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Public Versus Private Management in Water Public
Services: Taking Stock, Looking Ahead

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European University Institute

Badia Fiesolana

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Florence School of Regulation
Robert Schuman Centre for Advanced Studies
European University Institute
Casale, Via Boccaccio, 121
I-50133 Florence, Italy
Tel: +39 055 4685 878
E-mail: FSR.Secretariat@eui.eu
Web: <http://fsr.eui.eu/>

Abstract

Governments have largely turned to public-private partnerships (PPPs) to manage public services. Although it is difficult to analyze PPPs as discrete and alternative forms of public service organization, they all constitute some forms of partial outsourcing of activities that contribute to the realization of a public service. In water industries, the most common form of PPPs is the concession, in which a private firm finances and operates the public service of water while the infrastructure remains public. This report seeks to answer the question of whether PPPs have contributed successfully to the quality and improvement of water public services all around the world. The paper is organized in three sections. In the first section, the different supposed advantages and costs of PPPs are presented. The second section reviews some of the most important studies on the efficiency of PPPs in water industries. The last section provides some recommendations to improve the use of PPPs in water public services.

Keywords

Water, public-private partnerships, private participation, privatization

Why do governments use PPPs?

Advantages of PPPs

There are many reasons to believe that the participation of the private sector can improve the quality of public services, especially in water industries. On the one hand, **the private sector can decrease costs via scale economies, scope economies or economies of experience**. Scale economies are linked to the nature of the service which implies substantial fixed costs. Private operators might operate at a very large scale to benefit from economies of scale. Moreover, private operators are usually able to manage relatively similar services, such as production, distribution and treatment, which can lead to scope economies. Finally, the use of private operator can lead to economies of experience. Well-established firms have experience in dealing with recurrent issues and are thus expected to have lower operating costs. PPPs are thus considered to guarantee a certain level of cost control that is more difficult to reach with in-house provisions.

On the other hand, **governments may contract with private operators to increase competition and incentives to improve management, share risk or use contracting to decrease political inference in the management of public services**. With in-house provisions, governments cannot enjoy the benefits of competition. When outsourcing is the chosen solution, several operators are likely to compete in a call for tenders for a given contract. PPPs thus increase competition for the management of public services and can lead to improved efficiency. A drawback of PPPs is that control of production activities is more difficult than under in-house provision. However, PPPs might be selected because the costs of managing public organizations are higher than the costs of monitoring a contract with a private firm. Under PPPs, governments need to find proper incentives – such as bonuses and penalties – to allow the private firm to be efficient. An advantage of PPPs is that governments can transfer risks to the private firm, such as demand-related risks or production risk. Finally, outsourcing might be a way to reduce political interference, e.g. via the power of public employees or unions, or the impact of ideology on the management of public services.

Economic theories and empirical evidence are thus **in favor of global contracts** – i.e. a contract allowing different stages of service provision. Indeed, global contracts allow strong scale and scope economies and reduce political interference. In global contracts, overall costs are more transparent.

Limitations of PPPs

The literature recognized many costs associated with PPPs which are linked to **incomplete contracting and opportunistic behaviors, contestability and contract rigidity and the institutional environment**.

In PPPs, **long-term contracting secures investors** who invest in specific assets, i.e. investments whose value would be totally or partially lost in case of a contract breach. Long-term contracting might create some ‘lock-in’ situations in which parties can behave opportunistically, e.g. by failing to fulfill their obligations. This opportunistic behavior is reinforced by the fact that long-term contracts do not envision all the possible events, they are considered to be ‘incomplete’. **One of the potential limitations of PPPs is in their nature: long-term contracting involves uncertainty and potentially opportunism**.

PPPs are also characterized by **third-party opportunism**. Third parties, such as interest groups, might contest the raison d’être of the PPP in order to pursue their own interest instead of the general interest (in general, contestability by a third party is praiseworthy to avoid favoritism for example). The consequence is that **PPPs are usually more rigid than private law contracts** to protect the contract against third-party opportunism. Rigid contracts are less flexible, more difficult to change and lead to

higher costs of negotiations. The contestability of PPPs thus increases the rigidity of contracts, which can be costly for both parties.

Overall, contracting costs are lower when institutions are efficient. The incidence of corruption and the absence, or the weakness, of a regulatory authority increase the costs of PPPs.

PPPs in water services

PPPs and prices

The paper reviews 10 different studies in 4 countries (Brazil, Germany, France and Spain) on the impact of PPPs on prices. Most studies show that private management has either a neutral impact or increase price. The most advanced study, in terms of period and population covered, is Chong et al. (2015) who study the case of France. Their results show that there is no significant price difference between public and private management in large municipalities (with more than 10,000 inhabitants). In small municipalities (with less than 10,000 inhabitants), private management is associated with a 8% price increase *ceteris paribus*. Overall, the impact of PPPs on price seems to be neutral, all things being equal, at the exception of service quality that is not controlled for in their study.

PPPs and technical efficiency

The paper reviews 10 different studies in 7 regions (Africa, Asia, England and Wales, France, Germany, Spain and the USA). Technical efficiency is defined as cost efficiency or increase in total factor productivity. Most studies show no impact of public or private management on efficiency. The most significant study is the one of Saal and Parker (2000) on England and Wales for 1985-1999. The authors show that full privatization of the infrastructure in England and Wales did not lead to cost reductions or increase in productivity. Regulation, more than the use of private or public management, seems to be the important factor explaining changes in efficiency.

PPPs and service quality

While there are many studies on the comparison of public and private management regarding price or some measure of efficiency, few studies link ownership with quality. There are many ways to measure quality but the most common is to use an indicator capturing the quality of water while, for example, consumer satisfaction or customer services quality remain largely unstudied. The paper reviews 5 studies in two different countries, France and the United States. Quality is usually measured as the number of violations of water quality or the percentage of successful compliance tests. Most studies show a significant positive impact of private management on water quality.

PPPs and coverage

Another important issue in the debate about PPPs is how private sector participation relates to coverage and access for the poor. The paper reviews 4 articles covering 4 different countries (Argentina, Bolivia, Brazil and Malaysia). Overall, studies show that coverage is improved with private sector participation. Access for the poor is difficult to measure: in most cases, PPPs are related to increased coverage but also higher tariffs which can prevent the access for the poor. Overall, studies conclude that poor consumers' welfare increased with PPPs as price changes are limited and coverage largely increased. In Argentina, access to water after privatization has significantly decreased child mortality (Galiani et al., 2005). It seems that private sector participation improves coverage and does not decrease the access for the poor. The sub-section also presents the implementation of social tariffs in the city of Dunkerque in

France. The use of social tariffs in increasing-block tariffs schemes might be a way of promoting the access for the poor while securing revenues for private firms.

Recommendations to Improve PPPs in water services

Theory suggests that contractual choices are central to explain differences in performance, but very often, local authorities do not spend sufficient time on contractual details and have no specific skills on these issues. The cases where the public authorities do not invest in the relationship, do not invest in the award procedure, do not follow carefully the water service performance, and do not increase their skills (that are different from the skills that are needed to manage water services through direct public management) are also the cases for which PPPs will be inefficient and probably also the cases for which public management would provide bad results. **Local authorities should try hard to stay in control. Private companies should also try hard to include them in the process.**

The paper also stresses that PPPs are public contracts. Accordingly, **it is useless to try to replicate contractual practices that have shown their efficiency for private contracts** (Spiller 2008). Public contracts are inherently more rigid (Beuve, Moszoro and Saussier, 2015) and rely on more formal procedures without any possibility of using relational contracting (i.e., informal procedures based on trust relationships). The rigidity of public contracts must be taken as a given parameter.

Economic theory and the empirical studies show that PPPs in the water sector can deliver social value. These studies also identify the necessary conditions under which social value can be delivered.

- **Competition at the *ex-ante*** stage is a necessary condition for PPPs to deliver value.
- **Risk repartition** should be crafted carefully in the initial contract. The share of benefits and losses might even be implemented.
- Contractual choices are central not only to commit contracting parties but also to establish the rules of the game for contract adaptation. **Renegotiation procedures should not be avoided but controlled and made transparent to stakeholders.**
- **Transparency** is key because PPPs are public contracts that are under the scrutiny of third parties who are not necessarily interested in their success. It helps to reinforce **the accountability of the contracting parties that is needed for public services in general**, for water services more specifically, because this is a sensitive public service for citizens.
- **The involvement of public authorities is crucial.** PPPs are not a way for public authorities to contract out their obligations to manage public services. This often is forgotten by public authorities and is easily accepted by private operators. This is not a sustainable strategy for both contracting parties.

Overall this paper points out that recognizing that both PPPs and public management have their own failures would help to calm some of the controversial rhetoric that we can observe around the issues that relate to the management of water services. The privatization of water services will not solve all the problems that are associated with public management, but the opposite is also true. Both have their place in water management.

The question of public service organization is among the themes that are regularly debated and is even, in some cases, the object of demonstrations and protests by users and citizens. Private sector participation that usually takes the form of private management through public-private partnerships (PPPs) is often criticized for sacrificing the quality of an essential good or service in the pursuit of profit. Are such concerns justified? One only needs to consider the heated debates that surround water management in Europe to realize that the answer to this question constitutes a major public policy issue that is at the center of citizen concerns.

As noted by (Leigland, 2018), we start to observe a shift from the “ideological polemics that mix opinion with selected but often misinterpreted facts” to a different type of more measured “evidence-based critique of PPPs” (page 103). Indeed, there are many theoretical and empirical works, some of them on water governance issues, that have been developed in the last two decades. We believe that it is now time to consider these studies to demystify the promises and drawbacks of private sector participation and to look for improvements. By examining the academic literature, the goal of this paper is to propose a state-of-the-art compendium on the efficiency of private sector participation, with a special emphasis on water services.

Do private management and public services fit together?

Many countries face the double challenge of growing demand and aging physical assets in large parts of their infrastructure sectors. The needs for infrastructure investment worldwide in the coming decades are significant and, in many countries, far beyond the government’s capacity. Global infrastructure investment needs are estimated to be approximately USD \$50 trillion for roads, water, electricity, telecommunications and rail in OECD countries between 2005 and 2030 (OECD, 2012). Global financing needs for water infrastructure range from USD \$6.7 trillion by 2030 to USD \$22.6 trillion by 2050 (OECD, 2015).

As a consequence, there is an important role for private sector participation in funding the development of these essential services. Public financial constraints have been translated by a changing role of the government itself. Moving from its own production to delegation and externalization, the public sector has shifted its focus from addressing internal bureaucracy to managing relations with external partners, and the public sector currently favors private participation through PPPs to seek more efficient uses of increasingly limited resources.

However, at the same time, we can observe many failed PPPs (Estache, 2006). These failures attest to the difficult challenges that face policy makers. Infrastructure investment involves contracts that are complex and that operate under the double imperative of ensuring financial sustainability and meeting user needs and social objectives, and this type of investment is often also very exposed to public opinion and political scrutiny (Spiller, 2008).

To understand better this back-and-forth motion and why this love/hate relationship is often encountered in regard to public-private relationships — the history of partnerships between the public and private sectors to provide public services goes as far back as the history of the public sector itself — let us start by defining what PPPs are and their expected advantages and drawbacks.

***What are PPPs?*¹**

There is no single well-defined “type” of PPP but rather various types that differ depending on whether the contract is global (i.e., is bundling investment needs and the public service provision) or simple, whether payment is made upon delivery or deferred, and whether the operator is remunerated mostly based on the service operating results or, on the contrary, on its ability to meet the performance

¹ This part of the paper relies considerably on Saussier and de Brux (2018).

objectives that are described in the contract. The “landscape” of PPPs is thus a complex one that comprises various subcategories that range from traditional public procurement contracts, user-pay PPPs (concessions), and public-budget pay PPPs (availability contracts, which are most of the private finance initiatives or PFIs). Worse still, there are many possible variants within each group of PPPs. For instance, some concession contracts provide for risk-sharing mechanisms that can take the form of profit sharing above some threshold or revenue compensation in the case of underperformance (see, for example, Athias and Saussier (2018) for a description of payment schemes’ variety in road concession contracts). This type of risk-sharing mechanism, for example, is in place in the French city of Dijon’s water management contract. This mechanism enables risk mitigation, while still benefiting from private sector efficiency but at a lower cost. As noted in Saussier and de Brux (2018), such evolutions of user-pay PPP contracts indicate the parties’ acknowledgment that a significant counter-performance most often is due to exogenous factors for which the operator cannot reasonably be held responsible alone. This evolution brings user-pay PPP contracts (concession contracts) closer to availability-based contracts (public-budget pay PPPs), which creates a **continuum** of public-private contracts.

Although it is difficult to analyze PPPs as discrete and alternative forms of public service organization, they all constitute a somewhat **partial outsourcing** of activities that contribute to the realization of a public service. However, it is essential to emphasize that economic theory sees PPPs as having advantages and drawbacks that are associated not only with the outsourcing issue but also with the public-private nature of the relationship that makes these contracts so particular and much more difficult to manage than private-private relationships.

