Spain

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Water Governance in Spain: The Role of Federalism and Public-Private Partnerships

María A. García-Valiñas

1 Introduction

Water has been traditionally considered as a merit good that has significant implications in economic, social, and environmental terms (OECD 2003, 2013). This renewable natural resource is characterized by a strong heterogeneity in terms of spatial distribution. Water scarcity, stress, and quality problems are key issues that local, national, and supranational institutions have to deal with. Water management and governance schemes become strategic when designing public policies.

Spain is a European Union (EU) member country facing strong weather differences among regions. Both quality and availability of water experience broad variations depending on the area, and the country is subject to severe droughts (Lopez-Gunn et al. 2012) and quality problems (Willaarts et al. 2014). Moreover, it is a federal country, where subcentral governments actively design and develop public policies related to

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water resources. However, decentralization is not always combined with coordination among different government levels, as explained in latter sections. As a result, economic and regulatory tools show a strong heterogeneity. Additionally, Public-Private Partnerships (PPPs) have emerged as a usual framework to manage water resources. The expanding trend of PPPs in the last decades has generated a public and academic discussion about the superiority of this kind of organizational schemes, which will be also addressed in this chapter.

The chapter is organized as follows. First of all, a comprehensive picture of water sector in Spain is presented. Next, some key issues in water governance in Spain are described, such as the river basin organizational framework, the decentralization of economic instruments, or citizens' participation channels. The fourth section includes a broad discussion on the role of PPP schemes in the water sector. Finally, the chapter finishes with a brief summary of the main conclusions and future challenges.

2 Water Sector in Spain: Outstanding Problems

Since ancient times, water services provision in Spain has been a difficult task to drive. Several pressures have been identified. On the one hand, Spain is the most semi-arid country in the EU (Lopez-Gunn et al. 2012), and droughts and other water scarcity issues frequently affect some regions of the country. Moreover, climate change emerges as a major threat for water management in Spain. An increase of the average temperatures up to +1.9 °C has been predicted for 2040 (CEDEX 2011), jointly with a reduction in rainfall (up to 6%). In some specific areas, such as Canary Islands and the southern basins, significant changes in rainfall patterns are expected (Garrido et al. 2013). Southern basins could experience reductions of up to 13% of surface water runoff and around 15% of aquifers' recharge, while the reductions at Eastern Mediterranean basins would be below 10%. Northern basins will also experience reductions, but their relative profuse resource availability will likely mitigate the impact (Garrido et al. 2013).

On the other hand, significant population increases have been registered in the last decades. Thus, population has extended from 38.8 million in 1990 to 46.6 million in 2016 (INE 2017a). Despite a negative population growth rate predicted for the next decades (INE 2017a), there are still a high number of people keeping the pressure up on the water supply and sewerage systems. Moreover, the slight GDP growth rate increase forecasted for the next years (IMF 2017) is an additional factor with impact on water resources management. Water is considered as an additional input in the production process (Arbués et al. 2010; Renzetti 2015). As a consequence, recovering economic activity could lead to intensify both industrial and agricultural water use and waste.

Pollution and consumption are significant key drivers of water quality. A good monitoring system to control the quality of water bodies emerges as an essential instrument for water governance. Under the enactment of the EU Water Framework Directive (WFD, 2000/60/EC), the surveillance programme for water bodies developed in Spain has allowed the creation of a broad network of monitoring stations. Willaarts et al. (2014) conclude that around 50% of surface water bodies in Spain are in poor ecological status. Moreover, saline intrusion and non-source pollution have been the two main sources lessening the quality of underground water bodies (Custodio 2014).

In spite of water availability and quality problems, water prices in Spain do not register a high level (Calatrava et al. 2015). Moreover, inefficient price schemes are still applied.[1] The basis for water pricing in Spain was set at the 1985 Water Law (Garrido and Calatrava 2009). Since then, only partial changes have been observed, the most important of which resulted from the transposition of the WFD into

[1] For example, the majority of irrigation water users' associations face prices based on land surface. Water tariff usually consists of a fixed amount per hectare. These pricing structures are intrinsically linked to overconsumption and efficiency losses. Additionally, some urban water tariffs include free allowances. A free allowance is a minimum water consumption that is charged at zero marginal price. Usually, when the user pays the fixed charge, he/she gets the right to consume a basic amount of water. The use of free allowances has been criticized because they lead to significant efficiency losses. In general, it has been proven that this kind of elements provides strong incentives to water overuse, being against water conservation (Castro et al. 2002), and not very equitable (OECD 2003).

