

Franchise Bidding for Natural Monopolies, Physical Assets Valuation at Contract's Renewal and Incentives to Invest: the Case of the Water Sector in France[♦]

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Abstract: Transaction Cost Theory questioned the efficiency of franchise bidding schemes for natural monopolies (Williamson [1976], Crocker et Masten [1996]). One of the problems emphasized by theory concerns the difficulty of assessing a fair compensation for the incumbent (i.e. the winner of the first franchise agreement) at the end of the contract when physical specific assets must be transferred to an incomer or to the public authority. This difficulty may lead to opportunistic behaviours on the firm and/or the public authority's side when unanticipated investments must be realized during the contract and are not fully amortized at the end of the contractual relationship.

Using a database collected on a sample of 5 000 municipalities in the water sector in France in 2001, we show that a solution adopted by local authorities to face the potential opportunism problem associated with asset's valuation problems is to substitute for private firms when specific investments must be made at the end of the contract.

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INTRODUCTION

One of the key concept developed by transaction cost theory concerns “The fundamental Transformation” underlined by Williamson [1985]. Williamson points out the fact that when a buyer and a seller are involved in a relationship requiring the realization of specific investments, even if the seller can initially contract with any buyer in the competitive market, once the specific investments are made, the buyer and the seller fall in a situation of bilateral dependency. The competitive situation transforms in a “lock-in” situation in which it becomes too costly for the buyer and the seller to switch for a new partner.

Williamson [1976] illustrated the “Fundamental Transformation” concept when he studied the problems associated with franchise bidding for natural monopolies. His goal in the 1976’s paper was to show that a municipality that wanted to organize a competition between several firms for the production and distribution of a public service with natural monopoly features faced a number of potential issues. One of them is the difficulty to ensure an effective competition between the suppliers after the first award. The consequence of the “fundamental transformation” results in a bidding inequality between the incumbent and its competitors at the contract renewal to the advantage of the former.

One of the reason explaining the advantage of the incumbent relates to the difficulty to assess a fair compensation for the transfer of physical specific assets between the losing incumbent and the entrant firm or the public authority (Harstad and Crew [1999]). This difficulty is particularly acute when unanticipated investments must be realized during the execution of the contract as these investments involve negotiation costs for the valuation of assets’ transfer at the contract’s renewal.

The goal of this article is to study in more detail the potential transaction and political costs problems related to this difficulty of assessing a fair compensation for the transfer of physical assets. Using a database of 5000 observations collected in the water sector in France, we show that a solution adopted by municipalities to face these problems is simply to substitute for private firms when specific investments must be realized during the last years of the contract. Our results suggest that the probability of public investment grows as the expiry date of the contract comes. We also show that the probability of public investment in the last years of the franchise bidding contract grow all the more quickly as the incumbent’s investments are initially important.

There are, to our knowledge, very few papers in the transaction cost literature testing for ways to mitigate opportunistic behaviours in franchise bidding contracts. Zupan ([1989a], [1989b]) emphasizes the role of reputation effects and the public authority's negotiation power as important factors to mitigate opportunism. He considers two kinds of potential opportunistic that could be observed in the Cable sector in the United States. The incumbent may *ex-ante* underestimate costs or overestimate demand in order to obtain the franchise and renegotiate a price increase *ex-post* once he is awarded the contract. It may also take advantage of its monopoly situation to expropriate the investments realized by the public authority. Our study contributes to the transaction cost literature to the extent that we study public investment as an *ex-post* solution to opportunism. We emphasize public investment as a solution to mitigate other kinds of opportunistic behaviours than those that are classically studied by the franchise bidding literature, namely the opportunistic behaviours related to the valuation problems of physical assets at the end of the contract.

The paper is organized as follows. In a first section, we explain in more detail the opportunism problems raised by the transfer of physical assets in franchise bidding contracts. The second section describes how the water sector is organized in France and show why in the French water sector public investment may be a solution to overcome these problems.

I. Physical asset's valuation at contract's renewal and opportunism

Franchise bidding is usually described in the economic literature as a way of organizing the provision of public services in which a firm chosen by an auction mechanism is given the right to operate the service for a limited number of years. At the end of the contract, the regulator organizes a new auction between private firms for the right to operate the service for another period of time. The literature on franchise bidding generally assumes implicitly that physical specific investments are made and are owned by the firm. In such a context, several authors (Williamson [1976], Laffont and Tirole [1993]) point out the lack of incentives of the firm to invest during and at the end of the contract. More precisely, according to this literature, the firm invests at the beginning of the contract but it will be more and more reluctant to invest in specific assets as the expiry date of the contract comes. The reason is quite simple. The firm knows that it will have enough time to recoup the benefits of the investments realized at the beginning of the

long term contract. But the more the contract approaches to its end, the less the firm willing to invest because the higher the risk not to recoup the benefits of its investment. It would invest if it was ensured to have a fair compensation at the end of the contract for the asset's transfer. But this fair compensation may be very hard to assess for two reasons : first, the assessment of the residual value of the investment may be a source of conflict between the incumbent and the entrant firm (or the public authority), and second, the fair compensation may not adequately take into account the future cost savings related to the specific investment.

The residual value of an investment refers to the initial value of this investment less the depreciation charges. This residual value may be difficult to assess as depreciation is often not easy to measure as it depends on several factors (technological evolutions, maintenance efforts, environmental characteristics). As a consequence, depreciation charges may be difficult to be contracted upon *ex-ante*. The contractual incompleteness of the franchise bidding agreement concerning the rules to be adopted for assets depreciation may lead to opportunistic behaviours. Typically, the incumbent who has better information about the residual value as it realized the investment may tend to overestimate the price of transfer of the asset at the end of the contract. For instance, it may realize accounting manipulations so as to virtually enhance the residual value of its investment and sell it at a much higher price than its true value. On the contrary, the public authority or the entrant firm may try to buy the asset at the lowest possible price. As a result, costly negotiations may occur at the end of the contract about the value of transfer of the assets. The result of these negotiations are uncertain as, on the one hand, the public authority may want to reach a quick agreement in order to avoid the transaction costs associated with the transition towards the new franchise contract and on the other hand, the incumbent may fear of being held-up by the public authority for the specific investments realized during the contract. In the worst case, the uncertainty surrounding the results of the negotiations may lead to an under-investment problem of the incumbent during the contract.