Box 1. PPPs in water services

The most common PPP type in the water sector is the concession contract in which the operator manages the service, invests in the network and obtains financial compensation through consumer receipts. In such contractual agreements, public authorities transfer some risks (especially part of the demand risk) that are supported by private companies in exchange for greater decision rights and claims on revenues. If infrastructures pre-exist, investments are essentially maintenance costs (a “light investment concession”). If infrastructures do not pre-exist, concession contracts are usually very long-term agreements that increase their complexity.

Other contractual agreements are possible such as a management contract in which the operator is paid a fixed fee in exchange for the obligation to perform ancillary services such as the operation and maintenance of water and sewage facilities, the provision of technical assistance, and the collection of charges on behalf of the public authorities. In these types of contracts, a small part of the operator’s revenues may depend on performance. In management contracts, operators do not assume the risks of the cost of operation and maintenance or of financing improvements. The risk of the operator is to be able to achieve and maintain the service standards.

The following table was adapted from Prasad (2006), summarizes the different forms of private sector participation in water supply and provides examples.

Form	Ownership	Financing	Operations	Examples
“light” concession	Public	Public	Private	Côte d’Ivoire, France
Concession	Public	Private	Private	Used in Buenos Aires-Argentina, Jakarta.
Service contract	Public	Public	Public then private	Mexico City, Santiago-Chile, Madras
Management contract	Public	Public	Private	Cartagena-Colombia, Johannesburg, Mali
Build-operate-transfer	Private then public	Private	Private	Izmit-Turkey, Mendoza-Argentina
Sale of full divestiture	Private	Private	Private	England and Wales

The promise of PPPs

A search for expertise — The first reason that is identified by the economic literature to justify outsourcing is a lack of in-house expertise. For the same reason that private companies might outsource part of their activities, public authorities see outsourcing as an alternative to the integration of a partner or the development of skills, two processes that can take a long time and generate costly irreversibility. Outsourcing is an opportunity for public authorities to focus on their “core business”, namely, the supervision of public services rather than their provision. The provision of public services can be realized at a lower cost by private operators, which are experts that benefit from economies of scale, experience, and scope. This deficit in the expertise of the public party compared with that of private operators depends on the size of the public body, as well as the complexity of the services in question.

Economies of scale — The reason that is most often advanced to justify outsourcing is the search for economies of scale. Since the average cost that is incurred to supply a product or service depends on the

quantity to be produced, it generally is of interest to outsource an activity to a “specialist” that has several customers and that can thus make economies of scale (i.e., a reduction in the average costs) from which the specialist’s customers can benefit because of the competitive price that the specialist can apply. Such economies generally can be explained by the necessity, in order to supply the goods or services, to invest and bear substantial fixed costs (i.e., average costs are defined as the total costs (fixed and variable costs) divided by the produced quantities; if fixed costs are large, the quantities are higher and the average cost is lower).

If we apply this reasoning to public service management, one can easily understand that the in-house provision of public services (i.e., direct public management — which is the alternative to externalization, whatever its form) does not enable the same economies of scale as PPPs. Operators that are present in several markets can realize economies of scale, which is not the case for public authorities, as they only operate in a single market, unless the optimal output level — beyond which the average costs increase — is low or the public body is sufficiently large to be able to realize economies of scale itself. Therefore, these advantages of contracting out are stronger when the value of the investments to be established is substantial (especially in the case of the construction/renovation of infrastructure). The existence of such economies of scale can also explain municipalities’ wish to pool their purchase policies and the management of their public services within organizations for intercommunal cooperation. Finally, because private operators usually operate at a very large scale to benefit from economies of scale, the sectors that relate to the provision of public services often suffer from high degrees of concentration. The existence of a competitive price is thus not assured.

Several studies have attempted to estimate the optimal size of a water service depending on scale economies. For example, Mizutani and Urakami (2001) found that in Japan, a water supply organization of optimal size would supply a population of approximately 766,000 people, whereas Marques and De Witte (2011) estimated that the optimal scale of the water utilities in Portugal is located between 160,000 and 180,000 inhabitants. In both cases, this size is far greater than the size of many French and Spanish water services where PPPs are used widely.

Economies of experience — Some activities allow companies to benefit from economies that result from the accumulated experience of their employees and the organizational routines that they have established by coping with and overcoming the problems that they have often encountered throughout their history. This experience effect allows significant improvements to be introduced in the processes on which outsourcing is based, and moreover, it generally leads to a reduction in operating costs.

Economies of scope — Although it can be appealing to outsource a service or the production of goods to a specialized firm that operates simultaneously in several markets and benefits from economies of scale, it can also be efficient to conclude a contract with an operator that supplies multiple different goods or services and therefore benefit from economies of scope. Indeed, some activities can generate synergies when they require similar, complementary expertise and thus enable the operator that masters them to reduce its costs. More simply, economies of scope may arise from the fact that two different activities use the same imperfectly divisible resources (such as production equipment) and can therefore share the research and development activity or alternatively, share a brand. In such cases, they are very similar to economies of scale.

For example, economies of scope may be realized when a local authority decides, for instance, to outsource the production, distribution and treatment of water to a single operator that can establish a common central office to handle customer complaints for all of its activities.

The literature on the economies of scope in the water sector is relatively scarce and inconclusive. Most often, these studies conclude that there are no or very few scope economies in the water sector, even if there might be an advantage in terms of negotiation power to outsource to one operator several services (e.g., water distribution and water sewage (Marques and De Witte, 2011); see also Desrieux et al. (2013) on this topic).

The search for incentives — In addition to the technical reasons that were previously mentioned to provide an understanding of the advantages of outsourcing, other reasons that relate more to management issues are also alluded to in the economic literature. These scholars justify the use of outsourcing because it is a situation (1) where competition can fully play its part, (2) where management incentive practices are easier to establish, and (3) where risks are more likely to be shared between the public authority and the operator.

Outsourcing and competition — When a public authority decides to outsource a public service, it must choose a partner among a certain number of potential suppliers. For example, if a public authority decides to open a project to competition by organizing a call for tenders, then outsourcing is considered to guarantee a certain level of cost control that is more difficult to reach with in-house provisions, because internal services are generally not put in competition with potential external contractors. When performed properly, the opening to competition that is realized as part of the outsourcing process thus forces potential partners to disclose information regarding their costs by offering a price.

This is an important point, especially because it is raised systematically in the debate on PPP efficiency. With in-house provisions, it is not possible to enjoy the benefits of competition since such direct management does not compel the public body to organize competitive calls for tenders or to conduct a preliminary assessment to justify this organizational choice. In contrast, when outsourcing is the chosen solution, several operators are likely to compete in a call for tenders for a given contract. Therefore, adopting a direct management method deprives public authorities of the competitive pressures that are at play in the markets.

Incentives and management — Internal organization facilitates the control of production activities, whereas outsourcing — although it makes such control more difficult — presents the advantage of increasing the level of incentives for the operator that is in charge of supplying the goods or services. Because relationships within an organization are based on an employment contract, which establishes a relation of subordination that leaves little room for incentives (even if incentive wages can be established), these relationships do not encourage partners to be efficient to the same extent as market relations. Indeed, in the case of outsourcing, the relationship is based on a contract that can include strong incentives by describing the expected service (that is, a higher degree of precision as to the service to be provided) and by introducing a range of incentive clauses (bonuses and penalties) that allow the operator to keep all the additional revenue that it can generate by being efficient.

Risk sharing — Finally, outsourcing can also present advantages regarding risk sharing. Outsourcing the production or the management of a service makes it possible to transfer some risks from the public party to the private party. Depending on the public procurement tool, this transfer can be focused on production risks, demand-related risks, and risks that are associated with operating costs (see Table 1). From this perspective, the advantage of outsourcing lies in the greater ability of operators to diversify their risks (because of their level and the potential diversity of their activities) and their expertise in managing different types of risks. Consequently, operators bear lower costs than a public entity when coping with risks.

Table 1. Main risk allocation in the various procurement tools

	Public procurement contracts	User pay PPPS (concessions)	Public budget pay PPPs (PFI, availability contracts)
Deferred payment	No	Yes (generally by the user)	Yes (by public authorities)
Transfer of production risk (associated with the service or infrastructure)	Yes	Yes	Yes
Transfer of demand-related risk	No	Yes	No (or very little)
Transfer of risk associated with operating costs	Yes (in service contracts)	Yes	Yes partially
Global contract	Usually No	Yes	Yes
Project management	Public	Private	Private
Duration of contract	Short-medium term	Medium-long term	Long term

Source: Saussier and Tirole (2015)

Advantages of outsourcing the provision of services to a private partner — Aside from economic advantages, which are common to every transaction, the economic literature also identifies a range of additional reasons that justify the use of outsourcing and that are only relevant when studying the management of public services. These reasons mostly concern the difficulty of controlling and managing public organizations, as well as the risk of political interference that characterizes this difficulty. Outsourcing is then viewed as a way to reduce or eliminate the disadvantages that are specific to the in-house provision of public services.

Difficulties in controlling and managing public organizations — Organization theory has long since identified a limit that is specific to large companies and collectives: the delegation of decision-making power. Although delegating becomes indispensable when an organization increases in size and diversifies its activities, it raises the issues of incentives or the control of the decision maker. This is a key point of agency theory (Jensen and Meckling, 1976; Laffont and Tirole, 1993), and this point has always received special attention in economics. When discussing company managers to whom owning shareholders delegate their decision-making power, Adam Smith already observed that “the directors of such companies, however, being the managers rather of other people’s money than of their own, it cannot well be expected that they should watch over it with the same anxious vigilance with which the partners in a private copartnery frequently watch over their own” (Smith, 1776).

Although this problem is not exclusive to public organizations, it is accentuated in their case by the differences between a public and a private organization; a public organization is more difficult to control when decisions are delegated (especially from citizens to managers). According to (Laffont, 2000), these particularities concern the fact that public entities generally are subjected to several controls that involve various “controllers” with objectives that are potentially in conflict or even erratic with little credibility. Consequently, incentives are limited, and it is impossible for public organizations — if it is even desirable — to replicate the incentive rules of the private sector, which is characterized by more efficient corporate governance mechanisms and a single and inviolable objective: profit maximization. Outsourcing is then a way to rationalize the production of a public good or the provision of a public service by restricting the intended objectives to only economic performance while implementing more efficient control mechanisms.

Outsourcing as a way to reduce political interference — In addition to their low incentives, public organizations are more subject to political interference, which potentially diverts them even further from the pursuit of the economic objectives of performance. This point, which is often advanced in the economic literature (see, for example, Boycko, Shleifer and Vishny, 1996), was emphasized by the French Competition Authority (“Conseil de la Concurrence”) in its 2003 thematic study on “State monopolies in the competition game” (Les monopoles publics dans le jeu concurrentiel). This study indicated that because of political interference, public companies may face a multiplicity of sometimes contradictory objectives, which may be detrimental to their efficiency. For instance, supervisory authorities may have a “preference for high levels of production for various reasons, which may have to do in particular with social considerations (sustaining employment),” which may “translate into less attention being paid to losses and the profit criterion, as well as an increased valuation of the scale and range of activities (of the companies that they manage)” (thematic study, annual report of the Conseil de la concurrence, 2003, pages 85–86). Without attempting to be exhaustive, some empirical studies identify these possible “dysfunctions” and show that the choice to delegate also rests on noneconomic criteria. The political interests that are associated with the influence of pressure groups are one of these determinants. Their rents may be affected by the organizational form that is selected by the authorities. Thus, it is generally accepted that public employees and unions favor public supply, while industrial users prefer private supply (Miralles, 2008). However, a high degree of precariousness (i.e., a low income per capita or a high unemployment rate in the community) may encourage local authorities to retain direct control over a local public service to maintain a high level of employment in the public sector. Ideology may also influence the choice of an organizational scheme. For instance, a recent empirical study on water services in Spain has shown that public decision makers’ political affiliation has a significant impact on their outsourcing decisions, thereby illustrating the fact that it is possible for noneconomic considerations to emerge in decisions concerning public service management (Picazo-Tadeo *et al.*, 2012). Finally, the choice to delegate may also be influenced by tax restrictions that deprive local authorities of funding sources for local public services. Such difficulties can be associated with, for example, a tax burden that is deemed to be too high by taxpayers or with regulatory constraints regarding local taxation. Generally, tax restrictions increase the budgetary constraints of local authorities and thus suppress their ability to fund their local public services alone (see, for instance, Bel and Fageda’s (2007) survey of empirical studies on the reasons that motivate the externalization of public services).

PPPs: global contract versus simple contract — We have highlighted that the issue of optimal public service management can be addressed through the question of outsourcing by showing that direct management (in-house provision) entails sacrificing the potential economies of scale, scope and experience and comes at the cost of low incentives. These qualities make the efficiency of this governance structure uncertain. However, once the decision has been made to outsource all or part of the stages in the production and supply of a public service, the comparative advantages of the different types of PPPs still need to be discussed, instead of only comparing them with the public solution (direct management), which we have done until now. Here, we do not address the question of the total privatization of public services. In the economic literature, “privatization” often refers to externalization.