Spanish national legislation. However, current water prices for different users in Spain have not achieved the goals established at the WFD, especially when looking at cost recovery and environmental issues (Calatrava et al. 2015).

Although water infrastructures have improved in the last decades, there is still an urgent need to invest in both urban wastewater treatment and water supply systems. On the one hand, average water leakage rate in Spain is around 25% (INE 2014). What is most worrying is that there are many cities where the water loss rate is much higher than the average rate, particularly in the south of Spain (González-Gómez et al. 2012).

On the other hand, Spain has not got a full compliance with the Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment (Environment Agency Austria 2015). Aldaya and Llamas (2012) pointed out that many wastewater treatment plants do not operate correctly, and most that do only perform secondary treatment (not tertiary). The cost of restoring all these treatment plants and upgrading those with secondary treatment has been estimated at around €19 billion. That figure would amount to 4€ per m^3, which annualized in ten years would be about 0.45–0.5€ per m^3. This surcharge would represent an average increase of 20–40% of the urban tariff. This is not an extremely large increase but it could generate high political costs (Calatrava et al. 2015). On top of that, water reuse, closely linked to wastewater management, is a top-listed priority area in the Strategic Implementation Plan of the European Innovation Partnership on Water (EC 2012). However recycling water processes are far from being generalized. Actually, Spain shows by far the highest reuse potential, the calculations suggesting a value of over 1,200Mm^3/yr (EC 2014).

Definitively, water management in Spain is far to be a straightforward process. Moreover, it has not generated the expected outcomes. There are unfortunately still many issues that need to be resolved both in the short and long run. A mixture of scarce non-controllable inputs, overpressures on water resources, and a non-adequate design of institutional and regulatory framework are some of the reasons explaining the current situation of water resources in Spain.

3 Water Governance in Spain

Water governance is the set of rules, practices, and processes (formal and informal) through which decisions for the management of water resources and services are taken and implemented, stakeholders articulate their interest, and decision-makers are held accountable (OECD 2015). Regulatory issues emerge as a key factor of governance in the water sector. However, formal norms and regulation are not the only aspects that matter in this field. Other non-necessarily formal aspects that articulate coordination, participation, and information are also significant when attempting to improve water sector outcomes management. This section is especially devoted to describe the regulatory framework in Spain, with special attention to federalism and economic instruments.

An Overview

Spain is a federal country, whose bases are set at the Spanish Constitution (1978). The current vertical structure of government includes both central and sub-central levels. The Constitution recognizes explicitly the existence and right to self-governance of sub-central governments. Spanish institutional framework is composed of the central government (CG), 17 autonomous communities (regional governments, CCAA) and 2 autonomous cities at the intermediate level, and 50 provinces and 8,124 municipalities (MUN) at the local level (INE 2017b).

This framework makes water management more complex in terms of governance, since different levels of government develop several tasks related to water policies. As a consequence, coordination and negotiation processes emerge as substantial issues in this context. In the next subsection we will analyse the most significant topics related to water planning, economic and social aspects through the integrated water cycle.

Water Planning: River Basins

River basins are the basic managerial units set at the WFD (Arts. 3 and 13). These organisms are in charge of water planning and policy design

strategies (OECD 2011). Basin-based governance unit has been defended as the best scale option that can be adopted to manage water resources. In this respect, some advantages such as the adaptation to physical or hydro-ecological environment have been remarked (Cohen 2012). However, there are some critical voices that claim higher flexibility and dynamism in demarcating the optimal hydrological unit (Moss 2012).

Spain has a long tradition of using the river basins as basic organizational and managerial units. The germ of the current Confederaciones Hidrográficas (CCHH) was found at the end of the nineteenth century. In 1865, some preliminary efforts were made in order to set a basin-based management organizational framework. During the Primo de Rivera Dictatorship (1923–1930), these units were endowed with legal and administrative contents, while in 1934 they were called using their current denomination (Del Moral Ituarte 2016). During the Franco Dictatorship (1939–1975), water policy was strongly centralized through these organisms. However, coinciding with the return of democracy, the Constitution of 1978, and the State of Autonomies, sub-central governments emerged as significant agents in the development of water policies in the country.