But the fair compensation granted to the firm may be hard to assess for another reason. Indeed, it is difficult to take into account in the compensation of the firm the future benefits of an investment realized during the contract. To understand this idea, it is useful to take an example. For instance, in the water sector, if a firm operating in a city renews a part of the network's mains say, 5 years before the end of the contract and that it is not awarded the subsequent contract, the entrant or the public authority has to reimburse it for the residual value of its investment. But in

addition to this residual value, the entrant may claim that the value of its investment is enhanced because the network's renewal will decrease substantially the future maintenance costs related to the decrease of water losses. As the incumbent has better information on the network's state, it is also better informed about the future cost savings related to this investment. As a consequence, it may use this information to increase its price transfer's proposal by exaggerating the cost savings on leakages. At the same time, the entrant firm or the public authority may have incentives to ignore these cost savings or may simply underestimate their importance during the negotiations in order to buy the asset at a lower price. Moreover, the public authority may claim that these cost savings should be partly shared with the consumers in order to lower the compensation attributed to the losing incumbent. Anticipating the risk of not recouping enough cost savings during the remainder of the contract, the incumbent may refuse to invest or may under-invest during the contract. This risk of under-investment is naturally all the more acute than the incumbent anticipates a low probability of being awarded the subsequent contract.

Consequently, the difficulty of assessing a fair compensation for the incumbent may result in costly opportunistic behaviours from each party involved in the franchise bidding contract. These opportunistic behaviours may lead to transaction costs during and at the end of the contract.

We now turn to the analysis of the solutions that are usually adopted in the French water sector to cope with these opportunism problems.

II. Physical assets' valuation at contract's renewal and opportunism : the solutions adopted in the water sector in France

In France, the water sector is organized at the municipality level. There is no formal regulator. Each municipality can choose either to produce and deliver the water itself to the consumers (this way of providing the service is called "*direct management*") or to rely to a private firm for the production and distribution of water. A municipality that chooses this second option organizes a competition between different suppliers for the right to operate the service. The French legislation leaves municipalities with the choice between a wide variety of contractual arrangements to govern the relationship with the winning firm. These contractual arrangements differ according to the firm's degree of involvement in the service and, hence, the

proportion of the risk that it bears. The “*gérance*” contract is the one that most closely resembles direct management. The firm manages the service and is paid a fixed amount by the public authority. The final three types of contractual arrangements are usually referred to as “delegated management contracts” in the French legislation. They differ from others in terms of how the firm is paid and the investment costs that it bears. The “intermediary management” contract (in French, “*régie intéressée*”) has almost the same contractual arrangement as the *gérance* contract, except that a part of the firm’s revenue depends on its performance. The lease contract (in French, “*affermage*”) implies a sharing of the investment between the municipality and the firm. But the most important investments usually remain public. In this type of contract, the firm is no longer paid by the municipality but by customers. The well-known concession contract implies a higher degree of risk for the firm to the extent that it is responsible for all the investments occurring during the contract. The investments made by the firm in a lease or concession contract are transferred to the public authority at the end of the relationship.

A first major feature in the French legislation is that the ownership of the site specific infrastructures (mains, overpressure stations, consumer connections etc...) are public. Even if these investments are made by the firm, as in concession contracts or in some lease contracts, the infrastructures are incorporated to the patrimony of the municipality as soon as they are built. Therefore, a concessionaire making an investment during the contract could be exposed to a risk of hold-up from the municipality at the end of the contract. As the public authority owns the assets and as these assets can’t be displaced, it may have a great negotiation power and may take advantage of it to under-remunerate the incumbent. Anticipating this, the incumbent may have no incentives to undertake unanticipated specific investments during the last years of the franchise contract. If the assets were privately owned, the incumbent would have a greater negotiation power as it may be able to refuse to sell the assets if it is not satisfied with the compensation offered by the entrant. In the worst case, these conflicts may involve risks of service malfunction or service interruption obliging the public authority to buy the assets at the price demanded by the incumbent. However, when the assets are publicly owned, the negotiation power of the incumbent may be more limited everything else being constant.

A second important characteristic of the French legislation is that even if the incumbent is renewed for the subsequent contract, it has to transfer all the specific assets to the public authority at the end of the contract, even if the assets are not fully amortized at the end of the contract. As a

consequence, even if the environment is not competitive enough, the assessment of the residual value of the assets may still be a problem even if cost savings' assessment should not as the incumbent knows that it has a high probability of winning the subsequent contract. Indeed, the franchise bidding contracts in France are very imprecise concerning the modalities of assets' transfer at the end of the contract. This contractual incompleteness may give rise to opportunistic behaviours from the contracting parties. For instance, it may give incumbents incentives to make accounting manipulations so as to enhance the residual value of the assets and obtain a greater compensation for the assets' transfer. It may also give public authorities incentives not to reimburse the firm correctly for the residual value of the assets, which may negatively impact on the investment's incentives of the firm.

As a consequence, whether the market be competitive or not, transfer of assets may be problematic at the end of the water franchise and may involve opportunistic behaviours on the firm and on the public authority's side.

