

EPPP DP No. 2012-11

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

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December 2012

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INTRODUCTION

Many scholars advocate that competition for the market can effectively 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 it is difficult to replace the firm winning the very first auction 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 to another supplier. As a consequence, the incumbent enjoys a “first mover” advantage over rivals at contract renewals (Williamson, 1975). Whether this advantage is due to opportunistic behaviour or reputational bonus remains an open question.

To the extent that incumbents may be aware that it is difficult to challenge their monopoly position, they may have incentives to behave opportunistically. Several types 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. Although the empirical evidence indicates that the incumbent's advantage at contract renewal is not a myth, the incumbents do not necessarily take advantage of their monopoly position to behave opportunistically. This is usually due to reputation concerns that may restrain the firms' opportunistic conduct. The problem with such findings is that they do not provide a satisfactory explanation as to why firms would have reputational concerns if they know that they have a first-mover advantage and what factors may tilt the balance in favour reputational concerns and opportunistic behaviour.

The literature on relational contracting addresses these questions. According to Kim (1998), a principal renews the contract with a well-performing agent when the value of

future cooperation is greater than the one-shot gain from renegeing on the promised rent. Reputation building can make the agent works 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 the firm with a competitive advantage (Rao, 1994; 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 et al. (2012) link innovation to reputation in a PPP framework. In their model, the agent 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 of the contract 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.

Focusing on the British railway industry, Affuso and Newberry (2002) 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 chapter, 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 PPP contracts in the water industry. The level of specific investments in innovative capital can break the information gap between the principal (usually, a municipality) and the agent (usually, a 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 compiled by 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 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, in France 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 chapter 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.

THE FRENCH WATER INDUSTRY: GOVERNANCE, COMPETITION AND INNOVATION

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, municipalities may choose between alternative contractual arrangements that differ

according to the operator's investments in the service and the allocation of risk across the two parties.

Governance of water services

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-to-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 that French municipalities also use. These arrangements differ according to the importance of the investments and financial risks borne by the firm. Alternatively, the local public authority may choose to involve an outside firm in the operation of the service choosing a “*gérance*” contract in which it pays an external operator a fixed fee, or an “intermediary management” contract that is similar to the *gérance* 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 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 for 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 compared to the alternative of conducting costly audits.

Organization of the competition

Since the "Sapin law" (1993), the public authority can select its partner following a two-step procedure. In the 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 involves 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 the incumbent with nonrenewal of the contract even though the incumbent's bid is advantageous but is also characterized by strategic decisions that prevent challengers from competing on a fair basis. If the municipality's 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 despite the political costs implied by such decisions. Indeed, when the incumbent decides to withhold information, the 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 the challengers' winner's curse problem induces 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.

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.

EMPIRICAL STRATEGY

Our dataset consists of 4,351 observations at the municipality level for two different years (2004 and 2008), representing a total of 2,647 municipalities with PPP contracts. Each observation represents 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. In what follows, we present the variables and provide detailed descriptions for each variable.

Our *dependent variable* captures the reputational concerns of the incumbents and it is proxied by updates of the network maps which, in turn, reflects the information transmitted by the incumbent firm to the municipality. In a PPP agreement, the incumbent firm is expected to update the network maps if the incumbent is in charge of operating the service. Network map 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 (locations of mains repairs for example). 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 renewal. These aspects explain why the French legislation requires updating the network maps at least once a year.

Our data allowed us to construct a dummy variable (*INFO*), which is equal to 1 when network map updates are observed in the municipality in 2004 and 2008. In contrast, the value of the *INFO* is 0 if no update is realized. Of course, our proxy does not enable us to assess the quality and the extent of the updates, but we can be confident about the fact that more network information is available to the municipality when *INFO* equals 1 compared to when *INFO* equals 0. As can be seen in Table 9.1, 76.9 per cent of the municipalities have at least partial updates the network maps in 2008.

Insert Table 9.1 here

As indicated above, investments in leak detection systems are costly and specific. Investments in such systems are expected to be positively related to the dependent variable (*INFO*), which captures the network map update information transferred to the principal by the agent. Leak detection systems can be non-existent, manual or computer-based. The more complex system is the one that use geo-referring systems (*GIS*), as this system automatically targets and localizes leaks. Hence, we construct a *GIS* dummy as a *measure of innovative investment* and expect this variable to have two effects on the level of information that the incumbent provides to the municipality. On the one hand, such investments strengthen the “lock-in” situation as they are the property of the incumbent. As a result, not renewing the contract with the incumbent would be

associated with withdrawal costs for the municipality or with high entry cost for the potential entrants as the latter 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 to increased effort by the agent in a principal-agent framework. In this case too, investments in *GIS* leak detection systems will be associated with higher probability of transmitting information, but the motive is now to signal reputation concerns rather than increase the cost of contract renewal for the municipality or the potential entrant. In our sample, 58.2% of municipalities are partly or fully equipped with geo-referring systems (*GIS*). The remaining municipalities are not equipped with geo-referring systems but with simple information systems or manual detection systems.

As we have indicated above, 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 concerns and strategic behaviour on our dependent variable (*INFO*), the first proxy we consider is a Herfindahl-Hirshman index (*HHI*) calculated at the departmental level. We then derive a competition variable (*PCOMP*) that captures the level of *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 and is calculated with market shares of the operators in the department. This indicator captures the prospect for an incumbent to conquer new markets in the area where they operate. Intuitively, the higher is $PCOMP_j$ (or equivalently the lower is HHI_j), the higher is the prospect for the incumbent to conquer new markets. On the contrary, when $PCOMP_j$ equals 0 (or 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 concerns matter.

