Water Under the Bridge: Determinants of Franchise Renewal in Water Provision*

Eshien Chong
Sorbonne Business School

Stéphane Saussier
Sorbonne Business School

Brian S. Silverman
University of Toronto

Williamson's 1976 study of natural-monopoly franchise bidding launched extensive debate concerning the degree to which transaction-cost problems afflict government franchising. We propose that municipalities vary in ability to discipline franchisees, and that this heterogeneous ability affects franchise renewal patterns and the quasi-rents that franchisees extract. We study provision of municipal water services in France, a setting characterized by both direct public provision and franchised private providers. We find that small municipalities pay a significant price premium for franchisee-provided water when compared with publicly provided water; in contrast, large municipalities do not pay a premium on average. Further, large municipalities are less likely to renew an incumbent franchisee that charges an "excessive" price, while small municipalities' renewal patterns are not influenced by franchisees' excessive pricing. We interpret the results as evidence that although large municipalities can discipline franchisees and thus prevent extraction of quasi-rents, small municipalities are less able to do so due to weaker outside options. (*JEL*: H0, H7, K00, L33)

1. Introduction

The provision of natural-monopoly services is beset by significant governance challenges. Oliver Williamson's seminal article on franchise bidding highlighted transaction-cost problems in contracting for monopoly franchises, a common form of providing such services (Williamson 1976). Previous scholarship had assumed contestable bidding both for initial

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franchise contracts and for renewals (e.g., Demsetz 1968), which would serve to discipline franchise operators in perpetuity. In contrast, Williamson noted that in many settings the incumbent firm would be in a privileged position at time of renewal. Thanks to this "fundamental transformation," the incumbent would be able to behave opportunistically, thus reducing the social benefits of franchising versus alternative options such as regulation or public ownership of the provider.

Although Williamson illustrated these problems through a case study of cable television provision in Oakland, CA, subsequent large-sample empirical evidence on this subject has generally been mixed. In a study of US cable television franchise contracts, Zupan (1989) attempted to quantify the extent to which incumbent providers held up municipalities in terms of price or service. Although the incumbent supplier was renewed in more than 99.8% of contract expirations, Zupan concluded that the terms of renewal contracts did not differ substantially from those of new contracts. Similarly, Prager (1990) examined communities' satisfaction with their cable service and inferred from her assessment that communities were highly satisfied despite occasional frictions between municipality and provider. Both Prager (1990) and Zupan (1989) concluded that franchise incumbents are constrained from behaving too opportunistically.

Yet more recent assessment suggests that this positive picture of franchise bidding may be misleading. As technological developments have allowed entry of substitutes to cable television, studies have demonstrated that the effectiveness of private competition and the threat of public provision have an enormous effect on the extent to which incumbent providers can be disciplined (Goolsbee and Petrin 2004; Malatesta and Smith 2011; Seamans 2012). More generally, Crocker and Masten (1996: 15) note that the Prager and Zupan studies "have attempted to evaluate the efficacy of franchise bidding in absolute terms, when the relevant question from an institutional choice perspective is how well franchise bidding performs relative to governance of the same transaction through regulation.... Without a basis for comparison, judgments regarding the performance of franchise bidding are inescapably subjective."

In this article, we further explore the behavior of franchisees and municipalities, and address the concerns raised by Crocker and Masten (1996) about the extant research. We study the provision of water in France, where there is a long tradition of both public and private provision of water, and where there is still an abundant mix of both modes today. We explicitly compare performance across organization forms—private provision versus public provision—and across municipalities that vary in their ability to attract bids and to deliver this service through public provision.

We first identify average differences in price and quality of water between public and private provision, and between small towns and larger municipalities. We then estimate the "expected" price of water, under both organization forms, for each municipality given its characteristics, and identify the degree to which each municipality is "overpaying" or "underpaying" for water under its existing organization form and compared with the alternative organization form. Finally, we examine the behavior of municipalities at the termination of contracts. Specifically, we explore whether a municipality that has relied on private provision renews the incumbent provider, switches to a new provider, or switches to public provision at contract termination.