What are the solutions that could be adopted to mitigate these opportunistic behaviours ? We explain some of the most classical solutions mobilized in the French institutional framework to come up with these problems. A first one is to negotiate a contract extension when specific investments must be made during the execution of the contract. The French legislation enables municipalities to exceptionally extend the contract when the good execution of the public service requires the realization of investments that were unanticipated in the initial agreement. But such a solution would be undesirable if the environment is uncertain as it would oblige the municipality and the incumbent to negotiate a contract extension as soon as unanticipated events requiring the realization of specific investments occur, resulting in an endless contract. Generally, a franchise bidding contract requires investments at the beginning but also all along the contractual relationship. Delaying over time the end of the agreement is not an optimal solution as the frequency of competition for the market goes down, resulting in a higher disconnection between prices and costs (Williamson [1976]). A second solution is to negotiate a price increase with the incumbent. The incumbent may agree to invest during the execution of the contract if the increase in the price from the date of the investment to the end of the contract enables it to recoup enough benefits. However, public authorities may be reluctant to accept high increases in prices for political reasons. A third solution is to wait for the end of the contract and to make the

investments at the beginning of the next contract. However, this solution can be implemented only if the unanticipated investments needs occur at the very end of the contract and if the investment is not urgent. That's why, a fourth solution would be for the municipality to realize itself a part of the specific investments when these unanticipated investments. The advantages of public investment are threefold. First, it avoids the transaction costs related to private investment without any price increase or contract extension (under-investment, accounting manipulations). Second, it avoids the transaction costs linked to the contract extension (disconnection of prices to costs due to the diminution of the frequency of competition for the market). Finally, it avoids the political costs associated with a too important price increase in the short run.

These advantages may overcome the less productive efficiency generally attributed to public investment. We then derive the following proposition :

Proposition 1 : in franchise bidding contracts, the closer the end of the contract, the higher the probability that unanticipated specific investments be realized by the public authority, *ceteris paribus*.

This proposition is quite easy to understand. An investment realized at the beginning of the contract involves few transaction and political costs as the firm knows that it will have enough time to recoup the benefits of its investment. On the contrary, specific investments realized at the end of the franchise may involve substantial transaction and political costs if they are realized by the incumbent as residual value is more likely to be a problem. That's why, in this context, the public authority may prefer to substitute for the incumbent for the realization of the investment.

But the probability of public investment may also be addicted to the environmental uncertainty. If the environment is uncertain, it could be more costly for public authorities to extend the contract as the probability of contract renegotiation during the extension period is high. If the public authority accepts successive contract extensions, the relevance and efficiency of competition for the market disappears, resulting in an endless contract. What's more, if renegotiation is frequent, it may be politically unsustainable to leave the firm invest as successive renegotiations may involve successive price increases that could be all the more difficult to bear for the consumers than the franchise bidding contract is close to its expiry. We then derive this

second proposition :

Proposition 2 : in franchise bidding contracts, the more uncertain the environment, the higher the probability that unanticipated specific investments be realized by the public authority at the end of the contract, *ceteris paribus*.

However, the extent to which a municipality may invest during the contract also depends on the characteristics of the market. If the market is competitive enough, the incumbent may demand a higher price increase or a longer contract extension for the same amount of investment than when the market is not competitive as it knows that its probability of winning the subsequent contract is weaker than in a non competitive market. As a consequence, it may want to incorporate a maximum part of the future cost savings of its investment in the price increase or the contract extension. But if the market is not competitive enough, the price increase or contract extension it demands should naturally be less important as it anticipates a high probability of being renewed and so, a high probability of recouping enough cost savings on the subsequent contract. As a result, the probability of public investment should be less likely when the environment is not competitive. We then derive the following proposition :

Proposition 3 : in franchise bidding contracts, the more the market competitive, the higher the probability that unanticipated specific investments be made by the public authority at the end of the contract, *ceteris paribus*.

We also sustain that the complexity of the service may impact on the extent to which public investment is observed during the execution of the contract. Indeed, when the service is complex, the incumbent's volume of investments are likely to be high compared to services with low complexity. Consequently, the probability of an unanticipated investment is likely to be higher in high complex services than in low complex services. We then derive this fourth proposition :

Proposition 4 : in franchise bidding contracts, the more complex the service, the higher the probability of public investment during the contract, *ceteris paribus*.

The organizational mode for water provision may have an influence on the price levied by the municipality on consumers in case of unanticipated investments during the contract. Typically, concession contracts involve more important investments for concessionaire than lease contracts². Consequently, transaction and political costs associated with private investments at the end of the contract should be more acute than in lease contracts. We then derive this following proposition :

Proposition 5 : in franchise bidding contracts, concession agreements should enhance more the probability of public investment in the last years of the contract compared to lease contracts, *ceteris paribus*.

We now turn to the description of the data and variables we will use to test these five propositions.

III. Data and methodology

The data we will use for our study have been collected with the French Institute of Environment (IFEN). It is a sample of 5000 municipal water services observed in 2001. But as our study focuses on investments in franchise bidding contracts, we do not consider the services that are directly managed by municipalities without any intervention of a private firm. Deleting these municipalities, our sample reduces to 3402 observations. But as we focus on contracts in which unanticipated investments normally realized by private firms are realized *in-fine* by municipalities, we delete all the observations in *gérance* or *régie intéressée* as in these contracts, the private firm does not make specific investments. Our sample then reduces to 2537 observations and two organizational modes : lease and concession contracts.

For these 2537 observations, we observe several characteristics described in table 1. One of them is the price of water which divides in two parts. A first part reverts to the incumbent for

² In a lease contract, the firm has only to realise investments with a life duration of 10 to 15 years. In concession contracts, the concessionaire must also realise very long term investments. For instance, one of the missions of concessionaire is to renew the network's mains and mains have a life duration of at least 50 years.

service provision (investments, maintenance of network, production and distribution of water). This is the price negotiated in the initial contract and that has evolved depending on the evolution of the cost of the service. The second part of the water price reverts to the municipality. Its function is to finance the amortization of the investments realized by the municipality. The municipality decides once a year the price it will charge to the consumers by a deliberation of the municipal council. As a consequence, if the municipality must realize an investment during the contract, it can raise the level of the price charged to consumers from one year to another. The following relation relates the importance of the municipality's price on the total price charged to consumers :

$$\text{SHAREMUN}_i = P_{Mi} / (P_{Mi} + P_{Fi})$$

P_M refers to the price charged by the municipality i whereas P_F refers to the price charged by the firm (free of the taxes and royalties collected for the municipality, the State and the environmental agencies) for water production and distribution. The higher the level of SHAREMUN, the higher the importance of public investment in the total price of water. This will be the dependent variable we want to explain.