The power of incentives in global contracts — It is useful to draw a distinction between global contracts and simple contracts when comparing the different types of PPPs. The economic literature often defines PPPs as long-term contracts whereby a private operator finances, builds, and operates a public service, an infrastructure, or a public facility through a global contract (i.e., a contract that involves several stages of service provision, such as the design and construction of an infrastructure and its management). This global nature is often advanced as a major advantage of this type of PPP to justify its efficiency compared with traditional public procurement contracts. By offering a comprehensive “package deal” to a single operator, the public authority encourages this single operator to internalize cost reductions at the level of

service operation, which can be realized by an appropriate investment in the design of the support infrastructure (Bennett and Iossa, 2006; Hart, 2003; Martimort and Pouyet, 2008). When a private company is endowed with a global contract, it has strong incentives to properly invest at the construction stage to decrease future maintenance costs. A global contract has important consequences not only for private operators' incentives but also, ultimately, for the nature of the provided service itself. Indeed, this type of contract leads an operator to consider the complementarities and synergies between the different stages of the project. Such a consideration may influence the investments that are established and the operator's incentives to ensure that the different stages combine efficiently to reduce the infrastructure lead time (i.e., the "interface risk" that is associated with coordinating all stages of a project, namely, design, construction, and operation). Comparing the cost of global contracts with traditional public procurement requires being clear on the scope of what is compared. The cost of a global contract can only be compared with the discounted costs of the sum of the various contracts that are concluded through traditional procedures.

Deadlines are more likely to be met in the case of PPPs than under traditional public procurement when the project relates to the creation of new infrastructure ((NAO, 2009); Saussier and Truong Tran, 2012). This can be explained by the introduction of strong incentives for operators (i.e., the fact that payment generally does not start until the service operation phase is reached, penalties for delay, etc.). This meeting of deadlines can also be explained by a deeper involvement of the private partner and by the fact that the private partner acts alone. Finally, if the type of contract and the call for tenders allow it, pooling all activities that are necessary to the execution of a project under a single contract encourages an operator to innovate to generate more revenue.

Thus, the conclusion of a global contract modifies the nature and intensity of a private operator's incentives. This modification causes changes in investment amounts, the revenue or welfare that is generated by the service, and the infrastructure lead time (the incentive to deliver the infrastructure or facility on time).

Political interference in global contracts — Obviously, global contracts can allow a maximization of the abovementioned beneficial effects that are associated with the economies of scale and scope, provided that the single operator is the most efficient at the various stages of the project that are included in the single contract. Moreover, several studies have also analyzed the ability of such contracts to reduce political interference.

As soon as one discards the hypothesis of a voluntary and benevolent public authority that only seeks to maximize citizens' social welfare, the efficiency of a global contract can be challenged. Maskin and Tirole (2008) consider the case of a public authority that does not seek to maximize the social surplus but whose actions are driven by ideological considerations or even by political or social relationships and therefore prioritizes projects according to its own ideology or favors interest groups that are likely to be useful in the future. The authors then demonstrate that global contracts reduce such a risk compared with the use of separate public contracts, because the total cost of the project is estimated ahead and cannot be hidden. This increased transparency in public expenditure thus strengthens the accountability of public decision makers. However, according to Maskin and Tirole (2008), resorting to a global contract opens the way for another risk, namely, the transfer of project costs in time (few payments at the beginning of the project and many payments later on) by common consent among the parties. Thus, a long-term contract, which transfers decision-making rights to the operator or allows numerous opportunities for future renegotiations, can allow the transfer of the operator's rent in the long term, which makes PPPs more attractive in the short term.

The economic analysis therefore emphasizes that outsourcing provides many advantages regarding productive efficiency and production cost reductions for the provision of a public service. This analysis also suggests that establishing global contracts could heighten these advantages by increasing operators' incentives to minimize costs on the overall project. However, this analysis is only a partial insight.

Indeed, the advantages that are mentioned above generally can be obtained only by signing a contract, often a long-term contract, which allows private operators to obtain a return on investment or achieve performance targets. This is an important point, because the signature on a contract leads to various implementation and performance difficulties for PPPs, such as transaction costs, renegotiations, adverse effects on quality, etc. The theoretical advantages that are associated with public-private contractual arrangements must therefore be weighed against the costs that they entail, which will now be outlined.

The costs associated with PPPs

PPPs generally lead to long-term contracting. The contract forms the basis for the “partnership” between the public and private parties. The contracting process would be quite straightforward if it were possible to draw up complete contracts by considering all future contingencies and specifying an efficient means to address them in a way that is understandable to both the contracting party and third parties (e.g., law courts that are in charge of enforcing them). Unfortunately, in the case of long-term contracts, when the context is uncertain or complex and the economic operators are characterized by different levels of information or expertise, contracting becomes much more challenging. Several theoretical approaches focus on the contracting problems that are encountered in such agreements and the ways to minimize them. These approaches emphasize the importance of information asymmetries and risk sharing, the issue of contractual incompleteness, and the influence of the political dimension of PPP contracts. In the end, the relative efficiency of PPPs compared with the direct in-house provision of public services depends on the parties’ ability to limit the risks that are associated with PPP contracting.

Incomplete contracting and opportunistic behaviors — There is a need for long-term contracting to secure investors when private parties must invest in specific investments (i.e., investments whose value would be totally or partially lost in case of a contract breach) to provide public services. This lock-in situation is the cause of several difficulties, and the most obvious of these difficulties is that the parties may behave in an opportunistic manner (Klein et al. 1978; Williamson, 1985), in particular by making cost effort reductions that might degrade quality (which is often not perfectly contractible), by trying to renegotiate the initial contractual terms, or by failing to completely fulfill their obligations. Such behaviors are helped by the fact that long-term contracts are incomplete; every transaction is characterized by a certain degree of uncertainty, that is, by future hazards that cannot be anticipated contractually by the parties. This uncertainty may arise from the economic context (i.e., demand shocks, the introduction of product or process innovations, etc.), the regulatory environment (i.e., a modification of the existing rules or the introduction of new rules), and the complexity of the transaction itself. Although a long-term contract is an option that can be considered without too many difficulties in a stable environment, the circumstances are different in an environment that is characterized by high uncertainty. Consequently, contract design has critical importance in the case of outsourcing.

Table 2. Renegotiations in PPPs

Geographical area	Industry	% Renegotiated contracts	Average time of the first renegotiation	References
Latin America and the Caribbean	All industries	68	1.8 years	Guasch (2004)
	Electricity	41	2.1 years	
	Transportation	78	2.9 years	
	Water	92	1.3 years	
United States	Transportation	40	–	Engel, Fisher, and Galetovic (2011)
France	Urban parking	74	3.8 years	Beuve et al. (2013)
France	Motorways	50	–	Athias and Saussier (2010)
United Kingdom	All industries	55	–	NAO (2001)

Source: Estache and Saussier (2014)

Many complex public goods or services are regularly contracted out by public entities under complex contractual arrangements that favor the continuity of the relationship and the management of potential conflicts (through safeguard clauses, periodic review clauses, etc.). The main challenge here is to generate trust by reaching two contradictory objectives: securing the relationship by getting a steadfast commitment from the parties while retaining a certain level of flexibility that is necessary to allow contractual adaptations to the economic, financial, and statutory environment during the implementation phase.

The contractual clauses that define the remuneration of an operator can be understood through this lens. The following two contractual arrangements (as well as intermediate schemes regarding cost sharing) can be used (Laffont and Tirole, 1993).

- Under the first contractual arrangement, the company receives a full repayment of its costs and additionally receives a predefined payment (cost-plus contract). This arrangement limits the private partner's potential profits and permits easy adaptations. It also relieves the private partner of responsibility.
- The second arrangement involves a fixed price contract (i.e., the price is not indexed on effective production costs). Under this arrangement, the private partner is granted a fixed amount, regardless of the effective costs and level of demand. This requires the private partner to make more efforts to contain costs but offers the possibility of obtaining substantial profits when costs happen to be especially low (or when demand is particularly high), irrespective of any effort by the private partner.

Cost-plus contracts have little incentive power and can generate cost overruns, because the operator is not encouraged to be efficient in its management or in suggesting potential innovative solutions. In contrast, fixed price contracts provide strong incentives and hold the service provider accountable. However, fixed price contracts require surrendering an informational rent to the operator, which can give rise to cost overruns for a contracting authority that pays a higher price than the effective service production cost.

Contestability and contract rigidity — The contracting costs that are associated with outsourcing can also be larger in the case of public contracts because of the political interference that we previously mentioned. The specificities of PPPs make them intrinsically different from private-private contracts (that is, contracts that are conducted between two private partners). Some recent theories (Moszoro and Spiller, 2012; Moszoro, Spiller, and Stolorz, 2016; Spiller, 2008) indicate the importance of third-party

opportunism in public contracts. Indeed, opportunism can come not only from the signatory parties (i.e., the private operator and public authority) but also from third parties such as interest groups (i.e., consumer associations, lobbies, the political opponents of the decision maker, the rival companies of the operator, or citizens). A PPP contract relates to the provision of a public service, implies the investment of public funds and therefore concerns society as a whole. This interest of third parties in PPP contracts may prove to be useful, especially when it plays a supervisory role by preventing the public party from straying from the announced political agenda or by precluding private operators from renegotiating the terms of the initial agreement in an opportunistic way (McCubbins and Schwartz, 1984). However, third parties may also hinder the running of PPPs when they seek to pursue their own interests instead of the general interest. For example, it can be in the interest of third parties to question the integrity of the public party in relation to a public-private contract when they are competing with it in a “political market” (Spiller, 2008). This type of opportunistic behavior may have significant consequences on contracting costs. Indeed, to protect themselves from political contestability, both the public body and the private party may be tempted to design more rigid public contracts (that is, contracts that include more clauses than the contracts that are concluded between two private parties, because private parties do not have to protect against third-party opportunism). Thus, the public parties will generally draw more rigid contracts to avoid contract renegotiations that could be costly in terms of image if there is a high level of political competition within a municipality. However, establishing rigid contracts presents two drawbacks that should be explained. First, such contracts are particularly costly. Indeed, drafting rigid contracts generates additional transaction costs, both for the public authority (i.e., *ex ante* information retrieval, the drawing up of detailed specifications, etc.) and for the private party (i.e., longer and more complex procedures to participate in calls for tenders), which may result in cost overruns that would negate the potential advantages of a rigid contract (that is, the limitation of third-party opportunism). Second, such rigidity can hinder the ability of contracts to adapt to changes in the environment (i.e., statutory, technological and financial changes, etc.), while these evolutions are unavoidable in the case of long-term contracts.

Importance of the institutional environment — The abovementioned issue of contracting costs is raised more sharply when institutions are inefficient. Indeed, weak institutions damage the credibility of public authorities and can thus favor opportunistic renegotiations, which could lead to a misappropriation of resources or a decrease in the quality of the goods or services that are supplied by the private party. A weak institutional framework also increases the risk of opportunistic behavior on the part of the public body. In the absence of government control systems, it is easier for the government to modify the “ground rules” unilaterally. Guasch (2004) thus observes that the occurrence of renegotiations can be reduced significantly by the presence of a regulatory authority and that it is conversely increased by the incidence of corrupt behaviors (i.e., nepotism, clientelism, bribery, etc.).

The development of PPPs reflects (among other reasons) the logic of a public authority that increasingly wants to be a steering and managing force rather than the supplier of public services that are needed by the population. Although these partnerships are a source of potential gains, we have seen that they nevertheless remain contractual agreements that are likely to cause problems as soon as they are concluded over long periods of time and in complex environments. The arbitrations in play can be understood through the works of contract theory that address the decision to outsource, but one must also consider the intrinsic specificities of these agreements that are associated with their political dimension, which makes them more difficult to manage than purely private transactions.

What do we know about the efficiency of water PPPs? The empirical evidence

If economic theory can identify the advantages and drawbacks of PPPs, it is then an empirical question to determine their efficiency in one specific sector. Water services clearly range from easy to complex to manage in areas where institutions are sometimes weak, sometimes strong, with significant or few needs for more investment. This diversity is clear considering different countries; the magnitude of the advantages and drawbacks of PPPs are not the same when comparing Argentina with France. This

diversity is also clear within a given country. For example, the quality and scarcity of water and density of consumers might differ greatly in the north compared with the south of Italy, which explains the different choices that are made by the local public authorities concerning the management of water services. Empirical studies that examine the efficiency of water services might be helpful to determine if PPPs are appropriate or not.