We find two key results. First, private provision of water is more expensive than public provision, even after controlling for the characteristics of privately provided water. However, this price premium is focused primarily in towns of fewer than 10,000 inhabitants; in larger municipalities, the point estimate for the private-provision price premium is less than one-half that in small towns and is not statistically significant. Second, while large municipalities respond to "excessive prices" by switching provider or organization form, small towns' renewal decisions are unaffected by a provider's past pricing. Specifically, large municipalities respond to excessive private-provider price by non-renewal at the next contract—that is, by switching either to public provision of water or to a different private provider. In contrast, small towns' renewal decisions are generally not influenced by over-pricing. We consider and dismiss alternative explanations, including the possibility that a municipality's governance decision is constrained by the market structure of water provision in neighboring towns.

We interpret these results as evidence that a municipality's ability to constrain franchisee opportunism rests on its ability to credibly threaten to bring service in-house or to generate private-sector competition at contract renewal. Large municipalities are more attractive clients and therefore elicit more intense competition from private providers at renewal time. Large municipalities are also more likely than small towns to have the skills or scale necessary to revert to public provision of water. Small towns are less capable of disciplining incumbent providers through either external competition or the threat of public provision. This leads to differences in the behavior of franchisees, who charge a significantly higher premium in small-town contracts than in large-municipality contracts. Thus, we find evidence that is consistent with both Williamson (1976) and with subsequent research that highlighted mechanisms that might constrain franchisee opportunism. We note, however, that water provision is likely to be less subject to contractual hazards than most municipal services (Levin and Tadelis 2010). Consequently, the degree of franchisee hold-up evident in this study can be considered a lower bound.

In Section 2, we provide institutional details about the French water industry. In Section 3, we detail our expectations about prices, quality, and mode of provision of water. Section 4 describes the data and specifies our model. Section 5 presents the results of our estimations. We conclude in Section 6.

2. Institutional Details about the French Water Industry

2.1 Alternative Organization Modes for Managing Water Services

In France, as in most European countries, local public authorities are legally responsible for the provision of local services such as urban transport, distribution of drinking water, sewage treatment, collection and processing of household waste, and cultural activities. Because there is no national regulator, local public authorities are in charge of defining the services, selecting providers (which can be in-house), and monitoring performance. Although the responsibility for service provision rests with the public authority, a service can be delivered by either a public or a private provider.

The public authority may choose "direct public management" and itself undertake all operations and investments needed for provision of the service. Alternatively, the local public authority may choose to involve an outsider, almost always a private for-profit firm, in the provision of the service. When a public authority decides to rely on private water provision, it must organize a competitive bidding process for the franchise and then negotiate the contract that will govern its relationship with the private operator that wins the right to provide the service.

French water-provision contracts are awarded according to a two-step procedure as follows. After deciding to seek private provision of water, a local authority puts a contract out to tender. The authority sometimes publicly specifies and prioritizes the criteria that will be used to rank offers, but this is not required. Private operators first submit a statement of interest, and then submit a detailed bid for the contract. In the second step, the public authority selects one or more candidates and enters a phase of negotiation with the chosen candidate(s). At the end of the negotiation, the public authority chooses its partner and explains its choice.

Whereas many countries require that franchise contracts be awarded to the lowest credible bidder, French law specifies that the municipality is not obliged to choose its partner strictly in terms of objective criteria. Thus, the above-described two-step procedure affords a great degree of freedom to the public authority; it can select its partner freely, using both objective and subjective criteria (the latter during the negotiation stage).[1]

The successful bidder benefits from a local monopoly for the duration of the contract. In the French water sector, the average contract has a duration of 12 years. At the end of the contract, the municipal authority chooses to either put a new contract to tender, in which case there is a new round of competitive bidding, or revert water provision to direct public

1. Through much of the 20th century there have been allegations of corruption in the awarding of municipal water contracts in France. In response, beginning in 1990 the national government imposed a sweeping series of laws that are generally believed to have curtailed such corruption. The most comprehensive of these is the 1993 anti-corruption law specifying that a competitive bidding process is mandatory when attributing a franchise to a private firm (i.e., no direct negotiation). Our sample period covers contract renewal decisions only after this date.

management. In 2010, of the roughly 15,000 water services authorities in France, approximately 65% relied on private operators to manage water provision and 35% relied on direct public management.