1. Accounting for public investment in water franchise bidding contracts

The general model we intend to test for proposition 1 takes the following form :

$$\text{SHAREMUN}_i = \alpha_1 X + \beta_1 \cdot \text{EXPIRY}_i + \varepsilon \quad (1)$$

In our specification, α_1 describes a vector of coefficients and X describes a vector of control variables that are described in table 1. One factor that may have an influence on the level of SHAREMUN is the number of years remaining before the contract's expiry (denoted henceforth EXPIRY). Franchise bidding agreements in the water sector must often be renegotiated during the contract execution because unanticipated investments often appear. But the more the contract close to its expiry, the higher the probability that the public authority realize the investment because of transaction and political costs associated with private investments at

the end of the contract. We then expect that SHAREMUN increase when EXPIRY decreases.

2. Accounting for uncertainty

In order to take into account for environmental uncertainty, we cross the variable EXPIRY with a dummy variable equal to 1 if the water is extracted from an underground source (UNDERGROUND). We also create a dummy equal to 1 if the water delivered to consumer comes from a mixed origin (Surface or underground water). We name this dummy MIXORIG. The model we test to verify the second proposition can be written as follows :

$$\text{SHAREMUN}_i = \alpha_2 X + \beta_2 \cdot \text{EXPIRY}_i * \text{UNDERGROUND} + \gamma_2 \cdot \text{EXPIRY}_i * \text{MIXORIG} + \delta_2 \cdot \text{EXPIRY}_i + \varepsilon \quad (2)$$

Underground water is usually of better quality than surface water and more important, the quality of underground water is quite stable over time. On the contrary, surface water is less likely to be stable over time as the resource is more exposed to pollution, obliging water services to adapt their production techniques to the evolution of the water quality. As a consequence, we can think that the probability of unanticipated investment should be significantly less acute when the municipality is provided water from an underground source. We then expect that β_2 be positive and significantly different from 0.

3. Accounting for competition

In order to assess the degree of competition in the water sector, we were able to collect data about the market shares of each water company in 25 French departments, representing approximately 9000 municipalities and more than 13 million inhabitants. These market shares enabled us to construct a competition indicator that takes the following form :

$$\text{COMPETE} = \sum_{i=1}^n (P_i)^2, \quad \text{with } \sum_{i=1}^n (P_i) = 1,$$

P_i indicates the market share of a company i in a given department. This is simply a

Herfindhal index of firms' concentration in the department. The higher this index, the lower the competition among firms. Merging the data collected on the market shares with the IFEN database, our sample reduces to 792 observations.

The mean value for COMPETE index is around 5000. We cross the variable EXPIRY with a dummy variable taking the value 1 if COMPETE is less than 3800 (STRONGCOMP) and with another dummy taking the value 1 if COMPETE is between 3800 and 5400 (MEDIUMCOMP). We then propose to test this third model :

$$\text{SHAREMUN}_i = \alpha_3 X + \beta_3 \cdot \text{EXPIRY}_i * \text{STRONGCOMP} + \gamma_3 \cdot \text{EXPIRY}_i * \text{MEDIUMCOMP} + \delta_3 \cdot \text{EXPIRY}_i + \varepsilon \quad (3)$$

If proposition 3 is correct, we should observe that β_3 is negative and significantly different from 0 as incumbents operating in competitive areas should be inclined to invest in the last years of the contract only if they obtain a price increase or a contract extension high enough to cover the initial cost of their investments but also at least a part of the cost savings generated by these investments on the subsequent contract. As a result, the price increase or contract extension they demand should be more important than in a non competitive environment in which cost saving issues are not a problem because the incumbent knows that it has a great probability of recouping these cost savings on the subsequent contract.

4. *Accounting for complexity*

We assess the level of complexity by using the market share of direct management services in each of the 25 departments of our reduced sample (SHARED_M). The logic behind this choice is quite intuitive. Direct management is an organizational mode observed when the service is not too complex, for instance when raw water is of good quality or when water is easy to transport until consumers. But when the service becomes more complex, private management is usually preferred as private firms have more competences for managing these services. We think that geographical areas with high concentration of municipalities in direct management may reflect areas with low complexity for water management. On the contrary, geographical areas in which the concentration of direct management is low may suggest that these areas are

characterized by a high level of complexity for water production and delivery. More investments may be realized by the incumbents in these regions and so, more unanticipated investments are also likely to arise.

We cross the variable EXPIRY with a dummy variable equal to 1 if the market share for direct management is less than 15 percent in a given department (COMPLEX) and with a dummy variable equal to 1 if the market share for direct management is between 15 and 30 percent (MEDIUM). We estimate the following model :

$$\text{SHAREMUN}_i = \alpha_4 X + \beta_4 \cdot \text{EXPIRY}_i * \text{COMPLEX} + \gamma_4 \cdot \text{EXPIRY}_i * \text{MEDIUM} + \delta_4 \cdot \text{EXPIRY}_i + \lambda_4 \cdot \text{SHARED}_i + \varepsilon \quad (4)$$

We expect a positive sign for λ_4 . Indeed, the lower SHARED_i, the more complex the service and so, the higher the investments of the incumbent : SHAREMUN should then decrease, everything else being constant. But when the service is more complex, the probability of unanticipated investments should be higher and then, we can expect more public investment during the last years of the contract than in water services characterised by low complexity. As a consequence, β_4 should be negative and significantly different from 0.