Actually, responsibilities and decisions on water policies are taken depending on the water body considered. On the one hand, there are inter-communitarian river basins, in charge of planning and managing water bodies that cross several CCAA. In this case, the responsibility of water management lies on the central state (Spanish Ministry of Environment). On the other hand, there are a few intra-communitarian water bodies, where the distribution of functions between the central state and each region is bilaterally negotiated and set in the so-called autonomy statutes. Those could be reformed upon the request of the regional government. In any case, regional governments are assuming higher responsibilities than in the case of inter-communitarian water bodies.

Since past many years, there has been a long discussion about the decentralization level that is more convenient in this kind of situations. Thus, fiscal federalism theory recommends central public services provision when it comes to control for externalities and/or spillover effects in contexts where cooperative management is not possible (Oates 2001; Banzhaf and Chupp 2012). However, several problems such as pollution,

ecosystem degradation, and water pressures are still significant in the inter-communitarian water bodies (Thiel 2015). Moreover, central provision imposes uniform public policies, neglecting sub-central heterogeneity (Banzhaf and Chupp 2012).

In this context, more flexibility could be demanded, since the regional differences in Spain are remarkable. However, the Spanish Constitution and the European regulation strongly constrain the possibility of decentralization in this context. Actually, some attempts to extend the decentralization process on the CCHH have been aborted. That is the case of the Guadalquivir CH, in charge of an inter-communitarian river basin, where water bodies are shared by Andalusia, Extremadura, and Castilla-La Mancha territories.[2]

Economic Tools and Decentralization

The WFD sets requirements for member states to take account the principle of cost recovery of water services. In this respect, cost recovery should include both financial recovery of *operational and maintenance costs* (and ideally costs of capital renewal and extension as well) for water and sanitation services and also the recovery of the *environmental and resource costs* including costs related to water abstraction and costs induced by the pollution of water bodies. In this section, we will study the charges/taxes that have been designed to get the aim of full cost recovery, and which are commonly included in final users' water bills. We refer here to the water abstraction charge and the water pollution charge.

The Spanish system combines both central and sub-central economic tools. Thus, the 1999 Spanish Water Act requires that water users pay different charges to river basin authorities, since they are recipients of different

[2] In 2007 Andalusia gained exclusive responsibilities on the Guadalquivir water bodies that flowed through its territories and did not affect another autonomous community (Junta de Andalucía 2007). A combination of different factors, such as the high weight of Andalusia in the basin (this region covers the most part of the Guadalquivir River Basin area), the fact that other communities were downstream, and some political alignments in that period, led to make that decision. However, the remaining regions submitted claims to the Court, and finally in 2011, responsibilities fell back to the central government (Thiel 2015).

water services. First, users of the public hydraulic domain are charged a levy to protect and improve the domain's conditions. Second, urban and industrial users pay an "Effluent Control Levy" (*Canon de Vertido*), a levy on point source pollution. Third, users of surface water should pay a "Regulation Levy" (*Canon de Regulación*) to compensate the basin authority for the costs linked to building, operating, and maintaining public water regulation infrastructures. Finally, the "Water Use Tariff" (*Tarifa de Uso del Agua*) is set to fund investment, operation, and maintenance costs of specific infrastructures that are not regulation infrastructures (Calatrava et al. 2015).

Moreover, regional governments are in charge of developing green taxation. The majority of them have set additional charges/taxes on water resources use and pollution. For instance, the *Canon de Saneamiento* is a usual charge set by regional governments. The main aim of this tax is to get revenues to finance sewage services. However, there are a broad variety of green taxes/charges related to the hydrological cycle. Table 2.1 shows the taxes/charges that autonomous communities have set on water abstraction, consumption, and pollution. Except for Castilla-La Mancha, all the regional governments have established taxes at different stages of hydrological cycle. Most of them have set taxes on water use and pollution, where the tax base is the real or potential (if estimated) water consumption. However, a broad variety of tax rate/bill schemes are observed.