A quick note on the empirical methodology's difficulties

A recent report from the French General Commission for Sustainable Development (Commissariat général au développement durable, CGDD, 2010) demonstrated a difference in the price between public management (€3.00/m³) and private management (€3.57/m³) of water services in France in 2008. This report also insisted that “private operators are more often faced with specific technical operating conditions relating to network density, origin of water, level of water purification treatment and wastewater treatment”. This conclusion clearly illustrates how hazardous it can be to limit the evaluation of the relative performance of delivery options to a mere comparison of the average end-user prices, which is often done in newspaper articles. If the way that water services are provided (i.e., through direct public management or PPPs) is not selected randomly — and the theory suggests it should not be — and if private management is used more frequently in complex situations, the comparison of averages does not allow concluding that one structure is superior to another structure. Economic theory suggests that no single governance structure (i.e., public versus private management) is more efficient than the other governance structures at all times and in all places. Each mode has its own characteristics, which renders it more appropriate in certain situations. Only a comparison where all other things are equal, between municipalities with similar characteristics, allows identifying the conclusive elements regarding the relative performance of delivery options. This is the type of comparison that econometric studies are attempting to perform, and we will focus on these studies in this section. However, it is fair to recognize that such technical assessments face their own share of limitations. Most of these assessments have been constrained by data quantity and quality, and many of the results are closer to establishing correlations rather than causality between the management of water services and its outcomes (see Box 2 for an example in Germany).

Box 2. A variety of regulatory frameworks that render a comparison between countries difficult – the case of Germany

In Germany, there is no public data on water services organization and performance. The regulation of water tariffs depends on the legal form of the water company. Fully private water companies and water companies with mixed ownership must be organized under private law. Fully state-owned utilities can choose between private and public law. Under public law, the utilities have the possibility to charge fees instead of prices for water consumption. Fees and prices are subject to two distinct regulatory frameworks.

Ex ante, the calculation of water prices, is, *a priori*, not regulated, and firms can set prices without the formal approval of a public authority. However, a judgment from the Federal Court of Justice in 2015 clarifies that state-owned firms must follow guidelines to calculate water prices since the principles of equality, proportionality, and cost recovery apply to any financial conduct of the state (Cullman et al 2018).

Ex post, the regional and federal cartel offices can open an investigation if they suspect a water utility of charging unreasonably high tariffs. However, since 2011, investigations can only be opened with respect to prices and do not apply to fees. If investigations are successful, orders for price-cuts can be issued regarding future price schemes. However, there are no retroactive sanctions. An examination of fees is more limited. Each county has an inspecting authority, which monitors the activities of subordinate municipalities (*Kommunalaufsicht*). The mandate, however, is restricted to the control of legality, i.e., the authority can only investigate whether the level of fees is consistent with existing (municipal) law and, in particular, whether the principles of equivalence, cost recovery, and proportionality are respected. An examination of fees usually does not involve cost efficiency analyses or comparisons across firms.

Cullman et al. (2018) suggest that reported costs are taken as a given. They also note that because of this lack of control that the “substantial differences in water tariffs across Germany (...) cannot be fully explained by exogenous production conditions”. The cartel offices have opened several investigations against water suppliers, but firms can avoid the implementation of sanctions once they reorganize their legal status under public law.

The influence of private management on water prices

Even if a large part of the public discontent that is translated in newspaper articles focuses on prices, there are few empirical studies that have examined the effect of governance structures on water prices.

Two studies investigated the case of Spain. (García-Valiñas, González-Gómez and Picazo-Tadeo, 2013) assessed the relationship between provider ownership and the price of water for residential use that was formed by 386 southern Spanish municipalities in 2009. They found that the public companies that supplied water services set higher prices than the companies that were established under any PPP scheme. However, prices are lower when the urban water service is provided directly by town councils. Another study by (Martínez-Espiñeira, García-Valiñas and González-Gómez, 2009) studied the differences in the average price of the domestic water supply services in Spain with a “treatment effects” model (which accounted for the fact that municipalities do not randomly distribute themselves between a group that uses strictly public ownership and management and a group where all or part of the service has been delegated to a private firm) on a sample of 53 major urban municipalities. They found a positive and significant effect of privatization on water price levels.

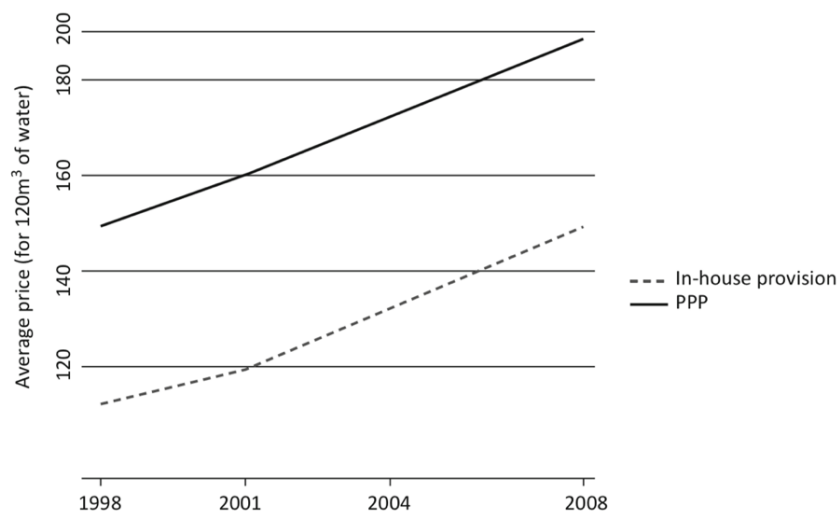
(Barbosa and Brusca, 2015) researched all the Brazilian water and sanitation utilities, including public and private companies, that supply water and sanitation services. Their sample includes 51 business corporations, 22 private companies, and 30 mixed capital companies, which gives them an unbalanced panel that spans the period from 2005 to 2012. Their findings, in the cluster of regulated corporations, indicate that there are no significant tariff differences between privately and publicly

managed corporations and that the regime of rate of return increases the water supply and total tariffs. In the cluster of unregulated corporations, these results suggest that privately managed WSUs have higher tariffs because of their higher profitability.

(Ruester and Zschille, 2010) investigated the impact of governance structure on water retail prices with a database of 765 German water suppliers. Controlling for scale economies, technical and structural characteristics, and endogeneity issues (the Heckman model), they found that private sector participation leads to higher prices.

We found more numerous empirical studies on water prices in France. The mobilized data also had a more convincing quality. The empirical results that were derived from the French data are particularly interesting because they reveal how an analysis that is limited to mere comparisons of averages can lead to erroneous conclusions. Indeed, several French studies emphasized that on average, consumers pay a higher price for water when the private sector intervenes in the supply of the service (Carpentier et al., 2006; Chong et al., 2006a, Chong, et al. 2015), which is in accordance with what newspapers periodically write. Chong, Saussier, and Silverman (2015) estimate that in 2008, the average price (non-deflated) that was paid by users for 120 m³ of water was higher by approximately 30% when the water service was delegated to a private operator (the average bill was €150 — see the next figure).

Figure 1. Comparing average prices depending on public versus private management for water distribution in France



Note: Price excluding taxes for 120 cubic meters. Data from the water survey of the French Environment Institute (IFEN)/Observation and Statistics Department (SOeS). Statistics computed by the authors based on a representative sample of 4,674 French municipalities in 2008.

However, when the various characteristics of municipalities are considered, particularly regarding the population that is served and the type of treatment that is required on raw water before it can be distributed, these gaps are reduced and disappear for cities that have more than 10,000 inhabitants. Carpentier et al. (2006) states that by examining 1998 data, the only remaining price difference from the advantage of in-house provision is for small municipalities (under 10,000 inhabitants). Thus, in 1998, the users who were supplied by a private operator in municipalities under 10,000 inhabitants paid 13.8% less on average than the users who lived in municipalities of comparable size where the service was delivered in house.

These estimates are confirmed by Chong et al. (2015) with more recent longitudinal data on the years 1998, 2001, 2004, and 2008.² The authors, when they analyze the influence of private management, with all other things being equal (controlling for considerable information such as the contract duration, the date of signature, water treatment types, leaks, population density³, sewage management, etc.) and considering the endogeneity of the management choice (public versus private), no longer find any price difference between the municipalities that provide water distribution under private management and the municipalities that resort to in-house provision, for municipalities of more than 10,000 inhabitants. A price difference to the advantage of in-house provision remains for municipalities under 10,000 inhabitants, in the range of 8%. It is important to emphasize that such price gaps cannot be explained by differences in water quality, which is controlled for. Other explanations are possible and range from a lack of competition during a call for bids for small municipalities to accounting issues (see Box 3). The study by Chong et al. (2015) also reveals an advantage for private management regarding the leak rate that is observed in the networks.⁴ This study is important because it is the only one, to our knowledge, that is based on a representative data set (more than 70% of French consumers are included in the study) and that uses panel data. This basis allows the authors to compare prices between municipalities that are comparable (i.e., the same water treatment, same population density, same rate of leakages, etc.) but differ only in the way that the water services are managed. However, it also allows the authors to compare one municipality with itself by using fixed effects as soon as one municipality changed the way that its water services are provided over the period. In this way, the unobserved heterogeneity that is constant over time and that might explain the cross-sectional results is controlled for.

In addition, the French case is also particularly interesting because France has a long tradition of resorting to private companies to handle water production and distribution services (private operators have existed in France since the mid-19th century). These findings are thus less likely to reflect errors due to a lack of experience on the part of the public decision maker, unlike the data from countries where resorting to the private sector constitutes a new experience.

Other French studies that have examined governance choices and water prices have demonstrated that elements other than governance choices might be central to this relationship. For example, (Porcher, 2017) quantified the impact of the choice of contracting out the management of water public services on price. He used a unique dataset of utilities with unusually detailed financial indicators, such as the debt of the water public service. He found evidence that private management is associated with higher prices on average, *ceteris paribus*, but that this difference disappears when accounting for the “hidden costs” of water, i.e., the price considering the debt refunding of the public service that could increase the price in the following years. Indeed, private management is characterized by higher tariffs but a lower debt level so that the price ensures the full-cost recovery, while under public management, prices are set at a lower level than under private management but with a higher debt from the public service (see box 3). (Desrieux, Chong and Saussier, 2012), with an original database of the contractual choices that were made by 5,000 French local public authorities in 2001, 2004, and 2008, also studied the influence of vertical integration on water distribution price when private management has been chosen.

² The data come from the water survey of the French Environment Institute (IFEN)/Observation and Statistics Department (SOeS). Five-thousand French municipalities were surveyed in 1998, 2001, 2004, and 2008, which provided a representative panel of French water services. The survey was abandoned after 2008 and replaced with a French Observatory (Sispea) that was supposed to collect information from municipalities on every water service in France on a voluntary basis. The observatory exists, but despite multiple efforts to improve the situation, the data are far from representative and reliable.

³ Population density is particularly important for understanding water prices and, more broadly, the rate of leakages that are observed on every network. For example, Germany is more than two times more densely inhabited, which explains why the rate of leakages is lower there. Suggesting that France should follow the same objectives as Germany concerning the rate of leakages, such as in the VEWA (2015) survey, is thus not justified from an economic perspective.

⁴ This result is supported by a study that was conducted by Le Lannier and Porcher (2014), who find no significant price differences between public and private management. Their study focuses on a different sample concerning 164 services that supplied more than 15,000 inhabitants in 2009.

They found that consumers pay on average 15% less, all other things being equal, when services are integrated vertically. As previously mentioned, they suggest that this effect does not reflect scope economies but rather a negotiation power equilibration.

Box 3: of the Impact of water services' debt on water tariffs

In France, public services such as water, waste, and public transportation, have their own budget ("supplementary budget" or "*budget annexe*" in French) that is appended to the municipality budget. This supplementary budget means that all the costs of the water industry must be covered by the price that is paid by consumers. This suggests that if the price does not cover the costs, the supplementary budget has a deficit that creates a debt for the public service, which cannot be refunded by increasing local taxes or with the surpluses of some other supplementary budgets (such as sanitation or transportation). Directly managed public services typically are expected to have lower prices than contracted-out services but higher debt from the supplementary budget because city councils are reluctant to increase prices in the short term. In contrast, under *lease* contracts, private firms tend to have higher prices than directly managed public services but lower debt from the supplementary budget.

A recent study by Porcher (2017) uses an original dataset of 116 water utilities in 2009 that served more than 9 million inhabitants in France. The study shows that the debt per customer is on average 319 euros and 133 euros under public and private management, respectively. In Porcher (2017), debts from the supplementary water budget are assumed to be refundable immediately, in 5 or 10 years under a 2% interest rate. Prices are then recomputed to consider debt refunding with different assumptions. Under an immediate debt refunding hypothesis, there is an average difference of 150.8 euros between public and private management for an annual bill. For an annual bill, the difference decreases to 5.57 euros in favor of private management under a 5-year debt refunding hypothesis, and it becomes 13 euros in favor of public management under a 10-year debt refunding hypothesis. The study thus shows that by using a period of debt-refunding that is longer than the standard contracts with private operators, municipalities can succeed in decreasing prices in the long run despite increased levels of debt.