5. Accounting for organizational modes

As we suspect that concession contracts may enhance the probability of public investment during the execution of the contract compared to lease contracts, we construct a dummy variable taking the value 1 if the contract observed is a concession contract (CONCES). We cross this variable with the variable EXPIRY and we propose to test the following model :

$$\text{SHAREMUN}_i = \alpha_5 X + \beta_5 \cdot \text{EXPIRY}_i * \text{CONCES} + \gamma_5 \cdot \text{EXPIRY}_i + \varepsilon \quad (5)$$

If proposition 5 is correct, we should observe a negative and significant sign for β_5 .

6. Accounting for trust

One of the most important factor explaining the municipality’s trust in its contracting partner is how long it has been contracting with this firm. The longer its contractual relationship with the firm, the more it trusts its contracting partner and so, the more it tends to leave it a major part of the specific investments. To capture these problems of trust, we create a dummy variable taking the value 1 if the municipality moved from a direct management mode to a private management mode between 1998 and 2001 (CHANGEMODE). We suspect that the municipalities moving from direct to private management may distrust the incumbent as they have never resorted to private management. They may prefer to control a large part of the investments to limit or avoid potential opportunistic behaviours from the firm and in order to be able to move back easily to direct management if they are not satisfied with the service provided by their incumbents. When the municipality delegates a large part of the investments to the incumbent, it may lose very quickly its competences for the water service management and it may become very difficult to move back to direct management at the end of the contract. What’s more, public investment leaves the opportunity for the public authority to sign a short-term contract enabling it to put back the market to competition quickly, constraining even more the opportunistic behaviours of the firm. We then expect that SHAREMUN decreases when CHANGEMODE takes the value 1. We include CHANGEMODE in the five specifications presented above.

IV. Description of the variables and statistical analysis

The following tables describe the variables we will use for our further econometric analysis and gives some statistical descriptions of these variables.

Table 1 : description of the variables

Name of variable	Status	Description
SHAREMUN	Numeric	Part of the municipal price in the total price of water
GROWTHPOP	Numeric	Growth of the municipal population (in %) between 1990 and 1998
LOG NETWORK	Numeric	Ln (number of kilometre of mains per inhabitant)
LOG RELATIONSHIP	Numeric	Ln (2001 - date of contract beginning + 1)
LOG DURATION	Numeric	Duration of the contract

LOG CONSUMPTION	Numeric	Ln (volume of water consumption in m3 per inhabitant)
LOG POPULATION	Numeric	Ln (population of the municipality) in 1999
WATER LOSSES	Numeric	Volume of water losses in m3/(length of the network*365)
TOURISTIC	Dummy	Takes the value 1 if the municipality is touristic
EXPIRY	Numeric	End of contract - 2001
LOG EXPIRY	Numeric	Ln (1+ EXPIRY)
EXPIRYSQ	Numeric	Expiry * expiry
CHANGEMODE	Dummy	Takes the value 1 if the municipality moved from direct to private management between 1998 and 2001
SURFACE	Dummy	Takes the value 1 if the municipality is delivered water from a surface source
MIXORIG	Dummy	Takes the value 1 if the municipality is delivered water from both a surface and an underground source
UNDERGROUND	Dummy	Takes the value 1 if the municipality is delivered water from an underground source
STRONGCOMP	Dummy	Takes the value 1 if the Herfindhal index for firm's departmental concentration is less than 3800
MEDIUMCOMP	Dummy	Takes the value 1 if the Herfindhal index for firm's departmental concentration is between 3800 and 5400
LOWCOMP	Dummy	Takes the value 1 if the Herfindhal index for firm's departmental concentration is above 5400
SHARED	Numeric	Departmental market shares for direct (or public) management (calculated using the percentage of population)
COMPLEX	Dummy	Takes the value 1 if the market shares for direct management in a given department is less than 15%
MEDIUM	Dummy	Takes the value 1 if the market shares for direct management in a given department is between 15 and 30%
SIMPLE	Dummy	Takes the value 1 if the market shares for direct management in a given department is above 30%
CONCES	Dummy	Takes the value 1 if the franchise bidding agreement is a concession contract
LEASE	Dummy	Takes the value 1 if the franchise bidding agreement is a lease contract

Table 2 : Mean, variance, min and max values for the numeric variables

Name of variable	Number of observations	Mean	Standard Deviation	Min	Max
SHAREMUN	2537	0,271	0,202	0	1
GROWTHPOP	2534	5,607	15,576	-40,384	495,09
NETWORK	2516	21,74	38,996	0,312	1437,79
RELATIONSHIP	2019	10,338	10,064	0	78
DURATION	1937	18,169	10,557	1	89
CONSUMPTION	2537	67,844	38,071	6,501	714,285
POPULATION	2537	9524,53	49246,06	11	2125246
WATER LOSSES	2515	0,0073	0,0152	-0,116	0,545
EXPIRY	1966	7,787	4,94	0	21
SHARED	677	24,653	19,524	3,261	77,722

