

Innovation and Regulatory Outcomes: Evidence from the Public-Private Contracts for Water Supply in France

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Abstract

One of the most important pitfalls associated with public-private partnership schemes (PPPs) conducted in natural monopoly industries is the difficulty of replacing the winning firm after a contract has been signed. Hence regulatory outcomes would depend on the balance between the opportunistic and reputational behavior of the incumbent firm. The aim of this chapter is to investigate whether investment in innovative leak detection technologies tilt the balance in favour of reputational behaviour by water companies involved in PPP schemes in French municipalities. Using a database of more than 4,000 observations collected in the French water industry in 2004 and 2008 and probit regression, we report that the threat of competition (measured by the percentage of municipalities in the department that chose in-house provision, the concentration of private operators in the department or by the time left to the end of the contract) induces firms to behave opportunistically – i.e., it reduces the probability of the firm provision of vital information on the state of the network. However, we also report that investment in costly and innovative leak detection technology (proxied by the existence of geo-referring information system to localize leaks) increases the probability of providing network information.

1. Introduction

Many scholars advocate that competition for the market can efficiently substitute for competition on the market in network industries characterized by natural monopoly characteristics (Demsetz [1968], Posner [1972]). However, the literature also emphasizes that a lot of potential pitfalls arise when public authorities implement auctions for the award of public-private partnership (PPP) contracts in monopolistic sectors (Crocker and Masten [1996]). One of the most important problems lies in the fact that the firm winning the very first auction can hardly be replaced at the end of the contract. The transaction cost literature (Williamson [1976], Klein [1998]) suggests that when the incumbent is in charge with the realization of specific investments a bilateral dependency arises between the firm and the public authority. The problem lies in the fact that the value of these assets would be lost if the firm is replaced. The existence of specific assets then creates a “lock in” situation that makes it difficult for the public authority to switch for another firm. As a consequence, the incumbent disposes of a “first mover” advantage over rivals at contract's renewal (Williamson [1975]). Whether this advantage lies in opportunistic or reputational behaviours remains an open question.

To the extent that the incumbent may be aware that his monopoly position can hardly be challenged, he may have incentives to behave opportunistically. Several kinds of opportunistic behaviours are analysed in the empirical literature. The firm may renege on its contractual promises after the contract is signed (Zupan [1989b], Prager[1990]). For instance, it may deliberately overestimate demand or underestimate costs to obtain the market and then, ask for a price increase pretending that it did not anticipate the bad market conditions. Empirical evidence however shows that the incumbent's advantage at contract's renewal is not a myth, even though they do not take advantage of their monopoly position to behave opportunistically. The authors explain that the existence of powerful reputation effects is important to curb firms' bad conduct. However, they do not explain why firms can have incentives not to behave opportunistically.

The literature on relational contracting does so. Following Kim [1998], an operator renews the contract with a well-performing agent when the value of future cooperation is greater than the one-shot gain from reneging on the promised rent. Reputation building can make the agent work harder: investments in innovative capital are a measurable input of these reputational concerns. In the theory of the firm, reputation is viewed as an asset or a resource providing to the firm a competitive advantage (Rao, [1994]; and Dowling, [2002]). Consequently, a large part of the literature on reputation is devoted to the link between corporate social responsibility and financial returns. Within the setting of relational contracting, contract renewal acts as an implicit incentive mechanism to motivate the agent to invest in its reputation in order to create a business asset that can substitute for detailed contractual controls (Gulati, [1998]).

The literature on innovation and its impact on the firm shows that investing in innovative capital increases the quality of products and corporate reputation (Branco and Rodrigues, [2006]) while product differentiation through innovation helps reputation building (Fombrun and Shanley, [1990]). Hoppe and Schmitz (2010) link innovation to reputation in a PPP framework. In their model, the builder provides the basic version of the infrastructure and can exert unobservable effort to come up with an innovation, which may reduce the costs of adapting the public service to future needs. Such innovation can be rewarded with a suitable bonus payment. Under renewable contracts, the incentive to innovate is the renewal and the innovation can be considered as a measure of reputation. Naturally,

investments in innovation create a lock-in situation in which the incumbent increases asset specificity and thus the winners' curse.