However, if the presence of other firms in a region may enhance the prospect for an operator to conquer new markets, the other 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 at contract renewal. As the incumbent may prefer to give priority to the protection of their 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.

Hence, 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 public 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.

In our database, we also make use 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 is the PPP contract to its renewal date. We expect the incumbent's incentives to provide network information to fall as the end of the contract approaches. Hence, we expect the *EXPIRY* coefficient to have a positive sign since lower values for *EXPIRY* would be associated on average with lower values for *INFO*.

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 of network renewal in the 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.

A question that arises is then how competition and investments in innovative capital interact in their effects on transmitting of information by the incumbents. As we hypothesize that the impact of competition and innovation could be either way, we hypothesize that the interactions of *GIS* with *PCOMP* and *SHARED* could also have positive or negative effects on the information transmitted to the municipality (*INFO*), but the signs will be consistent across the interaction terms.

We also included in the model a set of *control variables* that might impact on the firm's incentives to disclose information. The *DENSITY* variable, 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.

AUTARCHY is a ratio that measures the degree of a municipality's dependence on import of water from other municipalities. Lower values of *AUTARCHY* indicate the municipality is obliged to import water from other municipalities to meet users' demand. If *AUTARCHY* is close to 0, the firm running the water service totally depends on the imports of water from another municipality. Higher levels of *AUTARCHY* imply abundance of water resources in the municipality, which we expect to increase the bargaining power of the 'autarchic' municipalities and attract new entrants at the contract renewal stage. This combination induces incumbents to disclose information to the municipality so as to increase their chance of winning at the contract at the renewal stage.

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* is equal to 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 incumbents to public authorities.

Dummies for the *three big operators* 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.

MODEL AND RESULTS

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

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

where $INFO_i$ is a proxy for information in the form of network map updates; GIS_i is a dummy equal to 1 if the operator has invested in geo-referring 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 potential competition for the municipality i located in the department j ; $SHARED M_i$ is the reported percentage of the municipalities in the department that chose in-house provision in department j , $EXPIRY_i$ is the number of years before the PPP contract expires in the municipality i , and X_i is a set of controls for a given municipality i . The model is estimated using a standard Probit procedure. The estimation results are presented in Table 9.2, where the dependent variable is the information transmitted to the municipalities in the form of updates to network maps. As such, the dependant variable measures the extent of reputational concerns by the incumbents and the estimated coefficients indicate the effects of innovation investments and other factors on the probability of reputational behaviour by incumbents.

Insert Table 9.2 here

The results in Table 9.2 indicate that investment in specific innovation capital input GIS have a significant positive effect on the probability of reputational behaviour measured as network information 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 investment in innovative capital (GIS) and competition ($PCOMP$) is negative but not significant while it is negative and significant for the interaction between GIS and the percentage of the municipalities in the department that chose in-house provision ($SHARED M$). A similar result is found for the interaction between GIS and the number of years to end of contract ($EXPIRY$), which has a significant positive sign. When $EXPIRY$ gets closer to 0, the level of information transmitted by the incumbent to the municipality decreases. These results indicate that the probability of transmitting information to the municipality (i.e., the probability of reputational behaviour) decreases as the level of competition intensity increases. In other words, competition has an *offsetting effect* on the positive relationship between innovation investments and reputational behaviour.

Turning to proxies for competition, we can see that the effect of potential competition derived from the market concentration (*PCOMP*) on the probability of reputational behaviour is insignificant. However, the effect of *SHARED* is negative and significant, indicating that competition between organizational modes (i.e., between public and private provision) tends to reduce the probability of reputational behaviour. This result is confirmed in two of the three estimations (estimations 1 and 3). 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. Compared to non-significant effects from inter-firm competition (*PCOMP*), this result suggests that competition between organizational modes (public *versus* private provision) may represent a more credible threat for private operators than competition captured by the number of 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 private firm, and therefore they behave more strategically when faced with public providers as competitors.

In our estimations, *EXPIRY* has a positive sign and it is significant in the specifications where it is not interacted with GIS. Therefore, the further away is the contract's expiry 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 correlated with higher probabilities of reputational behaviour captured by network information transmitted to the municipality. Opportunistic behaviour is on average stronger when competitive intensity increases. Arguably, private firms may on average be all the more tempted to signal their reputational concerns during the contract by implementing innovative capital input; but they may decrease their commitment to reputational behaviour when competition between organisational modes increases or towards the end of the contract in order to lock-in the market.

DENSITY, *INTER-AUTHORITY* and *AUTARCHY* have significant AND positive effects. The positive effects of *DENSITY* and *AUTARCHY* on the probability of reputational behaviour as measured by the transmitted network information can be due to higher bargaining power of the municipalities with dense populations (i.e., deeper markets) and richer water resources. Municipalities that organize water distribution in cooperation with other local authorities (*INTER-AUTHORITY*) also have a positive effect on the probability of reputational behaviour for the same reason.

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.

CONCLUSION AND POLICY RECOMMENDATIONS

In this chapter, we intended to contribute to the debate about the determinants of reputational *versus* opportunistic behaviour of incumbents in water services governed by PPP contracts. 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 effect on firm's reputational behaviour measured by network information disclosure. The opposite result is found for competition at the regional level or at the contractual level thus demonstrating that firms behave opportunistically when competition is higher. The interaction between innovation investment and competition shows that competition mitigates the impact of investments in innovative capital on the probability of reputational behaviour.

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 firms could adopt 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 invest in innovative capital that would provide better quality network information to public authorities should be encouraged.

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Tables for chapter 9

Table 9.1: 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
AUTARCHY	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 9.2: 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)
AUTARCHY	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

Note: OLS regressions with city-clustered robust standard errors in parentheses with ***p<0.01
**p<0.05 *p<0.1