Table 3 : statistical description of the qualitative variables

Name of variables	Number of observations	Frequency
TOURISTIC = 1	346	0,13638155
TOURISTIC = 0	2191	0,86361845
<i>Total number of contracts used for computation</i>	2537	
<i>Missing values</i>	0	
<i>Total number of observations</i>	2537	
CHANGEMODE = 1	29	0,01143082
CHANGEMODE = 0	2508	0,98856918
<i>Total number of contracts used for computation</i>	2537	
<i>Missing values</i>	0	
<i>Total number of observations</i>	2537	
SURFACE = 1	1696	0,67867147
MIXORIG = 1	516	0,20648259
UNDERGROUND =1	287	0,11484594
<i>Total number of contracts used for computation</i>	2499	
<i>Missing values</i>	38	
<i>Total number of observations</i>	2537	
STRONGCOMP = 1	207	0,30576071
MEDIUMCOMP = 1	244	0,36041369
LOWCOMP = 1	226	0,3338257
<i>Total number of contracts used for computation</i>	677	
<i>Missing values</i>	1860	
<i>Total number of observations</i>	2537	
COMPLEX = 1	286	0,42245199
MEDIUM = 1	217	0,32053176
SIMPLE = 1	174	0,25701625
<i>Total number of contracts used for computation</i>	677	
<i>Missing values</i>	1860	
<i>Total number of observations</i>	2537	
CONCES	172	0,06779661
LEASE	2365	0,93220339
<i>Total number of contracts used for computation</i>	2537	
<i>Missing values</i>	0	
<i>Total number of observations</i>	2537	

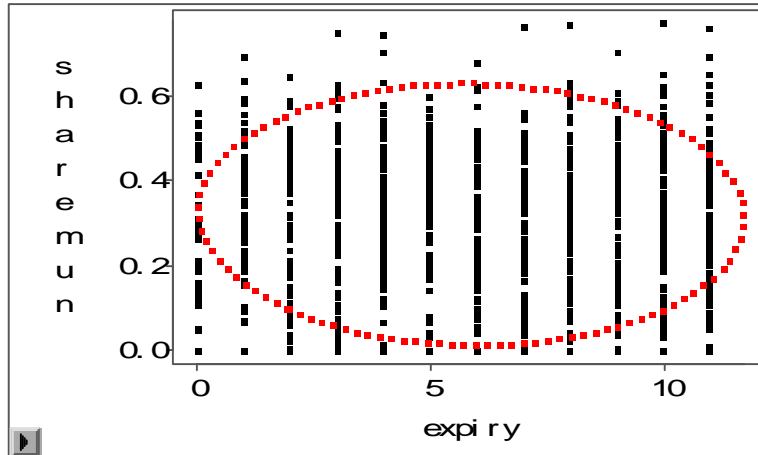
Deleting the outliers for some numerical variables presented above³, the final number of observations used for the econometric estimations reduces to 2308.

We now give some statistical evidence of the link between the time remaining before the end of the contract (EXPIRY) and the part of the municipal price in the total price charged to

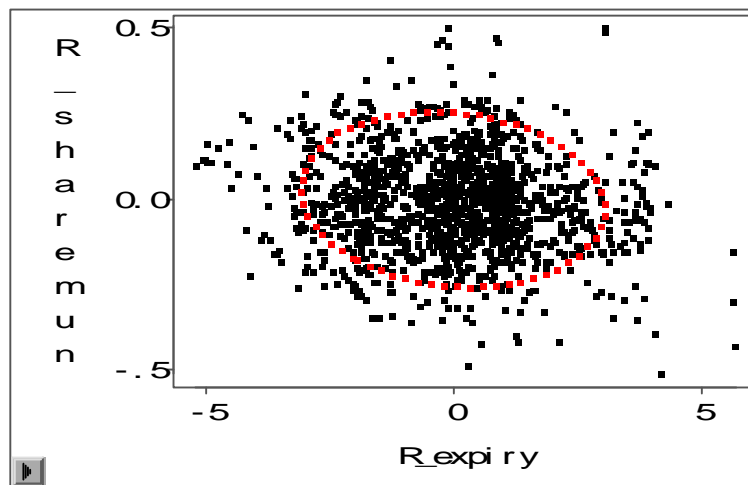
³ We only retain the observations with a value for SHAREMUN<0.80, a value for WATER LOSSES between 0 and 0.05, and a value for DURATION and RELATIONSHIP inferior to 40 years.

consumers. As we explained above, when unanticipated investments occur, transaction and political costs associated with private investment may increase when the expiry date of the contract comes so that we think that the probability of private investment may decrease the closer the end of the contract.

Graph 1 : correlation between SHAREMUN and EXPIRY : 80% confidence ellipse



Graph 2 : correlation between SHAREMUN and EXPIRY, controlling for GROWTHPOP, LOG NETWORK, LOG CONSUMPTION, LOG RELATIONSHIP, LOG DURATION, WATER LOSSES : 80% confidence ellipse



In the first graph presented above, the orientation of the confidence ellipse does not reveal a clear relationship (neither positive, nor negative) between SHAREMUN and EXPIRY. But a lot of factors may impact on the level of SHAREMUN. Some of them may also be correlated to EXPIRY. For instance, the duration of the franchise bidding contract may be positively correlated to the level of SHAREMUN. Indeed, everything else being equal, the less the contract lasts, the less time the incumbent has to recoup the benefits on its investments. As a consequence, the higher the price it charges to consumers and so, the lower the level of SHAREMUN. But the shorter contracts are also those that have the higher probability of being close to their expiry. As a consequence, if we don't control for this variable, it may contribute to create a positive link between SHAREMUN and EXPIRY related to the fact that the shortest contracts (with low value for SHAREMUN) are more likely than older contracts to be close to their expiry.

Controlling for the variables that may impact on the differences observed for SHAREMUN across municipalities, the confidence ellipse of the second graph shows a negative correlation between SHAREMUN and EXPIRY.

The following table relates in another way the correlation between SHAREMUN and EXPIRY by transforming them into qualitative variables.