Table 3: Private Management and Prices

Work	Area	Period	Sample	Results
Carpentier et al. (2006)	France	1998	5,000 municipalities (75% of the population)	Users who live in small municipalities (less than 10,000 inhabitants) that provide water services through private management pay higher prices for water (+15.2%). There is no price difference between public and private management for larger municipalities.
Chong et al. (2006)	France	2001	5,000 municipalities (75% of the population)	Users who live in small municipalities that provide water services through private management pay higher water prices (+7.3%).
Martínez-Espiñeira et al. (2009)	Spain	2006	53 municipalities (over 100,000 inhabitants; 33.5% of the national population)	The private management of water services leads to higher prices.
Rüster and Zschille (2010)	Germany	2003	765 water utilities	Retail prices increase with private sector participation.
García-Valiñas et al. (2010)	Andalusia	2005	301 municipalities (79% of the regional population)	There are more affordable residential water tariffs under an in-house provision regime.
Desrieux et al. (2013)	France	2001-2008	~ 1,700 privately managed municipalities	The use of the same operator for both the distribution and the sanitation of water leads to a significant price reduction for consumers.
García-Valiñas et al. (2013)	Andalusia	2009	396 municipalities (60% of the regional population)	Public companies that supply water services set higher prices than the public-private organizations that are established under any PPP scheme.
Barbosa and Brusca (2015)	Brazil	2005-2012	103 utilities	No significant tariff differences between public and private corporations.
Bel et al. (2015)	Andalusia	2009	715 municipalities (93% of the municipalities in the region)	Private firms with a larger market share make their dominant position effective by setting higher water prices.
Chong et al. (2015)	France	1998-2008	5,000 municipalities (75% of the population)	Users who live in small municipalities (fewer than 10,000 inhabitants) that provide water services through private management pay higher prices for water (~8%); there is no price difference between public and private management for larger municipalities.

Accordingly, the results from the studies that examine the impact of governance choices on prices are mixed. This discrepancy suggests that the influence of governance structures (i.e., public versus private management) is not central to the final prices that are paid by consumers. Other elements such as corporatization, productive efficiency, competition level, regulations and contractual choices are probably at least equally important.

Private management and technical efficiency

Efficiency can be measured as cost efficiency (decreasing costs for a given level of outputs) or total factor productivity (producing more for a given level of inputs). In industrialized countries, there is no clear relation between ownership and efficiency. Bhattacharyya et al. (1995) suggest that in the United States, publicly owned water utilities are more efficient. They apply a translog variable cost function to the data of 221 U.S. water utilities in 1992. Shih et al. (2004) find that public utilities have lower costs than private utilities. They apply DEA to two datasets, each with more than 1,000 observations of water suppliers that were obtained through the Community Water System Survey that was conducted by the U.S. Environmental Protection Agency. Garcia-Sanchez (2006), by using DEA with the data of 24 water utilities, cannot find any efficiency differences between publicly and privately owned companies in Spain. Stiel (2017), with a newly constructed and unique dataset from the German Federal Statistical Office, investigates the link between organizational innovation and productivity by focusing on three elements, namely, corporatization, outsourcing, and partial privatization. The data comprised 2,325 German state-owned firms for energy and water supply between 2003 and 2014 (German energy and water firms are multiproduct firms). Performance is measured as total factor productivity that is derived from a translog production function. These scholars find that corporatization and outsourcing are positively correlated with productivity and that fully state-owned firms outperform the firms with private minority shareholders. This paper does not directly compare the efficiency of PPPs versus direct public management. However, it sheds light on the fact that many organizational arrangements are possible and that corporatization is already one step toward the benefits of PPPs (i.e., the reduction of political interference).

In developing countries, some studies find a slight positive impact of private ownership on company efficiency. Kirkpatrick et al. (2006) use DEA and SFA to determine the impact of ownership structure on the efficiency performance of 110 water utilities in African countries. Higher relative efficiency is shown for privately owned utilities when using the DEA method, whereas no statistically significant result for the impact of ownership is found with SFA. Estache and Kouassi (2002) estimate a Cobb-Douglas production function for 21 African water utilities for the period of 1995 to 1997. In a second stage, they use a Tobit model to relate the resulting inefficiency scores to governance and ownership variables. Their results indicate that private ownership significantly decreases inefficiency. However, their dataset contains only three privatized firms, and corruption and governance seem far more important than the ownership variable in explaining the efficiency differences between firms. No significant differences between efficiency under public and private ownership are observed by Estache and Rossi (2002), who estimate a stochastic cost frontier model on the data from 50 water utilities in developing and transition countries in the Asian and Pacific region.

Instead of comparing public and private water utilities that operate at the same point in time, another body of work focuses on the impact of privatization on the efficiency and productivity of the sector, mostly in the United Kingdom. Saal and Parker (2000) study the privatization of water utilities in England and Wales in 1989. They expect privatization to improve efficiency on the premise that it removes soft-budget constraints, eliminates any political or special interest group interference that is associated with public ownership, exposes utilities to the market for corporate control, and incentivizes management and employees with performance pay structures and the market for managerial talent. Using cost function and Total Factor Productivity (TFP) analyses on a panel of ten private U.K. companies, the authors conclude that there is no statistically significant reduction in the trend growth rate of total costs following privatization with cost function analysis and no changes in productivity after privatization with TFP.

Table 4: Private Management and Efficiency

Work	Area	Period	Sample	Results
Byrnes et al. (1986)	USA	1976	127	No evidence of a difference in the total factor productivity between public and private.
Bhattacharyya et al. (1995)	USA	1992	221	No significant differences in cost-efficiency between public and private production. Private is more efficient at small scales of operation, whereas public is more efficient at large scales.
Saal and Parker (2000)	England and Wales	1985-1999	10	Privatization does not induce cost reduction. Strict regulation induces cost reduction.
Estache and Kouassi (2002)	Africa	1995-1997	21	Privatization decreases efficiency. There are, however, only three privatized firms, while corruption and governance explain the efficiency differences between firms more than the ownership variable.
Estache and Rossi (2002)	Asia and Pacific	1995	50	Cost efficiency is not significantly different in private companies than in public companies.
Shih et al. (2004)	USA	1995, 2000	1,246 water suppliers	Public systems have lower costs than private systems.
Garcia-Sanchez (2006)	Spain	2006		No evidence of a difference in technical efficiency between public and private.
Kirkpatrick et al. (2006)	Africa	2000	76	Production form does not impact costs.
Le Lannier and Porcher (2014)	France	2009	172	Public management is more cost efficient than private management. Note that costs are proxied by revenues.
Stiel (2017)	Germany	2003-2012	2,325	No evidence of ownership on productivity.

Private management and service quality

A few papers use quality as a performance indicator for at least two reasons. First, aside from the rates of compliance to water quality for some health indicators, there are no real measures of service quality. A good measure of service quality, such as the rate of complaints to capture the feeling of the user, usually is not available or largely unfulfilled. Second, water quality largely is uniformed in industrialized countries, with small disparities between services and governance forms. This section reviews the few papers that link ownership or governance forms to quality.

Two studies could be mentioned regarding water quality in France, even if their focus is not quality per se. The first is Ménard and Saussier (2000), who link governance choice to quality parameters, with a dataset of 2,000 observations for 1995. Their measure of quality is a dummy variable that is equal to 1 if a water service has been identified as failing to meet quality parameters at least once in the year and is 0 otherwise. They show that there are no significant differences between public and private management. This finding is true even if one considers small services with surface water of bad quality and services only with underground raw water. Another paper by Porcher (2012) uses a dataset of more than 2,200 French municipalities that were observed between 1998 and 2008. The paper shows that private management is associated with higher water quality, which is measured as the percentage of the tests that pass the required microbiological standards. The impact is nevertheless rather low, approximately 1 percentage point.

Three studies link privatization and quality in the United States. The most significant study, regarding the appropriate methodology, is Lyon et al. (2017) who show that privatization does not lead to significant changes in water quality⁵ on average, while municipalization leads to significant and persistent improvements in performance. The authors show that the increase in quality is particularly notable for large systems, systems that are located in areas with low educational attainment, systems with low poverty levels, and communities with a smaller number of systems. Wallsten and Kosec (2008) show that neither ownership type consistently performs better than the other ownership type; on average, private and local systems in the United States comply equally well with drinking water regulations. Their results do not suggest that small private systems are better or worse than small public systems. However, their results seem to show a more complex pattern because private systems have a negative impact on the maximum contaminant level violations and on monitoring and reporting violations. The results seem to advance the necessity of strict regulations. Konisky and Teodoro (2016) use water systems data between 2010 and 2013 and show that public systems incur more violations. They find that compared with private firms, governments violate these laws significantly more frequently and are less likely to be penalized for violations. The typical enforcement instruments that regulators use to influence firm behavior may be less effective against governments. The results for the United States are contradictory, but the dataset and the methodology that are used in Lyons et al. (2017) seem to be in favor of municipalization to improve water quality.

The results once again must be interpreted in the local context and the variable that is relative to the different studies. The studies that are selected here are essentially at the macrolevel (including all utilities for France or the United States), but case studies could show different evidence. For example, Galiani et al. (2005) show that privatization improves service quality via a case study of the water systems of Buenos Aires in Argentina. Indeed, privatization decreased spilled water in the daily millions of cubic meters by 14.8%, while the delay in days in attending repair requests decreased by 82.2%. Many other case studies may find contradictory results on the relative performance of public versus private operators regarding quality.

⁵ Water quality is measured via the number of treatment violations that are failures to properly treat a drinking water source to reduce the level of a specified contaminant. A reporting violation is a failure to collect the required number of samples (including confirmation samples) in the specified time frame.

Table 5: Private sector participation and water quality (list of academic econometric studies)

Work	Area	Year	Sample	Results
Ménard and Saussier (2000)	France	1993 and 1995	2,109 French municipalities	No significant differences between public and private management.
Wallsten and Kosec (2008)	USA	1997-2003	53,245 water systems	Privately owned systems report fewer contaminant violations than locally owned systems but have somewhat more monitoring and violation reporting.
Porcher (2012)	France	1998, 2001, 2004, 2008	2,200 French municipalities	Significant positive impact of private management on water quality, measured as the percentage of successful compliance tests.
Konisky and Teodoro (2016)	USA	2010-2013	4,277 water utilities	The expected count of health violations in a public agency water utility is 14% above the mean.
Lyon et al. (2017)	USA	2007-2014	179,927 water systems	The results indicate that while privatization does not lead to significant changes in water quality on average, municipalization leads to significant and persistent improvements in performance. These improvements are particularly notable for large systems, systems located in areas with low educational attainment, systems with low poverty levels, and communities with a smaller number of systems. Privatization has no significant effect on average; it appears to produce an improvement in water quality in the short term, which is reversed within five years.

Table 6: Coverage and access to the poor (list of academic econometric studies)

Work	Area	Year	Sample	Results
Mckenzie and Mookherjee (2002)	Bolivia	1992-1999	La Paz, Alto, Cochabamba, Santa Cruz	Coverage increased for the top 4 quintiles but decreased by 0.6 points in the first quintile. Overall positive effects of price changes and coverage on consumers' welfare, except for Cochabamba.
Clarke, Kosec, and Wallsten (2009)	Argentina, Bolivia, Brazil,	1993-2003	158 cities	No impact on coverage when including control groups, i.e., coverage is linked to a trend rather than private sector participation.
Galiani et al. (2005)	Argentina	1990-1999	494 municipalities	Increased coverage by 4.2 points in privatized municipalities.
Lee (2011)	Malaysia	1993-1994; 1998-1999	14,631 and 9,198 households	Negative impact on access; negative impact on water affordability for the poor (but strong governmental tariff regulation).

Private management and coverage and access for the poor

Another important issue in the debate about private sector participation relates to its impact on coverage and access for the poor. Studies on coverage usually occur in developing countries because coverage is largely assured in industrialized countries. A telltale story is that privatization decreases coverage because firms want to maximize their profits and do not want to serve unprofitable households.

Mckenzie and Mookherjee (2002) study the welfare effects from privatization in electricity, telecommunications, and water in four Latin American countries — Argentina, Bolivia, Mexico, and Nicaragua. Indeed, the main impact of privatization is the layoffs of many workers who worked in formerly public enterprises. However, the employment contractions were small in relation to the size of the aggregate labor force (2% in Argentina, 1% in Mexico, and 0.13% in Bolivia). The fiscal impact of the reforms allowed a shift in public spending away from expensive debt service obligations and funding operating losses in state-owned enterprises and more toward increased social spending.⁶ Their study particularly focuses on the benefits of water privatization in Bolivia. In La Paz and El Alto, privatization increased access to the poor and resulted in a decrease in the price of water. The overall impact of privatization on access, considering the Cochabamba case, remains positive but had a negative impact on the lowest quintile. Cochabamba is described as a failed concession with large increases of approximately 43% in average water tariffs.

