the one hand, pre-reform water prices and the ideological variables center left party and extreme left-wing party maintain their effect and statistical significance on the probability of remunicipalization.

On the other hand, the results for the price equation are also robust regarding the variable remunicipalization, in that the estimated parameter is negative and significant when all observations are included in the estimations but loses its significance after



a. Change in the price of water from (t-1) to (t+1)



b. Change in the price of water from (t-1) to (t+4)

**Fig. 1** Scatterplot of the price of water prior to the policy reform and its change after the reform: Influential observations Source: authors

excluding influential observations. Moreover, pre-reform prices continue to exert a negative and statistically significant effect on the change in the price of water, except in the short-run price equation excluding influential observations. Results in the medium term are, however, much more relevant for the purpose of this research. In that regard, a single year—as in the short-term price equation—might not be enough time to fully implement water price change strategies.

**Table 7** The price equation. Linear regression estimates (OLS) for the change in the price of urban water excluding influential observations

Variable	Short-term price equation: Change from (t-1) to (t + 1)		Medium-term price equation: Change from (t-1) to (t + 4)	
	Estimated parameter	p-value	Estimated parameter	p-value
Constant	20.997	0.160	13.331	0.276
Remunicipalization	0.399	0.909	-6.283	0.159
Price of water (t-1)	-0.825*	0.094	-0.901**	0.038
Control variables				
Years to next local elections	0.560	0.795	2.030	0.333
Left-wing party	0.717	0.873	1.255	0.778
Same party	-	-	0.449	0.925
Majority	-4.082	0.360	-	-
Same majority	-	-	5.400	0.277
Log of population	-2.221	0.211	-0.132	0.959
Change in population t to (t + 4)	-	-	0.049	0.891
Density of population	0.527	0.214	-0.091	0.848
Income per capita	0.251	0.595	0.061	0.908
Tourist places	-0.046	0.848	-0.038	0.883
Regional dummies	Yes		Yes	
R-squared	0.115		0.112	
Number of observations	119		119	

\*\* and \* stand for statistical significance at 5% and 10%, respectively. t refers to the year in which the policy reform, either remunicipalization or privatization, takes place; (t-1) refers to the year before the policy reform, while (t + 1) and (t + 4) refer to one and four years after the reform, respectively. Robust standard errors are computed. Estimated parameters and p-values for the regional dummies are not reported

## 6 Discussion and conclusion

Changing the form of delivery—from private to public or vice versa—has been one of the responses to dissatisfaction with the management of local public services. Along with pragmatic motivations, ideological considerations have also played a role in this response. Although it has not established a hegemony as a type of policy reform, remunicipalization has been particularly intense in urban water delivery. There are abundant experiences of remunicipalization of this service around the world, and comparatively higher prices with private delivery have been an important factor in this proliferation.

Although there is ample evidence in the literature of higher prices with private management of water utilities, there is not a single multivariate empirical analysis comparing the variation in the price of water following the change in delivery mode—either remunicipalization or privatization. This paper takes advantage of a large

database including 136 cases of a change in the mode of urban water delivery—either from private to public delivery (52 cases of remunicipalization) or vice versa (84 privatizations)—that occurred in Spain between the years 2003 and 2020. Drawing on existing theoretical knowledge and empirical evidence, several hypotheses on the drivers of remunicipalization and the pricing of urban water under public and private delivery are posed and tested in this paper.

Regarding the drivers of remunicipalization, it is found that both pragmatic and ideological reasons play a role. On the one hand, the higher the pre-reform water prices, the more likely the remunicipalization of the urban water service. Conversely, prices prior to the policy reform are negatively associated with privatization. This result might be interpreted as empirical evidence that disappointment with the higher urban water prices of private utilities is a driver of remunicipalization of the service, thus lending support to hypothesis H1. The finding also suggests that privatization might be a strategy in municipalities where the price of water is low and the costs of providing the service cannot be fully recovered. Another finding is that ideology may have some influence on the decision to remunicipalize, as center left parties and, most particularly, extreme left-wing ones are more in favor of returning the urban water service to public hands. This finding confirms hypothesis H2, and is consistent with results in Picazo-Tadeo et. al (2012), which show that parties on the ideological extreme-left exhibit a strong bias against the privatization of water services.