At the empirical level, Affuso and Newberry [2002], focusing on the British railway industry, find that Train Operating Companies tend to increase their investments when the contract's duration shortens, i.e. when competitive pressure increases. However, they fail to determine whether the investments realized are really specific and aim to create a "lock-in" or if they merely represent a signal sent by incumbent operators to the regulator in order to prove their commitment and then, to enhance their chance to be awarded the subsequent franchise. Theoretical and empirical studies in contract theory also point out a possible increase in the performance of franchise bidding agreements before contract's renewal (Yvrande-Billon and Gautier [2008], Rey and Iossa [2010]). Whether this time constraint can mitigate or exacerbate the impact of asset specificity on reputational behaviours remains an open question.

In this paper we focus on strategic actions that may be pursued by incumbents precisely in the perspective to raise rivals' entry costs and then to increase their "first mover" advantage. More precisely, we study incumbents' incentives to withhold information during the PPP contract. The existence of realized specific investments in innovative capital can break the information gap existing between the municipality and the private operator. However, firm behaviour is affected by the degree of competition for the market at the local level and the life cycle of the contract. In contracts that are characterized by a limited duration, the time to the end of the contract is an important determinant of the strategic behaviour of the firm.

Using a dataset on the French water industry by compiling data coming from the French Environment Institute (IFEN), the French Health Ministry (DGS) and the National Statistics Institute (INSEE) and based on more than 4,000 French municipalities with water services under private management are observed in 2004 and 2008, we show that incumbent firms that invested in innovative leak detection systems diffuse more information about the network. Indeed, a large part of the information asymmetry might be due to a lack of investments in information systems. Investing in innovative technologies then breaks the potential opportunistic behaviour of the firm. However, past investments in innovative leak detection systems are negatively correlated with the potential challenge of the rivals and increase the "lock-in" situation. This result can be interpreted as strategic market protection behaviour. However, when competition intensity increases, the level of information transmitted decreases, a situation that helps the incumbent to preserve his informational advantage over potential challengers. As rivals are not properly informed about the state and various characteristics of the network, they may be discouraged to bid so as to avoid the winner's curse problem (Wilson [1967]).

To sum up, then, our results are consistent with the three following ideas. First, past innovations impact the regulatory outcomes. Second, incumbent firms tend to withhold information in order to maintain their competitive advantage at contract's renewal or when the degree of competition is important. Third, the interaction of the level of innovation with the degree of competition is negative, i.e. competitive pressure mitigates the positive impact of innovative capital input on the level of information transmitted to the public authority. These results however contrast with previous empirical findings emphasizing the role of reputation effects as an efficient way to deter opportunism in PPP contracts.

The remainder of the paper is organized as follows. The second part is devoted to a brief description of the French water industry and our dataset. We then describe the analytical framework and derive the testable propositions before showing the results of the empirical analysis. A brief conclusion follows.

2. The French Water Industry: Governance, Competition and Innovation

2.1. Governance of Water Public Services

In France, as in most European countries, municipalities must provide local public services that have public good characteristics. However, if the responsibility for service provision is public, its management can be either public or private. In this case, they may choose between alternative contractual arrangements that differ according with regards to the operator's investments in the service and the allocation of risk across the two parties.

There are several types of organizational modes for local public services. Direct public management implies that the public authority undertakes all operations and investments needed for the provision of the service. Alternatively, the local public authority may choose to involve an outside firm in the operation of the service choosing a PPP contract. Most contracts involving a private firm are lease contracts. In those agreements, the firm is in charge with the day-by-day service operation (water production and distribution, network maintenance, bills' collection, water pressure supervision etc.). What is more, the firm is directly remunerated by consumers' bills, exposing her to some operating risks. However, the most important investments, and notably the investments concerning network renewals and extensions are generally realized by municipalities.

There are however other types of PPP contracts French municipalities can use. These arrangements differ according to the importance of the investments and financial risks beard by the firm. Alternatively, the local public authority may choose to involve an outside firm in the operation of the service choosing a "gerance" contract in which it pays an external operator a fixed fee, or an "intermediary management" contract that is similar to the gerance contract except that a small part of the operator's revenues depend on its performance. These contracts proffer few incentives to reduce costs and transfer no (or few) risks and decision rights to a private operator. Finally, under a "concession" contract, the external operator also undertakes construction risk, as it must finance a large part of investments over the duration of the contract. Moreover, the infrastructure is typically transferred to the local public authority at the end of the contract, most often without financial compensation. These contractual agreements differ from the previous ones in that they give operators incentives to reduce costs, and operators share risk in exchange for greater decision rights and claims on revenues.