Because privatization is often linked to price increases (which, in turn, are often linked to productivity increases or to the evolution of regulatory norms), one usually can expect a negative impact of privatization on water affordability for the poor. Similarly, private firms might not have any incentives to invest in the network to connect poor consumers who might not be able to afford paying for the service. Such a result is found in Lee (2011) for Malaysia. However, it is difficult to disentangle the results of privatization from the results of pro-access or tariff regulation government policies. Clarke et al. (2009) find no impact of private sector participation on coverage rates, most likely because the governments that were supporting privatization were also encouraging increasing coverage rates.

The implementation of social tariffs can be an accompanying solution to private sector participation. Although the existence of multiple block tariffs and social tariffs are largely regulatory, their use by private firms can be an innovative way of promoting access for the poor. In France, the so-called “Brottes Law” (2013) promotes experimentation of discriminative pricing based on income, e.g., the implementation of social tariffs for the poor, a different marginal price or fixed-part tariff that is based on a measure of income, increasing block tariffs, or higher marginal prices to the customer (and higher average prices for large consumers). It seems that social tariffs or measures such as energy paychecks are efficient redistributive measures to decrease the price of water for the poor because they directly target households with low incomes (Porcher, 2014). Increasing block tariffs might have lower redistributive effects, because water consumption, although it is positively correlated with income, is largely dependent on the size of the household (Smets, 2004; Porcher, 2014). Vital consumption of water is the same for all individuals; therefore, price elasticities between the rich and the poor do not differ much. In this case, increasing block tariffs should be used instead to promote water conservation. In practice, however, social tariffs and increasing block tariffs are implemented together.

There are many cases of implemented social tariffs. In Dunkerque, a French city where the water utility is managed by a private company, a three-part tariff and a social tariff were implemented in 2013. The three-part tariff works in the following way: a “vital consumption” tier below 75 cubic meters per household per year, a “useful consumption” tier between 75 and 200 cubic meters per household per year and a “comfort” tier above 200 cubic meters. The marginal price, exclusive of taxes, is 0.84, 1.56 and 2.07 euros per cubic meter for the vital, useful and comfort consumption tiers, respectively. The social tariff consists of a large rebate on the first tier for consumers who are eligible for universal health

⁶ There are, of course, cases of failed privatizations such as Cochabamba. The case of Nicaragua is particular, because privatization was part of the package to move the country from socialism to a market economy.

insurance, a social benefit for the poor in France. Consumers who are eligible for universal health insurance would pay 0.32 euro per cubic meter for the first tier. Mayol and Porcher (2018) show that the change in the tariff structure increases the consumption of consumers in the first tier and largely decreases consumption in the second and the third tier, which responds to both policy goals (increasing access to water for the poor and decreasing comfort consumption).⁷

Box 4: Private sector participation and water conservation

Conservation policies are usually set by governments. For example, in France, a large part of the conservation policies is decided at the state level or via the level of taxes that are fixed by the Water Basins to ensure water protection and depollution. An interesting question, however, is whether public and private utilities differ in their approach to conservation. Kallis et al. (2010) survey managers of public and private urban water utilities in California, United States, to see if they differ in their approaches to conservation and to their customers. Perhaps because California is characterized by recurrent droughts, public and private managers emphasize the collective ownership of the water sources and the collective value of conservation. However, public utilities appear to be more proactive and target-oriented in asking their customers to conserve. An interesting feature of the study is that the researchers survey public attitudes toward voluntary and mandated water conservation, as well as price increases. In the privatized utilities, price hikes are interpreted as serving their profit-making goal. Public utilities have more legitimacy for charging higher prices in periods of droughts.

What to bring back to better assess and improve PPPs?

Because water management is a very sensible topic, one would like to have a yes or no recommendation in regard to the role of private management. However, this is not easy. Empirical studies do not give a definitive answer concerning the efficiency of PPPs compared with that of direct public management in the provision of public services. This should not come as a surprise. After all, theory suggests that there is not one specific type of management that is the most efficient in all locations. What is efficient in France might not be efficient in developing countries. Moreover, even within a country, a local authority might face different situations depending on the location (e.g., the population density, the quality of raw water, etc. might differ).

Thus, what could we obtain from previous studies on this topic if not a definitive answer?

Public versus private management is only one of the many dimensions

One of the main lessons is that many dimensions are driving water management efficiency of which private participation is only one dimension and is not necessarily the most important dimension. Characteristics of the service, corporatization, the level of competition in the market, the quality of institutions, risk transfers, and contractual choices are many other dimensions of the problem that are driving the decision to provide water services through direct public management or not, as well as the performance of these services. Studies often focus on the public versus private management question without controlling for these other aspects. If there is no competition at the award stage, how can one be surprised that the price is higher through private management than through local direct public management? The reverse conclusion also should not come as a surprise if you are considering a country with weak institutions and where patronage is developed.

⁷ There is, however, substantial debate on the global efficacy of social tariffs, first, because the price of water is supposed to be used for recovery costs (full-cost recovery principle) and second, because the use of water might not be efficient because households could use more water than is necessary.

Factors influencing the likelihood of the performance of PPPs in the water sector and more broadly⁸

It is useful to have a broad perspective to determine what we know about the factors that influence PPPs' success or failure.

Contract management — PPPs are not a free lunch. For PPPs to be successful, public authorities need to think carefully about the steps of tender design, contract design, and contract management (Williamson 1976).

tender design — A large part of the empirical literature has analyzed the choice between rigid auctions that focus on price competition versus more flexible auctions that reduce “competition” and open room for negotiation. Bajari et al. (2009) examined a comprehensive data set of the private-sector building contracts that were awarded in northern California from 1995-2000. Their analysis suggests many possible limitations to the use of auctions. Auctions may perform poorly when projects are complex, contractual design is incomplete, and there are few available bidders. Furthermore, auctions may stifle the communication between buyers and sellers and prevent the buyer from utilizing the contractor's expertise when designing the project. What is true for private auctions is also true for public auctions, and the implications of these results for procurement in the public sector are straightforward.

Box 5: Privatization and mortality

An issue that is connected with coverage and water quality is mortality. Ensuring access to good quality water is a powerful mean to decrease mortality. Galiani et al. (2005) study the case of the privatization of local water companies in Argentina in the 1990s. This privatization campaign covered approximately 30% of the country's municipalities. With the variation in ownership of water provision across time and space that is generated by the privatization wave, the authors find that child mortality fell 8% in the areas that privatized their water services and that the effect was largest in the poorest areas. Indeed, the privatization of water systems is associated with a 26.5% reduction in child mortality in municipalities with high levels of poverty, which is measured as a percentage of unmet basic needs that are greater than 50%. The effect is even more significant because privatization is correlated with significant reductions in deaths from infections and parasitic diseases but remains uncorrelated with deaths from causes that are unrelated to water conditions, e.g., nervous system disorders, congenital anomalies, respiratory diseases, etc. Galiani et al. (2005) consider increasing access for the poor as one of the most important causal channels in explaining the decrease in child mortality. The authors compare the change in the proportion of households that are connected in municipalities that privatized and did not privatize water services in 1997. The results show a significantly larger increase in the proportion of the households that are connected to water services in municipalities that privatized than municipalities that did not privatize. Excluding Buenos Aires, where 98% of households were already connected to water services before privatization, privatization increased by 4.2 points in the share of connected households.

An interesting parallel can be made with Troesken's study (1999) of U.S. municipalities that bought private water companies to transform them to public companies in the beginning of the 20th century. At the time, Progressive Era reformers claimed typhoid, a waterborne disease, was more prevalent in cities with private water companies than in cities with public water companies. By 1899, 20% of all private water companies had installed filters, while only 6% of all public companies had installed filters. Public acquisition does not seem to be the reason for decreasing typhoid rates. Another historic study by Troesken (2001) examines the impact of private ownership on services provided to Black communities in the United States in the beginning of the 20th century. The results show that public ownership reduced Black disease rates sharply even when using different outcomes (typhoid fever rates in 1911 and 1921, waterborne diseases rates in 14 North Carolina towns between 1889 and 1908, and investment patterns in cities with public and private water companies). The results might be linked to the increased number of public employees after municipalization, which resulted in the building of pipes to cover the entire territory.

The benefits of negotiation during the selection stage are also emphasized by (Decio Coviello, Andrea Guglielmo and Giancarlo Spagnolo, 2017). With a regression discontinuity design analysis to document the causal effect of increasing buyers' discretion on procurement outcomes in a large database for public

⁸ This section relies on Iossa and Saussier (2018).

works in Italy, they found that discretion increases the probability that the same firm wins repeatedly, but it does not deteriorate the procurement outcomes. This result is robust when controlling for the geographical location, corruption, social capital, and judicial efficiency in the region of the public buyers that run the auctions. In the same vein, Chever et al. (2017), with data on 180 calls for bids and contracts that were signed by a French local public buyer of social housing, found that limiting competition (i.e., restraining the number of responses to the call for bids) for small simple projects enables economies to be made on transaction costs without increasing procurement costs, corruption and favoritism.

The complexity of the tender design might also impact the contract execution stage. (Antonio Estache and A. Limi, 2009) use data from road and railway concessions in Latin America to study the probability of renegotiation in connection with the selected award criteria. They found that auctioneers tend to adopt the multidimensional format when the need for social considerations, such as the alleviation of unemployment, is high, but renegotiations are more likely to occur when the multidimensional format is used. Good governance, particularly regulatory quality and anti-corruption policies, can mitigate the renegotiation problem.

However, a simple tender design that focuses on prices is not without drawbacks. Decarolis (2014) found evidence of a trade-off that is induced by first-price auctions between low prices at the awarding stage and poor ex post performance when bids are not binding commitments. By exploiting the different timing with which first-price auctions were introduced in Italy to procure public works, he found that at least half of the cost savings from lower winning prices are lost because of ex post renegotiations.

These studies suggest that the tender procedure is crucial and needs to be chosen according to the contract design and the institutional framework in which the project is embedded.

contract design — As discussed in detail by Iossa et al. (2007), aspects such as the risk allocation or the payment mechanism significantly affect PPP outcomes. Project-related risks, such as construction risk, cost overrun risk, and demand risk, are allocated through contract design. The sheer complexity of PPP projects makes contract design a key issue for their success; the contract may transfer an inappropriate type and amount of risk to the contractor.

Economic theory has given clear guidelines regarding the benefit and cost of transferring risk to the agent. Its basic insights suggest that we should transfer more risk, because the agent can control it and mitigate its consequences (among other factors). The success of PPPs is linked strictly to whether these principles of risk allocation are applied in practice. As discussed in Iossa et al. (2014), many factors may contribute to determining an inefficient risk allocation, which raises the risk of project failure. These factors include political interference, opportunistic renegotiations close to elections (Le Squeren 2016), unsuitable revenue guarantees, and incompetency. In addition, the need for public authorities to be protected against third-party critics (Spiller 2008, 2011) leads them to transfer as much risk as possible, and sometimes more than what is optimal, through rigid contracting that does not anticipate the need for flexibility of long-term contracts.

Of course, management of the contract is more difficult as soon as inefficient risk allocation is decided. In Latin American countries, most cases of renegotiation or contract termination have been due to the contract design failing to manage risks (Guasch 2004). Risk assessment and allocation are also problematic issues in the European Union and the United States, which leads to contract revisions (Estache and Saussier 2014, (OECD, 2017)) and unanticipated financial burdens for the public sector (Renda and Schrefler 2006).

The main message is therefore that efficient PPPs are PPPs for which competition exists at the *ex-ante* stage, the partnership is effective from the beginning (negotiation is introduced during the bidding process), the allocation of risks is carefully done, and the public authority is also highly involved during the execution stage.

Macroeconomic instability

The degree of macroeconomic and political instability also matters in accounting for PPP outcomes. In an uncertain macroeconomic environment, contract design failures are more likely since it is difficult for the contracting parties to envisage future contingencies and write contract terms accordingly (which aggravates the problems that arise from contract incompleteness). *Ex ante*, a high aggregate risk level discourages long-term contractual relationships and weakens incentives to undertake investments in infrastructure projects that typically have a long maturity.

Empirical evidence shows a correlation between macroeconomics instability and renegotiation incidence; the peaks of contract revision occurred when negative shocks hit Latin American countries and triggered severe macroeconomic crises. For instance, generalized renegotiations were observed soon after the Argentine hyperinflation in 1990, the Mexican crisis in 1995, the Brazilian devaluation in 1999, the Colombian recession in 2000, and the Argentine crisis in 2001 (Guasch et al. 2003). Moreover, political instability translates into higher risks of government-led renegotiations that may affect the profitability of the project and impact the insolvency of the private partner.