The main hypothesis posed in this research—hypothesis H3—concerns the change in the price for urban water after policy reforms addressing the management of the service. It states that the increase in the price of water is expected to be smaller after remunicipalization than after privatization. Indeed, the empirical findings are consistent with this hypothesis, as remunicipalization is found to lead to smaller increases in the price of urban water than privatization does, in both the short- and medium-term. In addition, it is worth highlighting that the ideology of the political party in power in the municipal government at the time of the policy reform does not consistently influence the change in the price of water after the policy reform. In particular, the empirical results in this research do not support the political discourse that left-wing parties tend to set lower urban water prices for social reasons—by either directly making tariffs more affordable for users after remunicipalization, or including clauses capping price increases in privatization contracts.

Nevertheless, the finding that larger water price increases are related to privatization is strongly dependent on a small number of municipalities in the sample where privatization was implemented after a period of abnormally low prices, and which experienced huge increases immediately after the policy reform. When these influential cases are removed from the analysis, no difference in urban water price increases after delivery reform—either remunicipalization or privatization—is found for the remaining cases. These outcomes are consistent with the idea that privatization has often been used to increase user participation in covering the costs of delivering urban water, thereby freeing municipal budgets from subsidizing the service—like Bel and Miralles (2010) found for waste collection.

The abovementioned results can contribute to solving the puzzle posed by the existing evidence on urban water services, which points to higher prices with private management but no significant differences in efficiency between public and private

utilities (Bel & Warner, 2008). In fact, the higher prices of private utilities would reflect a higher rate of cost recovery through user payments and, consequently, less pressure on local public budgets. This would also be coherent with the results reported by Porcher (2017), which suggest that higher water prices with private delivery could be related to requirements for debt repayment in the future.

The final hypothesis posed in this research is hypothesis H4, which concerns long-term urban water price dynamics. Given the regulatory trend in the European Union aimed at increasing cost recovery with user payments—with the ultimate goal of full cost recovery, according to the 2000 Water Framework Directive—it is hypothesized that water prices will tend to converge over time, regardless of whether the reform was remunicipalization or privatization. The findings from this research are consistent with this convergence hypothesis, stated under regulation favorable to total cost recovery. In this respect, it is found that the lower the pre-reform urban water price, the larger its increase after the policy reform. This leads one to expect smaller price differences between public and private management of urban water services in the future, as long as the principle of total cost recovery is promoted and respected.

This paper constitutes an attempt to provide general insights into the relationship between the direction—remunicipalization or privatization—of policy reforms aimed at changing the delivery mode of the urban water service and water prices. However, the research is not without its limitations, which may pave the way for future investigation. The main weakness is that the quality of the service is not accounted for. Although there are some sources of information on variables that could act as a proxy for service quality and investment—e.g., leaks in the distribution network or water treatment for potabilization—unfortunately the data are only available for very few cases in the sample; moreover, available data display little variability across municipalities and, more importantly, across time. Furthermore, again because of data unavailability, the analysis does not capture other factors that might influence policy reforms, such as potential corruption in private management. These factors are easier to document—when applicable—by means of case studies.

Accordingly, future studies on the relationship between policy reforms regarding management and prices in the urban water service should make greater efforts to identify variables that can account for the quality of the service. Also desirable are larger samples and datasets to improve the representativeness of the results. Likewise, since the empirical analysis carried out in this research focuses on Spanish municipalities, comparable analyses in other countries with similar (or different) regulatory frameworks might help to ascertain whether the findings can be generalized.

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**Data availability** All data generated or analyzed during this study are included in this published article [and its supplementary information files].

## Declarations

**Conflict of interest** The authors have no relevant financial or non-financial interests to disclose. The authors have no competing interests to disclose.

**Ethical approval** Not applicable.

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