On the one hand, it is surprising that there are still free allowances in some Spanish regions, where a minimum consumption level is obligatorily billed. For instance, Catalonia sets a free allowance of 6 m^3 per month for domestic users, a mandatory inclusion in the final water bill. Other alternative schemes are also observed, where an exemption threshold is set, but taxpayers should pay a fixed charge (which could be seen as equivalent to a free allowance). This is the framework applied in some regions such as Andalusia, Extremadura, or Galicia.[3] On the other hand, only seven regions decide to set increasing tax rates, while the remaining regions set a linear variable tax rate. On top of that, the majority of regional governments apply pollution-based adjustments in the calculation of final tax bill, and some of them consider agglomeration factors.[4]

[3] In Basque Country, a minimum water consumption of 130 litres per person and day is established, but no fixed charge is set.

[4] For instance, Catalonia considers the population size in the calculation of final tax bill, assuming that higher water pressure and pollution levels are generated in bigger municipalities.

Table 2.1 Regional water taxation in Spain, 2016

Region	Tax (Spanish name)	Tax event	Tax base	Free allowance/ exemption threshold	Increasing tax rate	Pollution-based adjustments
Andalusia	Impuesto sobre vertidos a las aguas litorales	Emissions to coastal water bodies	Pollution units (1000 m^3)	No	No	Yes
	Cánon de mejora de infrestructuras hidráulicas de depuración	Water use and availability	Water consumption (real or potential, m^3)	Yes	Yes	No
Aragon	Impuesto sobre la contaminación de las aguas	Water use and pollution	Water consumption (real or potential, m^3)	No	No	Yes
	Impuesto Medioambiental sobre determinados usos y aprovechamientos de agua embalsada	Environmental damage when using water from reservoirs	Reservoir storage (hm^3) + reservoir height (m)	No	No	No
Asturias	Impuesto sobre las afecciones ambientales del uso del agua	Water use and pollution	Water consumption (real or potential, m^3)	No	Yes	No
Balearic Islands	Cánon de saneamiento de aguas	Water use and pollution	Water consumption (real or potential, m^3)	No	Yes	No
Canary Islands	Cánon de vertidos	Water use and pollution	Pollution units	No	No	Yes

(*continued*)

Table 2.1 (continued)

Region	Tax (Spanish name)	Tax event	Tax base	Free allowance/ exemption threshold	Increasing tax rate	Pollution-based adjustments
Cantabria	Cánon de agua residual	Water use and pollution	Water consumption (real or potential, m^3)	No	No	Yes
Castilla-León	Impuesto sobre la afección medioambiental causada por determinados aprovechamientos del agua embalsada[a]	Environmental damage when using water from reservoirs[a]	Reservoir storage (hm^3) + reservoir height (m)	No	No	No
Castilla-La Mancha						
Catalonia	Canon del agua	Water use and pollution	Water consumption (real or potential, m^3)	Yes	Yes	Yes
Valencia	Cánon de saneamiento	Water use and pollution	Water consumption (real or potential, m^3)	No	No	Yes
Extremadura	Cánon de saneamiento	Water availability	Water consumption (m^3)	Yes	Yes	No
Galicia	Cánon de saneamiento	Water use and pollution	Water consumption (real or potential, m^3)	Yes	Yes	Yes

(*continued*)

Table 2.1 (continued)

	Impuesto sobre el daño medioambiental causado por determinados usos y aprovechamientos del agua embalsada	Environmental damage when using water from reservoirs	Reservoir storage (hm^3)	No	Yes	No
Madrid	Tarifa de depuración de aguas residuales	Water use and pollution	Water consumption (m^3)	No	Yes	Yes
Murcia	Cánon de saneamiento	Water use and pollution	Water consumption (real or potential, m^3)	No	No	Yes
	Impuesto sobre vertidos a las aguas litorales	Emissions to coastal water bodies	Pollution units	No	No	Yes
Navarra	Cánon de saneamiento de las aguas residuales de Navarra	Water use and pollution	Water consumption (real or potential, m^3)	No	No	No
Basque Country	Cánon del agua	Water use and pollution	Water consumption (m^3)	Yes	No	No
La Rioja	Cánon de saneamiento	Water use and pollution	Water consumption (real or potential, m^3)	No	No	Yes

Source: Own elaboration from http://www.minhafp.gob.es

[a]This tax is also levied on other environmental damages (i.e. the visual impact of wind farms)

Moreover, it is also noteworthy that only a few regions have levied charges on environmental damages linked to water abstraction. Thus, Aragón, Castilla-León, and Galicia have designed a tax to internalize the environmental damage when abstracting water from different natural sources, storing it in reservoirs or dams. Water abstraction has impact on the ecological water bodies' flow, generating significant environmental problems. Reservoirs' storage and height are usual dimensions considered in the calculation of tax base.