The firm managing the water service through a public-private contract accumulates over time some strategic information about demand characteristics, the state of the network and more generally about the operating costs. Naturally, it may have incentives to withhold its private information in order to make it more difficult for outsiders to compete on its market at contract's renewal. Facing an opportunistic incumbent, municipalities may face important difficulties to obtain information about the water service. This is especially true if we consider the acquisition of network information to the extent that in the water industry, the pipes are underground and then, not easily observable. Of course, municipalities may engage in auditing procedures by hiring independent consultants to improve their network's knowledge. But these procedures may be costly so that many municipalities may be reluctant to bear such costs.

Nevertheless, when reputation mechanisms do exist, incumbents' incentives to disclose information may be enhanced. For instance, they may decide to behave fairly when they think that such a strategy can be useful in the perspective of obtaining new contracts in other regions. This situation can be

referred to as “reputation effects external to the existing relationship” because the incumbent behaves fairly so as to increase his chance to extend his market to other municipalities (Zupan [1989b]). Of course, in situations when the incumbent has incentives to cooperate, the municipality may obviously be able to obtain information about the water service at a lower cost than if auditing procedures had to be used.

2.2. The Organization of Competition

Since the “Sapin law” (1993), the public authority can select its partner following a two-step procedure. In a first step, the public authority launches a classic invitation to tender opened to all interested operators. At the end of the tendering procedure, the public authority shortlists the candidates allowed to take part in the second phase of selection. This second step consists in a negotiation process between the public authority and the short-listed candidates. At the end of the negotiation, the public authority chooses its final partner for the duration of the contract.

In inviting tender, the local public authorities are not legally constrained in setting the criteria according to which it short-lists and ultimately chooses an operator. Moreover, it needs not publicize its subjective criteria, creating an informational asymmetry between the local public authority and prospective operators and giving the local public authority greater latitude in selecting a partner. This could reduce competition for the field and facilitate collusion among operators or between the local public authority and some operators. But giving municipalities freedom in the choice of their final partner may also induce some desirable outcomes. For instance, when the selection process is flexible, the municipality may be able to threaten not to renew the incumbent in the case when he submits the most interesting bid, but by taking strategic decisions that prevent challengers from competing on a fair basis. If this threat is perceived as credible, the incumbent may finally prefer to disclose his private information in order to preserve some chance to keep his ongoing market at the rebidding stage. This situation can be referred to as “reputation effects internal to the existing relationship” because the fear of losing the current contract may dissuade firms from behaving opportunistically. In a rigid auction procedure, the municipality would be obliged to simply choose the lowest bid, and then to renew the opportunistic incumbent.

Therefore, in the French institutional context characterized by a flexible selection process, there is some place for internal reputation effects to play a role. But these reputation effects will exist only if municipalities can credibly commit to terminating opportunistic incumbents, which imply to bear the political costs of such a decision. Indeed, in the case when the incumbent decides to withhold information, bidding parity is not ensured anymore and the probability increases that the bid proposed by the best challenger is higher than the incumbent's bid. This is due to the fact that challengers' winner's curse problem incites them not to bid aggressively. Nevertheless, selecting a challenger who submits a less interesting bid than the one proposed by the opportunistic incumbent may not be politically sustainable. Therefore, if the incumbent anticipates that the non renewal sanction is not credible; his incentives to withhold information may not be curbed.

2.3. Investments in specific innovative assets

Innovation in water industries is characterized by two facts. On the one hand, water is a cheap good: the cost of producing tap water lies mainly in its treatment and its transportation. In France, leaks represent around 20% of the stock of water introduced in pipes. Even if water is cheap, it is however not free and it can be costly in the end for private operators or for the customers themselves if they have to pay for the leaks in their bills. On the other hand, investments in leak detection systems are costly and may have an immediate impact on prices. This could be one of the reasons why few

operators invest in this kind of monitoring systems: investments should be done at the beginning of the contract to avoid a “hold-up” of their investments. In order to protect operators or public actors from the “hold-up” dilemma, contracts make the differences between private and public domains. Some investments might be done by private firms and remain in the public domain at the end of the contract while investments made on purpose of the private domain will be removed at the termination of the contract.