Table 4 : link between SHAREMUN and EXPIRY : chi-squared test for qualitative correlation

EXPIRY	SHAREMUN			TOTAL NUMBER OF OBSERVATIONS
	More than 50%	Between 30 to 50%	Less than 30%	
Less than 2 years				
<i>Number of observations</i>	28	58	73	159
<i>Theoretical number of observation under independence assumption</i>	20,095	60,639	78,266	
Between 2 and 4 years				
<i>Number of observations</i>	41	118	98	257
<i>Theoretical number of observation under independence assumption</i>	32,481	98,013	126,51	
Between 4 and 6 years				
<i>Number of observations</i>	32	130	100	262
<i>Theoretical number of observation under independence assumption</i>	33,113	99,92	128,97	
More than 6 years				
<i>Number of observations</i>	127	382	617	1126
<i>Theoretical number of observation under independence assumption</i>	142,31	429,43	554,26	
TOTAL NUMBER OF OBSERVATIONS	228	688	888	1804
Statistical value for the Chi-squared test	45,897***			

*** : significant at the 1% level

Table 4 clearly shows that municipalities with high values for SHAREMUN (above 50%) are over-represented when the expiry of the contract is less than 4 years. On the contrary, municipalities with low values for SHAREMUN (less than 30%) are over-represented when the expiry of the contract is more than 6 years : we observe 617 observations with those contracts in the database whereas we should observe only 554 under the assumption of independence between SHAREMUN and EXPIRY.

This first statistical analysis tends to confirm that municipalities facing unanticipated investments tend to invest at the end of the contract. We now try to confirm these first results by an econometric analysis of the variance of SHAREMUN.

V. Econometric results

The following table gives the econometric results for the first proposition presented above. The estimation method used is Ordinary Least Squares (OLS).

Table 5 - Econometric results for proposition 1 : general link between EXPIRY and SHAREMUN

Explanatory variables	SHAREMUN		SHAREMUN		SHAREMUN	
	Model 1a		Model 1b		Model 1c	
	coefficient	Std Err	coefficient	Std Err	coefficient	Std Err
growthpop	0.0005**	0,0003	0.0006**	0,0003	0.0006**	0,0003
log consumption	-0.036***	0,0104	-0.0405***	0,0106	-0.0361***	0,0104
log network	0.1001***	0,0061	0.105***	0,0062	0.0998***	0,0061
log population	-0.0004	0,0032	-0.0015	0,0033	-0.0001	0,0032
water losses	1.8985***	0,5996	2.1231***	0,6127	1.8335***	0,5998
log duration	0.0778***	0,0177	0.0093	0,017	0.0683***	0,0182
log relationship	-0.0682***	0,0079	-0.0412***	0,008	-0.0613***	0,0085
touristic	-0.0032	0,0104	-0.0011	0,0107	-0.0033	0,0104
expiry	-0.0139***	0,0013			-0.0082***	0,003
expirysq					-0.0003**	0,0001
log expiry			-0.0588***	0,0089		
underground*expiry						
mixorig*expiry						
surface*expiry						
mediumcomp*expiry						
strongcomp*expiry						
lowcomp*expiry						
sharedm						
complex*expiry						
medium*expiry						
simple*expiry						
conces*expiry						
lease*expiry						
changemode	0.0309	0,0306	0.0313	0,0312	0.0312	0,0305
Intercept	0.1787***	0,0606	0.3354***	0,0591	0.1703***	0,0606
Observations	1764		1764		1763	
R ²	0.385		0.3593		0.3865	

The first proposition is strongly supported by the data. The closer the expiry of the contract, the higher the part of the municipality price in the total price of water. This result suggests that the probability of public investment raises when the end of the contract is close. The reason is that these investments would involve potential opportunistic behaviours if they were realized by incumbents. The transaction and political costs associated with private investment

grows all the more rapidly as the investment must be realized at a date close to the expiry of the contract. The first proposition is tested with three sub-models. Model 1a only takes into account the EXPIRY variable. Model 1b replaces EXPIRY by LOG EXPIRY and model 1c accounts for a quadratic effect. Models 1b and 1c both suggest that public investment grow more and more quickly when the end of the contract comes.

Table 6-Econometric results for proposition 2 and 3 : accounting for uncertainty and competition

Explanatory variables	SHAREMUN		SHAREMUN	
	Model 2		Model 3	
	coefficient	Std Err	coefficient	Std Err
growthpop	0.0006**	0,0003	0.0009	0,0005
log consumption	-0.0346***	0,0104	-0.0503**	0,0203
log network	0.0987***	0,0062	0.0655***	0,0146
log population	-0.0006	0,0033	0.0009	0,0071
water losses	1.992***	0,5998	2.6277**	1,1278
log duration	0.0721***	0,0181	0.0343	0,0437
log relationship	-0.0644***	0,008	-0.0564***	0,0186
touristic	0.0021	0,0105	-0.0597***	0,02
expiry	-0.0105***	0,0017	-0.0139***	0,0035
expirysq				
log expiry				
underground*expiry	-0.0023*	0,0013		
mixorig*expiry	-0.0056***	0,0014		
surface*expiry	ref.			
mediumcomp*expiry			0.0023	0,0023
strongcomp*expiry			0.0072***	0,0024
lowcomp*expiry			ref.	
sharedm				
complex*expiry				
medium*expiry				
simple*expiry				
conces*expiry				
lease*expiry				
changemode	0.0255	0,0306	-0.0277	0,0663
Intercept	0.1802***	0,0612	0.4279***	0,1373
Observations	1743		438	
R ²	0.3916		0.2587	

We expected that municipalities more exposed to uncertainty were more likely to face unanticipated investments and then, were more likely to face public investment at the end of the contract. We then expected a positive and significant sign for UNDERGROUND*EXPIRY. Actually, contrary to our expectations, the sign is negative and significant at the 10% level. The coefficient for the municipalities being delivered water from a mixed origin (both surface and underground) is also negative and strongly significant at the 1% level. We have no explanations for this result, but we suspect that our specification does not account for uncertainty but catches another phenomenon.