Finally, we should not forget the key role of local governments in the management of water economic tools. Local governments are in charge of the water services provision to non-agricultural users. As mentioned before, Spain is an extremely atomized country, since its territory is split in more than 8,000 municipalities (INE, 2017b). Almost 5,000 of them have less than 1,000 inhabitants (INE 2017a). Paradoxically, the number of municipalities has registered a slight increasing trend during the last decades (INE 2017b). Retail urban water prices are set at the local level. Moreover, there is no central government institution or regulatory body coordinating retail water prices in Spain. As a result, a wide range of water structures and price levels emerges (Calatrava et al. 2015). In any case, Spanish water prices have been traditionally among the lowest in the European Union (OECD 2010, 2013). Moreover, the country is poorly complying with the polluter-pay principle set at the European WFD (EEA 2013).

Civil Society Participation

Public participation is considered to have a positive and significant impact on the quality of water governance (De Stefano et al. 2013). The European WFD and other EU water directives oblige Spain to involve civil society in the decision-taking process (Osbeck et al. 2013). Public participation should involve three different issues: information, consultation, and active participation. Despite the information and consultation stages have been developed, however active participation processes are relatively new in Spain and "collide heavily with Spanish political and institutional tradition" (Ruiz-

Villaverde and García-Rubio 2017, p. 2490). Civil society participation is mainly conducted through the Water Basin Councils (institution under the river basin authorities). Several stakeholders are involved in the design of water policies. However, different groups have different weights in the decision-making process, being user groups (e.g. agriculture, hydropower, urban users) have much stronger weight. Moreover, campaigns and demonstrations (informal participation tools) could also have impact on the final policy structure. Actually, informal participation has emerged especially in the last decade, since "there is greater social awareness of water as a common good" (Ruiz-Villaverde and García-Rubio 2017, p. 2491).

4 Urban Water Management Services: The Role of PPPs

Spanish regulatory framework[5] establishes that local governments are responsible for guaranteeing urban water services. However, municipalities are flexible to choose the legal regime to provide local public services. The local government may choose to either manage the service in-house or externalize it. When the last option is chosen, management may be transferred either to a public[6] or private company. Moreover, there are some municipalities opting for joint management model, in order to take advantage of economies of scale.[7] In this section, the attention is focused on the role of PPPs in the water sector, showing some figures and outcomes of this kind of management in Spain.

[5] Law 7/1985 on the Regulation of Local Government Terms and Conditions and Law 57/2003 on Local Government Modernization Measures and the Royal Decree 2/2000 establish the legal regimen related to the provision of municipal services.

[6] Public companies are a usual scheme to provide public services in Spain. On the one hand, they provide more flexibility than in-house provision. On the other hand, many sub-central governments have decided to set public companies to provide public services as a strategy to elude the legal constraints on public deficit and debt (Fernandez-Llera and García-Valiñas 2013).

[7] According to González-Gómez et al. (2014) and based on FEMP (2012), 325 associations of municipalities provide wholesale of retail water services in Spain. Private companies are also looking for the optimal provision size, since they design growth strategies to provide the service to a group of municipalities close to each other.

PPPs in Spanish Water Sector: Schemes and Figures

Public-private partnerships are a usual way of collaboration in water services management (World Bank 2006). In terms of PPP schemes, the management of the service may be either fully privatized (contractual PPP) or partially privatized to a mixed company (institutionalized PPP), including both public and private capital (García-Valiñas et al. 2013). It is worth highlighting that Spanish legislation only contemplates privatizing the management of the service, as the infrastructure remains in public hands.

Statistics show that there has been a progressive process of water services privatization in Spain during the last decades. In 2008 private companies supplied 46% of the Spanish population (AEAS[8] 2010). During the last economic crisis, an increasing privatization trend is also observed, since local governments needed extra resources to reduce their level of public debt and achieve the budgetary stability goals (García-Valiñas et al. 2015). Thus, in 2014 private corporations provided urban water services to 56% of the Spanish population (AEAS/AGA 2016). Moreover, Spanish water industry is highly concentrated. *Aqualia* and *Aguas de Barcelona* are the two main private operators[9] (García-Valiñas et al. 2013; González-Gómez et al. 2014; Bel et al. 2015).