How does investment in innovation affects firm’s behaviour? One would expect firms investing in strategic assets to behave opportunistically at the renewal: the threat of withdrawing private investments in case of operator change is an important explanation of path dependency, i.e. the fact that there are few switches from an operator to another at the end of the contract (see Chong et al. [2012] for a discussion of “switchers”). In our framework, we use past investments in innovative capital input as a proxy of firm behaviour. The use of a modern technology to deter leaks is a signal for reputational concerns and thus we expect the level of transferred information to be more important when such investments are implemented. However, such behaviour should be mitigated by the level of competition for the market. When competition is high, firms’ past investments in innovative capital input result in lower level of information transferred to the municipality.

3. Variables

3.1. Descriptive Statistics

Our dataset is made of 4,355 observations at the municipal-level for two different years, representing overall 2,647 municipalities under PPP contracts. All observations represent a PPP contract signed between a municipality and a private firm. The dataset is nationwide so the distribution of observations covers the whole French territory. We now present the different variables and give some descriptive statistics about each variable.

3.2. Dependent Variable

In order to investigate our empirical question, we have to find a proxy measuring the importance of the information transmitted by the incumbent firm to the municipality. In a PPP agreement, the incumbent firm is expected to update the network maps to the extent that he is in charge with the operation of the service. Maps' updates can provide structural information (date when the pipe was installed, kind of material used for the pipe, topographic information etc.). But they can also provide information about the interventions realized on the network during the year (localization of mains' repairs for instance). Frequent updates enable the municipality to constantly have new information that may be useful to plan future investments on the network and to enhance bidding parity at contract's renewal. These arguments certainly explain why French legislation advises updating the network maps at least once a year.

Our data allowed us to construct a dummy variable equal to 1 when network maps' updates are observed in the municipality in 2008. At the opposite, the value of the proxy is 0 if no update is realized (variable INFO). Of course, our proxy does not enable us to assess the importance and the nature of the updates when there are any. But we can be confident about the fact that more network information is available to the municipality when INFO equals 1 than when INFO equals 0.

As table 1 in appendix shows, 76.9% of municipalities have updated at least a small part of the maps of the network during the year.

3.3. Innovative Capital

As we mentioned above, investments in leak detection systems are heavy and specific. Investments in such capital assets are expected to be positively linked with the level of information transferred to the principal by the agent. These systems can be inexistent, manual or computer-based. The more complex system is the one using geo-referring (variable GIS) as it automatically target and localize leaks. The impact on the level of information of the dummy GIS_j equal to 1 if the municipality has a geo-referring information system can be twofold. On the one hand, such investments strengthen the “winner’s curse” as they are the property of the incumbent. As a result, not renewing the incumbent would be associated to the withdrawal of a part of investments or to high entry cost for the new selected firm that would have to buy the incumbent’s fixed capital. In this case, we expect GIS to have a positive impact on INFO. On the other hand, large investments made by an operator are a signal similar as an increased effort by the agent in a principal-agent framework. In this case, investments in leak detection systems are associated with increased transmission of information to signal reputation.

In our sample, 58.2% of municipalities are partly or fully equipped with geo-referring systems. The remaining municipalities are not equipped with geo-referring systems but with simple information systems or manual detection systems.

3.4. Competition Variables

As we already stressed, opportunistic considerations may induce an incumbent firm to conceal their private information about the network whereas reputation effects may induce her to reveal more information. Therefore, map updates should be more likely in those situations when reputation effects are important. On the contrary, they may be less likely in those situations when incumbents have incentives to behave strategically.