Country regulation and institutional framework

For similar reasons, the regulatory and institutional framework matter heavily since the quality of contract enforceability and governance are critical factors that affect PPP agreements. In Latin American countries, weak governance and the government's lack of commitment not to renegotiate has also accounted for recurrent contract revisions. In many of these countries, the regulatory agencies rarely were given training and instruments to perform their mandate with competence and even lacked political support from the government. Moreover, in some cases, the government had political control over them, which raises concerns regarding autonomy and accountability (Estache 2006). There were instances in which the private partner considered its main counterparts to be ministers and secretaries rather than the regulatory agency. Weak institutions reduce the commitment level of the initial contractual agreement and the ability to transfer risks credibly. For example, (Decio Coviello *et al.*, 2017) showed how inefficient courts can sway public buyers from enforcing a penalty for late delivery to avoid litigation, which therefore induces sellers to delay contract delivery. More precisely, with a large dataset on Italian public procurement, they found that where courts are inefficient, (i) public works are delivered with longer delays, (ii) delays increase for more valuable contracts, (iii) contracts more often are awarded to larger suppliers, and (iv) a higher share of the payment is postponed after delivery.

Weak political and regulatory institutions also raise the risk of corruption (see Iossa and Martimort 2016) that reduces the performance of PPP contracts. For example, Coviello and Gagliarducci (2017) studied the impact of politicians' tenure in office on the outcomes of public procurement with a dataset of Italian municipal governments. They found that an increase in tenure is associated with worse procurement outcomes. They suggest that time in office progressively leads to collusion between government officials and local bidders.

Many political motives have been proposed to explain the interests of the public sector party in renegeing on PPP contracts. The government may increase its chances to be re-elected by expanding spending or by promoting investment in public works that create jobs and boost economic activity (Guasch 2004). By renegeing, the government may also circumvent the opposition's scrutiny and reap the political benefits that result from higher present spending, e.g., a higher probability of being re-elected (Engel et al. 2006). Whatever the reasons, renegotiations have a large cost, as illustrated by Bajari et al. (2014). By studying highway paving contracts, they found that renegotiation imposes significant adaptation costs. Their results suggest that bidders respond strategically to contractual incompleteness and that adaptation costs are an important determinant of their bids; they account for 7.5% to 14% of the winning bid.

However, there is also a cost of non-renegotiation that is trapped in a badly suited agreement. Because flexibility is needed at the award stage (i.e., negotiation phase), flexibility is also needed at the execution stage. As stated by Spiller (2008) “In a sense, (...) the frequency of contract renegotiation may provide concessions a ‘relational quality’”. Accordingly, renegotiations are needed and should be anticipated. (Beuve, de Brux and Saussier, 2013) studied concession contracts in the car-park sector and found that the frequency of renegotiations, as well as their types and scope, influence the probability of renewing a contract with the same partner for a public partnership. This finding suggests that renegotiations should not be interpreted as a sign of weakness but as good news that indicates that the contracting parties can make the contract adaptable over time as long as they are managed correctly to create social value.

Conclusion

Private management, through PPPs, is just a word. Private management in one city might differ from private management in another city. The devil lies in the details. Each contract is different. The level of specified incentives might differ. Award procedures and risk sharing also might differ. Theory suggests that contractual choices are central to explain differences in performance, but very often, local authorities do not spend sufficient time on contractual details and have no specific skills on these issues. Therefore, “Private” is not essential in PPPs; the theory and empirical studies suggest that what are essential in PPPs are the first and the last Ps.

The cases where the public authorities do not invest in the relationship, do not invest in the award procedure, do not follow carefully the water service performance, and do not increase their skills (that are different from the skills that are needed to manage water services through direct public management) are also the cases for which PPPs will be inefficient and probably also the cases for which public management would provide bad results. Local authorities should try hard to stay in control. Private companies should also try hard to include them in the process. As noted by Klein, despite more than two decades of use and refinement of the PPP mechanism, “The general picture is one of waves of enthusiasm for PPPs followed by some disenchantment and consolidation. Different countries were caught up in the waves at different times.” (Michael Klein, 2015). Evaluations show that PPPs can outperform public sector firms, and “are useful tools for reform of service delivery” (Klein, 2015). However, it is no longer clear that PPPs consistently are run better than public firms. “The evidence suggests that well-run public firms tend to match the performance of private firms in regulated sectors” (Klein, 2015). This result suggests that as soon as PPP are well managed, they perform well and are even better than public management in the range of services for which they are shaped.

However, PPPs are public contracts. Accordingly, it is useless to try to replicate contractual practices that have shown their efficiency for private contracts (Spiller 2008). Public contracts are inherently more rigid (Beuve, Moszoro and Saussier, 2015) and rely on more formal procedures without any possibility of using relational contracting (i.e., informal procedures based on trust relationships). The rigidity of public contracts must be taken as a given parameter.

Economic theory and the empirical studies show that PPPs in the water sector can deliver social value. These studies also identify the necessary conditions under which social value can be delivered.

- Competition at the *ex-ante* stage is a necessary condition for PPPs to deliver value.
- Risk repartition should be crafted carefully in the initial contract. The share of benefits and losses might even be implemented.
- Contractual choices are central not only to commit contracting parties but also to establish the rules of the game for contract adaptation. Renegotiation procedures should not be avoided but controlled and made transparent to stakeholders.
- Transparency is key because PPPs are public contracts that are under the scrutiny of third parties who are not necessarily interested in their success. It helps to reinforce the accountability of the

contracting parties that is needed for public services in general, for water services more specifically, because this is a sensitive public service for citizens.

- The involvement of public authorities is crucial. PPPs are not a way for public authorities to contract out their obligations to manage public services. This often is forgotten by public authorities and is easily accepted by private operators. This is not a sustainable strategy for both contracting parties.

Recognizing that both PPPs and public management have their own failures would help to calm some of the controversial rhetoric that we can observe around the issues that relate to the management of water services. The privatization of water services will not solve all the problems that are associated with public management, but the opposite is also true. Both have their place in water management.

References

- Athias, L. and Saussier, S. (2018) 'Are public private partnerships that rigid? And why? Evidence from price provisions in French toll road concession contracts', *Transportation Research Part A: Policy and Practice*, 111, pp. 174–186.
- Aubert, C. and Reynaud, A. (2005) 'The impact of regulation on cost efficiency: An empirical analysis of Wisconsin water utilities', *Journal of Productivity Analysis*, 23(3), pp. 383–409.
- Bajari, P., Houghton, S. and Tadelis, S. (2014) 'Bidding for incomplete contracts: An empirical analysis of adaptation costs', *American Economic Review*, 104(4), pp. 1288-1319.
- Bajari, P., McMillan, R. and Tadelis, S. (2009) 'Auctions versus negotiations in procurement: An empirical analysis', *Journal of Law and Economics Organization*, 25(2), pp. 372-399.
- Barbosa, A. and Brusca, I. (2015) 'Governance structures and their impact on tariff levels of Brazilian water and sanitation corporations', *Utilities Policy*, 34, pp. 94-105.
- Bel, G. and Fageda, X. (2007) 'Why do local governments privatize public services? A survey of empirical studies', *Local Government Studies*, 33(4), pp. 517-534.
- Bel, G. and Warner, M. (2008) 'Does privatization of solid waste and water services reduce costs? A review of empirical studies', *Resources, Conservation and Recycling*, 52(12), pp. 1337–1348.
- Bel, G., González Gómez, F. and Picazo-Tadeo, A.J. (2015) 'Does market concentration affect prices in the urban water industry?', *Environment and Planning C: Government and Policy*, 33(6), pp. 1546-1565.
- Bennett, J. and Iossa, E. (2006) 'Building and managing facilities for public services', *Journal of Public Economics*, 90(10-11), pp. 2143-2160.
- Beuve, J., de Brux, J. and Saussier, S. (2013) 'Renégocier pour durer : une analyse empirique des contrats de concession', *Revue d'économie industrielle*, 141, pp. 117-148.
- Beuve, J., Moszoro, M. W. and Saussier, S. (2015) *Political Contestability and Contract Rigidity: An Analysis of Procurement Contracts*. SSRN Scholarly Paper ID 2475164. Rochester, NY: Social Science Research Network. Available at: <http://papers.ssrn.com/abstract=2475164> (Accessed: 17 April 2015).
- Bhattacharyya, A., Harris, T.R., Narayanan, R. et al. (1995) 'Specification and estimation of the effect of ownership on the economic efficiency of the water utilities', *Regional Science and Urban Economics*, 25(6), pp. 759–784.
- Boycko, M., Shleifer, A. and Vishny, R.W. (1996) 'A theory of privatization', *The Economic Journal*, pp. 309-319.
- Boyer, M. and Garcia, S. (2008) 'Régulation et mode de gestion: une étude économétrique sur les prix et la performance dans le secteur de l'eau potable', *Annals of Economics and Statistics / Annales d'Économie et de Statistique*, (90), pp. 35–74.
- Byrnes, P., Grosskopf, S., Hayes, K. (1986) 'Efficiency and ownership: further evidence', *Review of Economics and Statistics*, 68(2), pp. 337-341.
- Carpentier, A. et al. (2006) 'Effets de la délégation sur le prix de l'eau potable en France : une analyse à partir de la littérature sur les effets de traitement', *Economie et Prévision*, 174(3), pp. 1–19.
- Chever, L., Saussier, S. and Yvrande-Billon, A. (2017) 'The law of small numbers: investigating the benefits of restricted auctions for public procurement', *Applied Economics*, 49(42), pp. 4241-4260.
- Chong, E. (2006) 'Contractual length as an instrument to discourage collusion in auctions: A theoretical perspective with application to the French water sector', ADIS Working Paper.

- Chong, E., Huet, F., Saussier, S. and Steiner, F. (2006) 'Public-Private Partnerships and Prices: Evidences from water distribution in France', *Review of Industrial Organization*, 29(1), pp. 149–169.
- Chong, E., Saussier, S. and Silverman, B. S. (2015) 'Water Under the Bridge: Determinants of Franchise Renewal in Water Provision', *Journal of Law, Economics and Organization*, pp. 31 (1), 3-39.
- Commissariat général au développement durable (2010), 'Le point sur les services d'eau et d'assainissement : une inflexion des tendances', Lettre n°67.
- Conseil de la concurrence (2003), *Rapport annuel du conseil de la concurrence*, La documentation française.
- Coviello, D. and Gagliarducci, S. (2017), 'Tenure in office and public procurement', *American Economic Journal: Economic Policy*, 9(3), pp. 59-105.
- Coviello *et al.* (2017) 'Court Efficiency and Procurement Performance', *Scandinavian Journal of Economics*, Forthcoming.
- Coviello Decio, Andrea Guglielmo and Giancarlo Spagnolo (2017) 'The Effect of Discretion on Procurement Performance', *Management Science*, Forthcoming.
- Cowan, S. (1997) 'Competition in the water industry', *Oxford Review of Economic Policy*, 13, pp. 83–92.
- Clarke, G.R.G., Kosec, K. and Wallsten, S. (2004) 'Has private participation in water and sewerage improved coverage? Empirical evidence from Latin America', *Journal of International Development*, 21(3), pp. 327-361.
- Cullmann, A., Rechlitz, J. and Stiel, C. (2018), 'The German drinking water sector', *Palgrave Handbook on Water*, dir. Stéphane Saussier, forthcoming.
- De Carolis, F. (2014) 'Awarding price, contract performance, and bids screening: Evidence from procurement auctions', *American Economic Journal: Applied Economics*, 6(1), pp. 108-132.
- De Witte, K. and Saal, D. (2010) 'Is a little sunshine all we need? On the impact of sunshine regulation on profits, productivity and prices in the Dutch drinking water sector', *Journal of Regulatory Economics*, 37(3), pp. 219–242.
- Desrieux, C., Chong, E. and Saussier, S. (2013) 'Putting all one's eggs in one basket: relational contracts and the management of local public services', *Journal of Economic Behavior and Organization*, 89, pp. 167-186.
- Engel, E., Fischer, R. and Galetovic, A. (2006) 'Privatizing highways in the United States', *Review of Industrial Organization*, 29(1-2), pp. 27-53.
- Engel, E., Fischer, R. and Galetovic, A. (2011) 'Public-private partnerships to revamp U.S. infrastructure', *Hamilton project report*, pp. 1-26.
- Estache, A. (2006) 'Infrastructure: A survey of recent and upcoming issues', *The World Bank*, Mimeo.
- Estache, A. and Kouassi, E. (2002) 'Sector organization, governance, and the inefficiency of African water utilities'. Policy research working paper series 2890, *The World Bank*, Washington DC.
- Estache, A. and Rossi, M. (2002) 'How different is the efficiency of public and private water companies in Asia?', *World Bank Economic Review*, 16, pp. 139-148.
- Estache A. and A. Limi (2009) 'Joint Bidding, Governance and Public Procurement Costs: a Case of Road Projects', *Annals of Public and Cooperative Economics*, 80, pp. 393–429.
- Estache, A. and Saussier, S. (2014) 'Public-private partnerships and efficiency : a short assessment', *EPPP Working paper 2014-06*.