Contractual public-private partnerships are one of the most widespread forms of public services privatization in Spain. In 2014, fully private companies provided water services to the 34% of Spanish population (AEAS/AGA 2016). Concessions are the usual way through which the local government entrusts an individual or legal entity with the management. They are awarded following a public tender and for a limited period of time. In the case of water supply companies, contracts that involve building infrastructures and operating the service must be no longer than 50 years, while

[8] The Spanish Association of Water Supply and Sanitation (AEAS) is a private organization carrying out periodic surveys on water services and pricing in Spain. Nowadays, it is the only source from which it is possible to get statistical information on PPPs in Spain, since no official institution is collecting such information. However, these surveys are not census, since they represent approximately 40% of the population and 88% of the municipalities (González-Gómez et al. 2014).

[9] Acciona, Valoriza, Gestagua, Aguas de Valencia, FACSA, Agua & Gestión, PRODAISA, Espina & Delfín, and Hidrogestión are examples of minor companies (at the national level) operating in the Spanish water sector (González-Gómez et al. 2014).

those that only imply running the service have a 25-year constraint.[10] At the end of the contract, local governments must again decide how they wish the service to be managed for the next years.

Institutionalized PPPs are another alternative scheme to allow private sector sharing in urban water services management (González-Gómez et al. 2011; García-Valiñas et al. 2013), whereby the board is shared between the private and public sector. In those companies, local government participation is usually sufficiently significant to guarantee that public objectives will be accomplished successfully. In 2014, those entities served to the 22% of Spanish population (AEAS/AGA 2016). This form of management has significantly gained weight in the last years (AEAS/AGA 2016), since it makes possible to merge public interests (universal access, quality standards) with the industry know-how of private firms. In this sense, the private partner is mainly responsible for the daily water services management, while the public partner makes political decisions.

Whatever the PPP scheme is, when local governments allow private initiative coming into the management of water services, there is a bidding announcement with some requirements to operators in order to attend to the competition. Those specifications include, among others, a minimum entrance and/or annual fees, and/or a certain level of investment during the concession period. Private operators might submit a bid trying to improve those minimum requirements. Once all the bids are registered, local governments make a decision based on several criteria (García-Valiñas et al. 2015).

PPPs in Spanish Water Sector: Outcomes

There is not a wide body of scientific literature comparing public and private management in the Spanish water sector. One of the main reasons is the difficulty to collect data on the industry, since no official institution

[10] Contracts' length is nowadays under discussion. Spanish parliament is currently debating a draft law to implement the transposition of some European Directives related to public contracts (2014/23/UE; 2014/24/UE; 2014/25/UE) into national law. According to the European regulation, contracts could not be longer than five years, and only extensions would be accepted if these are justified by new investments. Further information on the draft bill could be checked at http://transparencia.gob.es.

provides micro-data and/or disaggregated information. That fact makes complex the economic analysis of water sector in the country. The majority of published papers consider partial- and small-sized samples, since capturing information is a difficult task. In any case, there are three key dimensions where empirical studies have focused on: efficiency, prices, and quality. Tables 2.2, 2.3, and 2.4 summarize the main contributions in the three aforementioned items.

Efficiency has been a substantially controversial issue. From a theoretical point of view, it has been traditionally argued that private companies could be more efficient, since they are specialized in the provision of water services, while local public entities have to deal with different kind of services. However, the empirical evidence in Spain does not show clear conclusions on this particular issue. Among others, García-Sanchez (2006), González-Gómez and García-Rubio (2008), and González-Gómez et al. (2013) show that there is no evidence of the superiority of private management with respect to public one. Spain is a highly heterogeneous country, where climatic and regional differences emerge. Some papers have shown that, once controlled for non-controlled inputs and environmental factors, efficiency differences between private and public management tend to disappear (García-Rubio et al. 2010; González-Gómez et al. 2013).