To account for the impact of reputation effects and strategic behaviours on our dependent variable, the first proxy we consider is a Herfindahl-Hirshman index (HHI) calculated at the departmental level. We then derived a variable that represents the potential competition between firms in the region:

$$PCOMP_j = 1 - HHI_j$$

where HHI_j is the Herfindahl-Hirshman index for a given department *j*. This indicator captures the perspective for an incumbent to conquer new markets in the area where he operates. Intuitively, the higher is PCOMP_j (or equivalently the lower HHI_j), the higher is the perspective for the incumbent to conquer new markets. On the contrary, when PCOMP_j equals 0 (or equivalently when HHI_j equals 1), this means that there is only one firm operating in the region, which means that this firm has presumably few possibilities to conquer new markets. In our dataset, PCOMP is on average equal to 0.862, i.e. the level of competition is presumably high. Therefore, in geographical areas where several firms are present, incumbents may have more incentives to provide network information. Behaving fairly may enable them to build a good reputation that may be helpful to extend their market shares at the expense of their rivals. We then expect a positive sign for PCOMP_j if reputation effects matter, a negative sign if firms are more keen on behaving opportunistically.

However, if the presence of other firms in a region may enhance the perspective to conquer new markets for an operator, these firms may also represent a threat for the incumbent. Indeed, when disclosing network information, an incumbent may encourage these firms to come and compete in the markets he operates at contract's renewal. As the incumbent may prefer to give priority to the

protection of his current market, we cannot exclude the possibility that the presence of other operators in the neighbourhood fosters his strategic behaviours instead of lowering them. In other words, a negative sign for $PCOMP_j$ may be consistent with the idea that incumbents disclose less network information in areas where the number of other suppliers is high so as to protect their market from competition. The intersection between the proxy for competition intensity and the level of innovation should then be negative.

The degree of potential competition between firms at the local level appears to have an ambiguous effect on incumbents' incentives to update the network maps. The same reasoning is true if we consider competition among organizational modes instead of inter-firm competition. More precisely, a second proxy measuring for each region the market shares of in-house provision is introduced ($SHARED M_j$). The higher this variable, the more the region is dominated by direct public management services. In particular, a high value for $SHARED M$ means that the municipalities involved in a PPP contract in these regions are likely to be located near other municipalities providing water in-house. On average $SHARED M$ equals 0.037, meaning that the intensity of competition coming from public actors is rather low. However when a municipality involved in a PPP agreement is located in the neighbourhood of municipalities that opted for direct management, it can easily associate with them at the end of the PPP and benefit from their experience in the case when they are not satisfied with the performance of their incumbent. In other words, the proximity of municipalities providing water in-house makes the transition to direct management easier for municipalities in PPP at the end of the contract.

The variable $SHARED M$ then proxies the degree of potential competition between PPP and in-house provision, and in the same way as $PCOMP$, we expect this variable to have an ambiguous impact on incumbents' incentives to disclose network information. On the one hand, the proximity of other municipalities that operate their water service in-house may induce the incumbent to behave less strategically in order to send a good signal to these municipalities and convince them to switch for a PPP contract. On the other hand, the dominance of in-house provision in the department may also represent a threat for the current markets detained by the incumbent to the extent that the municipalities they contract with may switch more easily from a PPP to direct management at the end of the contract. As a consequence, when $SHARED M$ is high, the incumbent may have incentives to disclose less network information in order to make the transition to in-house provision more costly for the municipality.

To summarize, a positive sign for the two geographical competition variables described above may reflect incumbents' incentives to behave fairly in order to conquer new markets (reputation). However, a negative sign may reflect a strategic behaviour of market protection (opportunism). We particularly expect the interaction between competition and innovation to increase or decrease these reputation or opportunism effects.

3.5. Contractual Characteristics

In our database, we also dispose of variables reflecting the contractual characteristics of the service. In particular, we account for the influence of the contract's expiring date on the incumbent's incentives to disclose information. For this purpose, we created a variable called $EXPIRY$. It represents the difference between the year when the contract expires and the year of observation. Hence, the smaller $EXPIRY$, the closer the PPP contract to its expiring date.

We suspect that under some circumstances, the incumbent's incentives to provide network information may decrease when the end of the contract comes. In such a situation, $EXPIRY$ would have a positive

sign (since lower values for EXPIRY would be associated on average with lower values for INFO). First, the information disclosed toward the end of the contract is more valuable to increase competition at the next bidding process than the information disclosed a couple of years before. Second, concealing information at the end of the contract is strategic behaviour of the incumbent in order to get renewed.