In the same way, proposition 3 is not corroborated by the data. We expected that in regions in which competition was more likely to play were also those in which transaction and political costs associated with private investment at the end of the contract were more likely to be high. Contrary to our expectations, we observe a positive and significant sign for STRONGCOMP*EXPIRY, suggesting that in strong competitive regions, the probability of public investment increase at the end of the contract $(-0,01+0,007<0)$, but significantly less than in low competitive regions. We have no definitive explanation for this result. One of the potential explanation is that in strong competitive regions, some incumbents may invest at the end of the contract to give the municipality a good signal that could enhance its probability of being awarded the next contract. This need to show the municipality its motivation may naturally increases when the environment is competitive as the fear of being evicted is higher than in non-competitive environment. Another possible explanation for this result is that, as we explained above, the incumbent has better information about the residual value and the future cost savings of its investment. Therefore, investing at the end of the contract may help raising entry costs for potential competitors. In water franchise bidding contracts, all potential entrants face a common value problem as they don't know exactly the real state of the network. But this common value issue may become even more problematic if the incumbent invests in specific assets at the end of the contract because unlike the incumbent, competitors have no exact idea of the future impact of the recent investment of the incumbent on future exploitation costs. Consequently, they may tend to under-estimate these cost savings in their bids as they may not want to be confronted to the winner's curse. These two explanations for the positive sign observed for STRONGCOMP*EXPIRY would then be consistent with the results of Affuso and Newberry[2002] in the British railway industry albeit their study was led in a quite different

institutional context.

Table 7-Econometric results for proposition 4 and 5 : accounting for complexity and organizational modes

	SHAREMUN		SHAREMUN		SHAREMUN		SHAREMUN	
	Model 4a		Model 4b		Model 4c		Model 5	
Explanatory variables	coefficient	Std Err	coefficient	Std Err	coefficient	Std Err	coefficient	Std Err
growthpop	0.0005	0,0005	0.0005	0,0005	0.0005	0,0005	0.0006**	0,0003
log consumption	-0.0605***	0,0199	-0.059***	0,0199	-0.0591***	0,0199	-0.0355***	0,0104
log network	0.065***	0,0144	0.061***	0,0145	0.0618***	0,0146	0.0982***	0,0061
log population	0.0005	0,0071	-0.0001	0,0071	0.0001	0,0071	0	0,0032
water losses	2.0522*	1,1208	2.1133*	1,1197	2.0187*	1,1242	1.7102***	0,5998
log duration	0.0226	0,0432	0.0125	0,0432	0.0149	0,0433	0.0688***	0,0178
log relationship	-0.0503***	0,0184	-0.0442**	0,0185	-0.0452**	0,0186	-0.0619***	0,0081
touristic	-0.0565***	0,0197	-0.0582***	0,0196	-0.057***	0,0197	-0.0056	0,0104
expiry	-0.0096***	0,0031	-0.003	0,0035	-0.0049	0,004	-0.0122***	0,0013
expirysq								
log expiry								
underground*expiry								
mixorig*expiry								
surface*expiry								
mediumcomp*expiry								
strongcomp*expiry								
lowcomp*expiry								
sharedm	0.0016***	0,0004			0.0006	0,0007		
complex*expiry			-0.009***	0,0021	-0.0065*	0,0034		
medium*expiry			-0.0057**	0,0022	-0.0038	0,003		
simple*expiry	ref.		ref.					
conces*expiry							-0.0037***	0,001
lease*expiry							ref.	
changemode	-0.0347	0,0656	-0.027	0,0659	-0.0302	0,066	0.0318	0,0305
Intercept	0.4547***	0,1346	0.5136***	0,1338	0.4919***	0,1358	0.1831***	0,0604
Observations	439		438		437		1763	
R ²	0.2678		0.2726		0.2741		0.3895	

Proposition 4 is corroborated by the data. To test this proposition, we create three sub-models. Sub-model 4b only accounts for the departmental market shares of direct management (SHAREDm). As expected, in geographical areas where complexity is a problem (low value for SHAREDm), incumbents have to invest in more specific assets than in areas characterized by low complexity. The importance of the municipal price in the total price charged to consumers

then decreases when SHARED_M decreases and *vice versa*. Sub-model 4b no more accounts for SHARED_M but accounts for COMPLEX*EXPIRY and MEDIUM*EXPIRY. As expected, we find that those regions in which complexity is likely to be a problem are also those in which public investment at the end of the contract is the more likely when unanticipated investments occur. Taking into account both SHARED_M, COMPLEX*EXPIRY and MEDIUM*EXPIRY in model 4c, we can see that SHARED_M is still positive but no more significant whereas it was significant at the 1% level in model 4a. This result suggest that taking into account the situation differences between municipalities regarding the number of year before contract's expiry is important. As complexity alone increases the part of the water price reverting to the firm, this part is also more likely to decrease (and hence, the municipal part is likely to increase) at the end of the contract in geographical areas characterized by complexity.

Proposition 5 is strongly supported by the data. The negative and significant sign for CONCES*EXPIRY suggest that concession contracts are more likely to involve public investment at the end of the contract than lease contracts. Once again, transaction and political costs associated with private investment are likely to be more acute in concessions than in lease contracts.

CONCLUDING REMARKS

Our econometric results suggest that the probability of public investment is all the more important than the contract is close to its end. What's more, we also find that when unanticipated investment must be realized in the last years of the contract, the probability that the municipality realize these investments is all the more important than the incumbent's investment are initially important : this is typically the case in complex water services and in concession contracts. These results are consistent with transaction cost theory predictions. However, our results surprisingly suggest that geographical areas in which competition is likely to play are less likely to observe public investment at the end of the contract.

Our study does not pretend to give an optimal solution to opportunism issues related to transfer of physical assets. Other solutions are analysed by the franchise bidding literature⁴. But

⁴ See for instance Harstad and Crew [1999], Littlechild [2002], Sorana [2003], Laffont and Tirole [1993].

our study suggests that public investment may be one of the operational solutions that can be mobilized to overcome the transaction and political costs arising when unanticipated investments are realized by an incumbent in the last year of a franchise bidding contract.

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