- Galiani, S., Gertler, P. and Schargrotsky, E. (2005) 'Water for life: The impact of the privatization of water services on child mortality', *Journal of Political Economy*, 113(1), pp. 83–120.
- García-Sánchez, I. M. (2006) 'Efficiency Measurement in Spanish Local Government: The Case of Municipal Water Services', *Review of Policy Research*, 23(2), pp. 355–372.
- García Valiñas, M.A., González Gómez, F. and Picazo-Tadeo, A.J. (2013), 'Is the price of water for residential use related to provider ownership? Empirical evidence from Spain', *Utilities Policy*, 24, pp. 59-69.
- García Valiñas, M.A., Martínez-Espiñeira, R. and González-Gómez, F. (2010), 'Affordability of residential water tariffs: Alternative measurement and explanatory factors in Southern Spain', *Journal of Environmental Management*, 91(12), pp. 2696-2706.
- Guash, J-L. (2004) 'Granting and renegotiating infrastructure concession: doing it right, The World Bank, Mimeo.
- Guasch, J-L., Laffont, J.-J. and Straub, S. (2003) 'Renegotiation of concession contracts in Latin America', *Policy research working paper 3011*, The World Bank.
- Guasch, J-L., Laffont, J.-J. and Straub, S. (2008) 'Renegotiation of concession contracts in Latin America: Evidence from the water and transport sectors', *International Journal of Industrial Organization*, 26(2), pp. 421–442.
- Hart, O. (2003) 'Incomplete contracts and public ownership: remarks, and an application to public-private partnerships', *The Economic Journal*, 113(486), pp. C69-C76.
- Iossa, E. and Martimort, D. (2016) 'Corruption in PPPs, incentives and contract incompleteness', *International Journal of Industrial Organization*, 44, pp. 85-100.
- Iossa, E. and Saussier, S. (2018) 'Public-private partnerships in Europe for building and managing public infrastructures: An economic perspective', *Annals of Public and Cooperative Economics*, 89(1), pp. 25-48.
- Iossa, E., Spagnolo, G. and Vellez, M. (2007), 'Contractual issues in public-private partnerships', *Report*, The World Bank.
- Iossa, E., Spagnolo, G. and Vellez, M. (2014), 'The risks and tricks in public-private partnerships', *The Analysis of Competition Policy and Sectoral Regulation*, pp.455-489.
- Jensen, M.C. and Meckling, W.H. (1976) 'Theory of the firm: managerial behavior, agency costs and ownership structure', *Journal of Financial Economics*, 3(4), pp. 305-360.
- Kallis, G., Ray, I., Fultin, J. and McMahon, J.E. (2010) 'Public versus private: Does it matter for water conservation? Insights from California', *Environmental Management*, 45(1), pp. 177-191.
- Kirkpatrick, C., Parker, D. and Zhang, Y.-F. (2006) 'State versus private sector provision of water services in Africa: An empirical analysis', *The World Bank Economic Review*, 20, 143-163.
- Klein M. (2015) 'Public-Private Partnerships: Promise and Hype'. Working Paper n° 7340 -- The World Bank. Available at: <https://elibrary.worldbank.org/doi/ref/10.1596/1813-9450-7340>.
- Klein, B., Crawford, R.G. and Alchian, A. (1978) 'Vertical integration, appropriable rents, and the competitive contracting process', *The Journal of Law and Economics*, 21(2), pp. 297-326.
- Klien, M. (2011) 'Political vs managerial control and public service prices: Evidence from Austrian water utilities', *Working Paper*.
- Konisky, D.M. and Teodoro, M.P. (2016) 'When governments regulate governments', *American Journal of Political Science*, 60(3), pp. 559-574.

- Laffont, J.-J. (2000) 'Étapes vers un Etat moderne : une analyse économique'. Conseil d'Analyse Economique, Paris : la Documentation française.
- Laffont, J.-J. and Tirole, J. (1993) 'A theory of incentives in procurement and regulation, MIT press, Cambridge.
- Lee, C. (2011) 'Privatization, water access and affordability: Evidence from Malaysian household expenditure data', *Economic Modelling*, 28(5), pp. 2121-2128.
- Leigland, J. (2018) 'Public-private partnerships in developing countries: the emerging evidence-based critique', *The World Bank Observer*, 33(1), pp. 103-104.
- Le Lannier, A. (2011) 'Difficultés d'exécution de la concurrence par comparaison: Une application au secteur de l'eau en Angleterre et au Pays de Galles' (French Edition). Editions universitaires européennes.
- Le Lannier, A. and Porcher, S. (2013) 'Gestion Publique ou Privée ? Un benchmarking des services d'eau en France', *Revue d'économie industrielle*, n° 140(4), pp. 19-44.
- Le Lannier, A. and Porcher, S. (2014) 'Efficiency in the public and private French water utilities: prospects for benchmarking', *Applied Economics*, 46(5), pp. 556-572.
- Le Squeren, Z. (2016) "Politics and public administration: The influence of electoral motives and ideology on the management of local public services", Ph.D. thesis, Sorbonne Business School, France.
- Lyon, T.P., Montgomery A.W. and Zhao, D. (2017) 'A change would do you good: Privatization, municipalization and drinking water quality', working paper, Stephen M. Ross School of Business, University of Michigan.
- Marques, R.C. and De Witte, K. (2011) 'Is big better? On scale and scope economies in the Portuguese water sector, *Economic Modelling*, 28(3), pp. 1009-1016.
- Martimort, D. and Pouyet, J. (2008), 'To build or not to build: Normative and positive theories of public-private partnerships', *International Journal of Industrial Organization*, 26(2), pp. 393-411.
- Martínez-Espiñeira, R., García-Valiñas, M. A. and González-Gómez, F. (2009) 'Does Private Management of Water Supply Services Really Increase Prices? An Empirical Analysis in Spain', *Urban Studies*, 46(4), pp. 923 -945.
- Maskin, E. and Tirole, J. 'Public-private partnerships and government spending limits', *International Journal of Industrial Organization*, 26(2), pp. 412-420.
- Masten, S. E. (2011) 'Public Utility Ownership in 19th-Century America: The "Aberrant" Case of Water', *Journal of Law, Economics, and Organization*, 27(3), pp. 604-654.
- McCubbins M.D. and Schwartz T. (1984), *American Journal of Political Science*, 28(1), pp. 165-179.
- McKenzie, D. and Mookherjee, D. (2003) 'The distributive impact of privatization in Latin America: Evidence from Four Countries', *Economia*, 3(2), pp. 161-233.
- Mayol, A. and Porcher, S. (2018) 'Tarifs discriminants et monopoles de l'eau potable. Une analyse empirique de la réaction des consommateurs face aux distorsions du signal prix', *Revue économique*, forthcoming.
- Ménard, C. and Saussier, S. (2000). Contractual Choice and Performance: the Case of Water Supply in France. *Revue d'Economie Industrielle*, vol. 92 (1), pp. 385-404.
- Ménard, C. and Saussier, S. (2002) 'Contractual choice and performance: The case of water supply in France', in Brousseau, E. and Glachant, J.-M. (eds) *The Economics of Contracts: Theory and Applications*. Cambridge, UK: Cambridge University Press, pp. 440-462.

- Ménard, C. and Saussier, S. (2003) 'La délégation du service publique, un mode organisationnel efficace?: Le cas de la distribution d'eau en France', *Revue d'Économie Publique*, 12(1), pp. 99–129.
- Miralles, A. (2008) 'The link between service privatization and price distribution among consumer types : municipal water services in the Spanish region of Catalonia', *Environment and Planning C: Government and Policy*, 26(1), pp. 159-172.
- Mizutani, F. and Urakami, T. (2001) 'Identifying network density and scale economies for Japanese water supply organizations', *Papers in Regional Science*, 80(2), pp. 211-230.
- Moszoro, M.W. and Spiller, P.T. (2012) 'Third-party opportunism and the nature of public contracts', NBER w18636.
- Moszoro, M.W., Spiller, P.T. (2012) and Stolorz, S. 'Rigidity of public contracts', *Journal of Empirical Legal Studies*, 13(3), 2016.
- NUS-Consulting (2008) 'Etude sur le prix de l'eau en Europe en 2008'. Available at: <http://www.mediaterrre.org/europe/actu,20081009103002.html>.
- OECD (2012) *Strategic Transport Infrastructure Needs to 2030*. OECD Publishing. doi: 10.1787/9789264114425-en.
- OECD (2015) *Fostering Investment in Infrastructure*, p. 60. Available at: <https://www.oecd.org/daf/inv/investment.../Fostering-Investment-in-Infrastructure.pdf>.
- OECD (2017) 'Public Private Partnerships for Transport Infrastructure: Renegotiation and Economic Outcomes'. OECD - Roundtable Report 161.
- Picazo-Tadeo, A. et al. (2012) 'Do ideological and political motives really matter in the public choice of local services management? Evidence from urban water services in Spain', *Public Choice*, 151(1), pp. 215–228. doi: 10.1007/s11127-010-9744-0.
- Porcher, S. (2012) 'Do markets reduce prices?', EPPP Chair discussion paper 2012-07, EPPP Chair, Sorbonne Business School.
- Porcher, S. (2014) 'Efficiency and equity in two-part tariffs: the case of residential water rates', *Applied Economics*, 46(5), pp. 539-555.
- Porcher, S. (2017) 'The 'hidden costs' of water provision: New evidence from the relationship between contracting-out and price in French water public services', *Utilities Policy*, 48, pp. 166-175.
- Prasad, N. (2006) 'Privatisation results: Private sector participation in water services after 15 years', *Development Policy Review*, 24(6), pp. 669-692.
- Renda, A. and Schrefler, L. (2006) 'Public-private partnerships. Models and trends in the European Union', Study for the European Parliament's Committee on Internal Market and Consumer Protection.
- Ruester, S. and Zschille, M. (2010) 'The impact of governance structure on firm performance: An application to the German water distribution sector', *Utilities Policy*, 18(3), pp. 154–162.
- Saal, D. S. and Parker, D. (2000) 'The impact of privatization and regulation on the water and sewerage industry in England and Wales: a translog cost function model', *Managerial and Decision Economics*, 21(6), pp. 253–268.
- Saussier, S. and de Brux, J. (2018) 'The Economics of Public-Private Partnerships', Springer International Publishing.
- Saussier, S. and Tirole, J. (2015) 'Strengthening the efficiency of public procurement', 2015/3 (22), Notes du Conseil d'analyse économique.

- Saussier, S. and Tran, P.T. (2012) 'L'efficacité des contrats de partenariat en France : une première évaluation quantitative', *Revue d'économie industrielle*, 140, pp. 81-110.
- Shih, J-S., Harrington, W., Pizer, W.A. and Gillingham, K. (2004), 'Economies of scale and technical efficiency in community water systems', *Resources for the future*, Discussion paper 04-15.
- Smets, H. (2004), 'La solidarité de l'eau potable: aspects économiques', Report, Académie de l'eau, Paris.
- Smith, A. (1776), 'An inquiry into the nature and causes of the wealth of Nations', Strahan and Cadell, London.
- Spiller, P.T. (2008) 'An institutional theory of public contracts: regulatory implications', NBER w14152.
- Spiller, P.T. (2011) 'Basic economic principles of infrastructure liberalization: A transaction cost perspective', in *International Handbook of Network Industries: The liberalization of infrastructure*, Edward-Elgar, pp. 11-25.
- Stiel, C. (2017) 'Modern Public Enterprises: Organisational Innovation and Productivity'. Working Paper 1713, DIW Berlin, December.
- Suárez-Varela, M. et al. (2016) 'Ownership and Performance in Water Services Revisited: Does Private Management Really Outperform Public?', *Water Resources Management*, pp. 1–19.
- VEWA (2015) 'Comparison of European water and wastewater prices', Report.
- Troesken, W. (1999) 'Typhoid rates and the public acquisition of private waterwork, 1880-1920', *The Journal of Economic History*, 59(4), pp. 927-948.
- Troesken, W. (2001) 'Race, disease, and the provision of water in American cities, 1889-1921', *The Journal of Economic History*, 61(3), pp.750-776.
- Wallsten, S. and Kosec, K. (2008) 'The effects of ownership and benchmark competition: An empirical analysis of US water systems', *International Journal of Industrial Organization*, 26(1), pp. 186-205.
- Walter, M., Cullmann, A., von Hirschhausen, C., Wand, R. and Zschille, M. (2009) 'Quo vadis efficiency analysis of water distribution? A comparative literature review', *Utilities Policy*, 17(3-4), pp. 225–232.
- Williamson, O.E. (1976), 'Franchise bidding for natural monopolies – in general and with respect to CATV', *Bell Journal of Economics*, 7(1), pp. 73-104.
- Williamson, O.E. (1985) *The Economic Institutions of Capitalism*, The Free Press.

Authors contacts:

Simon Porcher and Stéphane Saussier

IAE de Paris - Sorbonne Business School

8 bis rue de la Croix Jarry

75013 Paris

France

Email: porcher.iae@univ-paris1.fr

Email: saussier.iae@univ-paris1.fr