Let us explain in more details why the incumbent's incentives to disclose network information may be lower at the end of the contract than at the beginning. First, an important institutional feature of the French water services is that municipalities are in charge with the network's renewal in the wide majority of the PPP agreements. Obviously the more reliable the information they have about the network, the more efficient the investments realized. However, efficient investments reduce water leakages and then affect the incumbent's operating costs. Therefore at the beginning of the PPP contract, the incumbent may find an interest in disclosing its private information. Of course, behaving fairly may reduce his informational rents but this reduction may be more than compensated by a decrease in his operating costs enabled by municipalities' more efficient investments.

Nevertheless, at the end of the contract, the information disclosed by the incumbent may decrease for two reasons. First, the information revealed at the end of the agreement may decrease the operating costs of the water service in the future, but the incumbent is not sure anymore that he will be the next supplier. In other words, he may be reluctant to reveal information that may benefit the subsequent firm. Second, the more the contract approaches its end, the more the information disclosed by the incumbent can be used by rivals to compete for the market at the subsequent auction or by the municipality to switch for in-house provision. As the incumbent wants the degree of competition to be as low as possible, he may decide to conceal more and more information as the contract's expiring date arrives. Such behaviour may disadvantage rivals' firms because as they lack information, they may decide not to bid at contract's renewal or they may include a risk premium in their bid to take into account the winner's curse problem. What's more, information concealment may increase the transition costs incurred by the municipality to switch for in-house provision.

However the argument that opportunistic behaviours should increase when the contract's end comes can be contested. Theoretical and empirical studies in contract theory also point out a possible increase in the performance of franchise bidding agreements before contract's renewal, suggesting that opportunism may decrease over time (Rey and Iossa [2010], Yvrande-Billon and Gautier [2008]). A first reason advanced by the literature to explain this result is that because of bounded rationality problems (limited memory, myopia), public authorities may forget or forgive bad past behaviours and then, they may rather focus on recent performances to decide to renew the incumbent or not. A second argument lies in the fact that when the contract's expiring date gets closer, the incumbent becomes more concerned with his contract's renewal than at the beginning of the agreement, which may induce fairer conduct.

3.6. Interactions

A question that arises is then how competition and investments in innovative capital are relied to impact information. As we do not draw any hypotheses on the impact of competition and innovation, we could expect competition to increase the impact of past investments on information transmitted to the municipality or to decrease the impact of investments in innovative capital to the municipality. Interactions of GIS with PCOMP, SHAREDMD or EXPIRY are included in the regressions and the expected coefficients are expected to have the same signs.

3.7. Control Variables

We also included in the model a set of control variables that might impact on the firm's incentives to disclose information. We also consider a variable that can be a good proxy for the capacity of the municipality to force the incumbent to produce information. The DENSITY, measured as the ratio of the population of the municipality with the length of the network, can impact the level of information disclosed by the firm. Indeed, municipalities with a large density probably have a higher capacity and higher incentives to get detailed network maps from the operators because they have more skilled staff and deeper financial resources to hire technical experts that can control the nature of the information disclosed by the firm.

SCARCITY is a ratio that measures the degree of independence of a municipality concerning the provision of water to its population. The lower SCARCITY, the more the municipality is obliged to import water from other municipalities to meet users' demand. If SCARCITY is close to 0, the firm running the water service totally depends on the imports of another municipality for their users' water provision. Water scarcity may incite incumbents to improve network performance in order to economize on water losses. This may result in higher incentives to disclose information to the municipality so as to induce efficient investments that may contribute to reduce leaks.

We also consider whether a municipality that is part of a group of municipalities to provide water has bigger market power. A dummy INTER-AUTHORITY equals 1 if the municipality provides water jointly with others and 0 otherwise. This is due to the fact that a group of municipalities may have higher experience and financial power than municipalities alone. We expect a positive impact of this dummy on the level of information disclosed by the firm to the public authorities.

Dummies for the three big operators and for municipalities operated by joint ventures are finally used as controls with independent operators as the reference variable. We account for the possibility that some operators can be more reluctant to provide information than others.

A detailed description of all the variables and descriptive statistics are reported in Table 1 in appendix.