Another interesting conclusion is that private corporations seem to be more efficient in managing specific inputs. Using non-parametric techniques, Picazo-Tadeo et al. (2009a, b) and Suárez-Varela et al. (2017) found that private firms are more efficient when dealing with labour. These findings are basically explained by the higher flexibility of the regulatory and legal context for private firms. As Suárez-Varela et al. (2017, p. 2366) mentioned, "the superiority of the technology used by private units in the management of labour might be due to certain regulatory and institutional restrictions faced by public management units that could reduce their flexibility in adjusting this production factor. In general, public managers are constrained by more stringent labour regulation which makes it more difficult to fire employees, and they also face higher levels of absenteeism (…). In addition, local governments, particularly those ruled by left-wing parties, tend to develop policies to promote employment stability (…). Finally, creating overemployment when public services are delivered in-house might also form part of local politicians' rent-seeking strategy (…)".

Table 2.2 PPPs and water services efficiency in Spain

Reference	Sample	Area and period	Main variables	Methodology	Key results
García-Sanchez (2006)	24 municipalities (over 50,000 inhabitants: 21.24% national population)	National scope, 1999	Inputs: staff; treatment plants; delivery network; total costs Outputs: water supplied; number of connections; quality analyses	*DEA*; non-controllable inputs; second stage (Tobit model)	No significant differences between public and private management were found
Picazo-Tadeo et al. (2009a)	34 municipalities (50% regional population)	Andalusia, 2001	Inputs: delivery network; sewer network; labour; operational costs Outputs: water delivered; collected sewage; treated sewage	*SFA*; second stage to capture the effect of environmental variables	Private utilities outperform public companies in the management of labour
Picazo-Tadeo et al. (2009b)	34 municipalities (50% regional population)	Andalusia, 2001	Inputs: delivery network; sewer network; labour; ground, surface, and purchased water Outputs: water delivered; collected sewage; treated sewage	*DEA*; second stage to capture the effect of environmental variables	Private utilities are superior to public companies in the management of labour

(*continued*)

Table 2.2 (continued)

Reference	Sample	Area and period	Main variables	Methodology	Key results
García-Rubio et al. (2010)	20 water utilities	Andalusia, 1993–2006	Inputs: labour costs; operational costs; hydraulic yield Outputs: water delivery; connections; delivery network; quality	*DEA*	Differences between public and private governance disappear when hydraulic yield (proxy of the degree of renovation network) is included in the analysis
González-Gómez et al. (2013)	80 rural water utilities	Andalusia, 2009	Inputs: delivery network; wastewater treatment capacity; staff costs; operational costs Outputs: population; sewage treated	*DEA*, controlling for environmental factors	No significant differences between public and private management were found when controlling for environmental factors
Suárez-Varela et al. (2017)	70 municipalities (under 50,000 inhabitants)	National scope, 2013	Inputs: labour; operational costs; distribution network Outputs: water delivered; population served	*DEA*; metafrontiers and directional distance functions	Private utilities are superior to public companies in the management of labour

Source: Own elaboration
DEA: Data envelopment analysis, *SFA:* stochastic frontier analysis

Table 2.3 PPPs and residential water prices in Spain

Reference	Sample	Area and period	Main variables	Methodology	Key results
Martínez-Espiñeira et al. 2009	53 municipalities (over 100,000 inhabitants; 33.5% of national population)	National scope, 2006	Dependent variable: monthly water bill for several consumption levels (3, 5, 10, 15, 20, 25, and 50 m^3) Independent variables: weather conditions; water tariff characteristics; water quality and treatment; geographical, housing, and sociodemographic factors; political orientation of local government; private/public management dummies	*OLS*, *RE*, *FILM*	Private management of water services leads to set higher prices
Garcia-Valiñas et al. (2010)	301 municipalities (79% of regional population)	Andalusia, 2005	Dependent: household expense on basic water threshold (% of municipal average income) Independent variables: income; geographical, housing, and sociodemographic factors; water tariff characteristics; provincial and river basin dummies; private/public management dummies	*OLS*	More affordable residential water tariffs under in-house provision regime

(*continued*)

Table 2.3 (continued)

Reference	Sample	Area and period	Main variables	Methodology	Key results
García-Valiñas et al. (2013)	396 municipalities (60% of regional population)	Andalusia, 2009	Dependent variable: average representative bill (15 m^3/month) Independent variables: population; housing stock; water treatment; different management regimes; market concentration index; water corporation dummies	*OLS*, *FILM*	Public companies supplying water services set higher prices than those establish under any PPP scheme
Bel et al. (2015)	715 municipalities (93% of municipalities in the region)	Andalusia, 2009	Dependent variable: average representative bill (15 m^3/month) Independent variables: population; population density; water treatment; different management regimes; water corporation dummies; market concentration indices	*FILM*	Private firms with a larger market share make their dominant position effective by setting higher water prices