4. Model and Results

4.1. Empirical Set-Up

The general model we intend to test takes the following form:

$$INFO_i = \alpha_1 GIS_i + \alpha_2 INTER_i + \alpha_3 PCOMP_i + \alpha_4 SHARED M_i + \alpha_5 EXPIRY_i + \beta X_i + \varepsilon_i$$

where $INFO_i$ is a proxy for information, GIS_i is a dummy equal to 1 if the operator has invested in specific leak detection systems, $INTER_i$ is the interaction term between GIS_i and one of the indicators of competition ($PCOMP_j$, $SHARED M_j$ or $EXPIRY_j$), $PCOMP_i$ is the reported value of $PCOMP_j$ for the municipality i located in the department j , $SHARED M_i$ is the reported value of $SHARED M_j$ for the municipality i located in the department j , $EXPIRY_i$ is the number of years before the PPP contract's expiring date in the municipality i , and X_i is a set of controls for a given municipality i . This equation is estimated using a standard probit procedure.

4.2. Results

Table 2 in appendix shows our estimates of the impact of GIS, INTER, PCOMP, SHARED M and EXPIRY on INFO.

In all models, investments in specific innovative capital input GIS have a significant positive coefficient on the level of information that is transmitted to the municipality. Innovation enhances strategic reputational behaviours but leads also to the lock-in situation identified by Williamson [1975]: specific investments guarantee incumbents to be renewed at the end of the contracts, which enhances reputational behaviour rather than opportunistic behaviour. The interaction term between GIS and PCOMP is negative but not significant while it is negative and significant for the interaction between GIS and SHARED.M. The level of information transmitted by the incumbent to the municipality decreases with competition intensity. A similar result is found for the interaction between GIS and EXPIRY which as a significant positive sign. When EXPIRY gets closer to 0, the level of information transmitted by the incumbent to the municipality decreases.

We now turn to the proxies for competition. PCOMP has a non-significant impact on the level of information. Our results suggest that SHARED.M has a negative impact that is significant in models (1) and (3). The higher the potential degree of competition between organizational modes in a department, the lower the firms' incentives to conceal information. Therefore, the data suggest that the presence of several municipalities choosing in-house provision in the same geographical area seems to induce private firms operating in this area to conceal information. A high degree of potential competition among firms does not seem to significantly accelerate incumbents' incentives to withhold information. This result may be explained by the fact that competition between organizational modes may represent a more credible threat for private operators than competition between firms (Chong et al. [2006]). In other words, private firms may be more afraid to be evicted and replaced by a public manager than by another firm, and then they behave more strategically in the first case. Indeed, the concentration of the French water industry and collusion strategies may make the eviction of an incumbent firm not credible, even when several competitors exist in the department.

In our estimations, EXPIRY has a positive sign and it is significant in the specifications where it is not interacted with GIS. Therefore, the farther the contract's expiring date, the higher the incentives to disclose information. In other words, as the improvement of the competitive environment at the departmental level tends to foster strategic behaviours, the closeness of the contract's renewal has the same effect, suggesting the existence of opportunistic effects at the end of the PPP contract.

To sum up, our preliminary results suggest that in France, investments in innovative capital are strategic behaviours to increase the reputation of the firm. Opportunistic behaviours are on average stronger when competitive intensity increases. Arguably, private firms may on average be all the more tempted to signal their quality during the contract by implementing innovative capital input; but they may decrease their cooperation at the margin at the end of the agreement in order to lock-in the market.

DENSITY, INTER-AUTHORITY and SCARCITY have a significant positive impact. DENSITY increases the level of transmitted information. One possible explanation for this result may be that when density is high, competition for the market is higher and then the firm behaviour is based on reputational investments. As expected, INTER-AUTHORITY has a positive impact on the level of information transferred to the municipality. SCARCITY has a significant positive sign as expected, because SCARCITY induces higher incentives to disclose information to the municipality so as to enhance efficient investments that may contribute to reduce leaks.

Finally, operators' fixed effects show no significant impact except for one of the main operator (OPERATOR1). Independent operators are the reference variable. It seems that only the main operator has a clear strategy to provide more information and invest in reputational behaviours.

5. Conclusion and policy recommendations

In this paper, we intended to contribute to the debate about firm's opportunism vs. reputation in PPPs by specifically studying firms' behaviour with regards to their incentives to disclose network information. We particularly focused on two factors that could influence the firm's behaviours: investments in innovative capital and competition intensity at the regional or at the contractual level. Our results show that innovative capital input has a positive impact on firm's information disclosure. The inverse result is found for competition at the regional level or at the contractual level thus proving that firms behave opportunistically when competition is higher. The interaction between both effects shows that competition mitigates the impact of investments in innovative capital on the level of information transmitted to the municipality. In their will to lock-in the market, private firms can have strategic reputational behaviours, a pattern that is rarely underlined in the literature on PPPs.

Of course, our work has some limitations. The most important one lies in the fact that we don't take into account the possibility that some PPP contracts may include provisions stipulating some performance obligations that have to be fulfilled by the firm with regards to information disclosure. We intend to address this shortcoming in the near future.

Nevertheless, our work raises an important point for policymakers. We showed that firms involved in PPP contracts in the water sector may strategically react to the competitive environment by concealing network information in order to raise rivals' entry costs. Therefore, some policies that aim to foster competition in this industry may fail if they don't take into account the strategic behaviours that could be adopted by incumbent firms in order to protect their rents. This is especially true when specific investments in innovative capital have been undertaken. Arguably, regulatory policies that reinforce the obligation for incumbents to collect and transmit network information to public authorities should be encouraged.

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Table 1: Descriptive Statistics

Variable	Definition	Mean	Std. Dev.	Min	Max
INFO	Takes the value 1 if a network map update is observed in 2004 and 2008	0.769	0.422	0	1
GIS	Takes value 1 if the local authority has geo-referring information system to localize leaks	0.582	0.493	0	1
PCOMP	Proxy for the potential competition intensity at the department level	0.862	0.068	0.489	0.972
SHARED	Percentage of the municipalities in the department that chose in-house provision	0.038	0.089	0	0.877
EXPIRY	Time to the end of the contract measured in years (year of contract termination – 2004)	6.541	4.335	0	25
DENSITY	Population per kilometer of pipe	0.022	0.029	0	0.882
INTER-AUTHORITY	Takes value 1 if the local authority is organizing water distribution in cooperation with other local authorities	0.777	0.417	0	1
SCARCITY	Produced volume/(produced volume + imported volume)	0.879	0.237	0	1
OPERATOR1	Takes 1 if the local authority has a PPP contract with this operator	0.407	0.491	0	1
OPERATOR2	Takes 1 if the local authority has a PPP contract with this operator	0.229	0.421	0	1
OPERATOR3	Takes 1 if the local authority has a PPP contract with this operator	0.230	0.421	0	1

Table 2: Results from the Probit estimations

VARIABLES	(1) INFO	(2) INFO	(3) INFO
GIS	1.368** (0.623)	0.699*** (0.0580)	0.352*** (0.0867)
GIS*PCOMP	-0.822 (0.716)		
GIS*SHARED		-0.880* (0.493)	
GIS*EXPIRY			0.0493*** (0.0106)
EXPIRY	0.0174*** (0.00526)	0.0172*** (0.00524)	-0.00694 (0.00787)
SHARED	-0.866*** (0.294)	-0.483 (0.366)	-0.861*** (0.296)
PCOMP	0.538 (0.971)	0.272 (0.942)	0.459 (0.933)
DENSITY	0.000960* (0.000512)	0.000958* (0.000512)	0.000966* (0.000514)
INTER- AUTHORITY	0.237*** (0.0633)	0.234*** (0.0635)	0.235*** (0.0633)
SCARCITY	0.451*** (0.0974)	0.451*** (0.0975)	0.450*** (0.0978)
OPERATOR 1	0.186** (0.0865)	0.183** (0.0867)	0.208** (0.0876)
OPERATOR 2	-0.0897 (0.0896)	-0.0955 (0.0901)	-0.0783 (0.0903)
OPERATOR 3	-0.00400 (0.0896)	-0.00533 (0.0898)	0.0110 (0.0900)
Constant	-0.732 (0.824)	-0.512 (0.798)	-0.498 (0.791)
Pseudo R ²	0.119	0.119	0.122
Observations	4,351	4,351	4,351

City-clustered robust standard errors in parentheses with ***p<0.01 **p<0.05 *p<0.1