Source: Own elaboration

OLS: Ordinary least squares, *RE:* random effects model, *FILM:* Heckman selection models based on full information maximum likelihood

Table 2.4 PPPs and water services quality in Spain

Reference	Sample	Area and period	Main variables	Methodology	Key results
González-Gómez et al. (2012)	133 municipalities (50% of regional population)	Andalusia, 2005	Dependent variable: percentage of water losses Independent variables: population; population growth; water treatment; abstraction and network characteristics; local financial burden; local government ideology; water price levels; different management regimes	*WLS*	Water services outsourcing is linked to higher water losses. Private suppliers seem to lack incentives to devote resources to the reduction of water losses
García-Rubio et al. (2016)	1,023 individuals, covering information is on 64 Spanish cities (population over 100,000 inhabitants)	National scope, 2011	Dependent variable: respondent's satisfaction with tap water quality on a scale 1 to 4 Independent variables: gender, age, education, income; ideology; water price; public services satisfaction; water chemical characteristics; geographical and climatic characteristics; private/public management dummies	*OLM*	User's tap water quality perceptions are worse when a private company is managing water services

Source: Own elaboration
WLS: Weighted least squares, *OLM:* ordered logit model

Regarding water prices, previous literature has not found clear conclusions for the Spanish case. All the studies have focused on residential water tariffs, since it is a controversial sector where different policy aims merge (OECD 2003). On the one hand, some previous studies have detected higher price levels under private provision (Martínez-Espiñeira et al. 2009). Similarly, Bel et al. (2015) found that private firms with a larger market share set higher water prices. On the other hand, some studies conclude that public management does not necessarily lead to lower prices. Based on a sample of southern Spanish municipalities, García-Valiñas et al. (2013) found that public companies supplying water services set higher prices than those established under any PPP scheme. However, when looking at the price paid for low water consumption levels, conclusions could change. In this respect, Garcia-Valiñas et al. (2010) showed that in-house provision leads to set more affordable water prices in Andalusia. They argued that the proportion of income spent in a minimum water threshold is lower when the service is not outsourced.

Finally, only a few studies have focused on the quality dimension of water services. A priori, it is expected that private firms looking for profits could reduce water services quality standards, in order to keep/increase their markup. Network losses emerge as a significant dimension of water services quality. Some authors have mentioned that private companies have no incentive to repair water losses, since raw water abstraction costs are lower (Garcia and Thomas 2003). González-Gómez et al. (2012) found more significant water leakage levels under any PPP scheme. Moreover, tap water quality is another significant dimension. García-Rubio et al. (2016) analysed users' perceptions on tap water quality, finding that users' perceptions are poorer when there is a private company supplying water.

5 Conclusions

Throughout these pages, a broad picture of water sector governance in Spain has been provided. An extremely heterogeneous country, Spain is dealing with serious water stress and quality problems. In this context, the design of a good institutional and regulatory framework could contribute to get an equitable and efficient use of water bodies. Then, governance emerges as a key issue to improve water resources allocation.

We have also explained how this country is characterized by a federal structure of regional and local governments that participate in the design and development of water policies. As a consequence, water sector management is felt in general to be complex, in terms of the agents and organizations involved. The strong variety of economic and regulatory tools make difficult the coordination and cooperation among different institutions. Moreover, the exceptionally atomized map of sub-central governments planning water policies is not always aligned with the European Union requirements. On top of that, the weight of PPP schemes in the management of water resources in Spain has increased in the last decades. However, checking the empirical literature on efficiency, prices, and quality, no intensively positive outcomes have been detected in the last years.

Some authors have claimed the urgent need to coordinate water policies in Spain, through the establishment of a regulatory agency with jurisdiction throughout the national territory (González-Gómez et al. 2014). However, this option is a very sensitive topic in a highly decentralized nation, where sub-central governments are trying to conquer new policy areas to develop their autonomy, instead of looking for joint or central actions.

Moreover, as De Stefano et al. (2013, p. 224) pointed out, "the most compelling challenge is possibly ensuring the reliability and the consistency of the information made available by public administrations". Despite the efforts made in the last years, more public institutional support and transparency is needed when it comes to collect and publish information related to the Spanish water sector.

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