French law provides that all infrastructure remains the property of the municipality. Franchise contracts frequently stipulate specific infrastructure improvements to be carried out by the private operator, and/or stipulate that the private operator will maintain/improve infrastructure to keep water loss (due to leaks in the infrastructure) below specified levels. Since the infrastructure is owned by the municipality, the cost of the requisite work is priced into the operator's contract bid.

One key feature of French water provision is a principle known as "water pays water." National regulation requires that water users must pay the full cost of water provision, and that no payments for water provision may be diverted to other uses. This prevents the use of any subsidies for water, regardless of governance form used.[2]

2.2 The Industry Structure of Private Water Provision

Private water provision in France goes back at least as far as the mid-1700s, but became particularly common with the encouragement of Emperor Napoleon III in the mid-19th century. Over the last 100 years, substantial consolidation among providers has yielded a set of three large competitors and a small competitive fringe. Veolia, Suez, and Saur collectively provide water to 60% of French municipalities, covering 65% of the French population. The fringe firms provide water to 5% of the municipalities, covering 2% of the population. The remainder is served through public in-house provision. Thus, the three-firm concentration ratio in French water provision is 90% if one focuses solely on privately provided water, or 65% if one includes in-house provision as part of the relevant market. By way of comparison, the four-firm concentration ratio in the US cable industry is around 80% if one focuses solely on cable television, and around 60% if one includes satellite pay television as part of the relevant market.

In the 1990s and 2000s, contracts put out to tender have received, on average, 4.5 statements of interest and 2.6 bids (Tiret 2008).

2.3 Likely Triggers of Non-renewal

In France roughly 700 water contracts terminate each year. At contract expiration, a local authority has the option to switch from private to

2. Specifically, since 1964, French law (law no 64-1245 "on the rules and the distribution of water and the fight against pollution") has espoused the "water pays water" principle: The price of water paid by consumers must cover, over the contract life, all expenses related to the service. The budget of the water service is isolated from the budget of the municipality. As a result the price of water finances both capital investments and operating costs of the service. This principle is also affirmed in Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000, establishing a framework for Community action in the field of water policy in Article 9 concerning recovery of costs for water services.

in-house management, or to select a different private provider for the subsequent franchise contract. In principle, it should be feasible for a municipality to change providers or to bring water provision in-house. As noted above, physical assets are the property of public authorities from the beginning to the end of the contract and there is no payment required from public authority to the incumbent private operator if the authority chooses to switch provider or bring in-house. When a local authority decides to bring water provision in-house, it usually offers to hire the franchisee staff previously in charge of the service; these employees frequently accept in order to keep working in the same geographical area. Nevertheless, authorities often must hire additional staff to compensate for franchisee workers who choose not to join the public authority. Sometimes, the transition is organized through progressive steps, with part of the public service temporarily sub-contracted to a private partner until the public authority is ready to provide complete service.

If local authorities' decisions are driven by economic considerations, then it is natural to expect that public authorities are particularly interested in the prices paid by consumers. Price is observable by consumers, who are also voters, and consequently changes in price can potentially affect future election prospects. Relatedly, the popular press focuses principally on price when assessing the performance of water provision (and, indirectly, the performance of local authorities' decision-making competence). Indeed, for more than a decade the popular and academic press in France has devoted widespread attention to how water services are managed and the resulting impact on prices; similarly, consumer groups have produced reports and press releases on the subject. These reports and studies have noted wide variety in the price of water across municipalities in France. Of particular note, these studies indicate that prices paid by consumers are higher when their water services are managed by private operators than under direct public management (e.g., Carpentier et al. 2006; Chong et al. 2006; Commissariat Général au Développement Durable 2010). Although many of these reports fail to demonstrate a causal relationship between private management and higher price, the resulting public outcry ensures that local authorities are particularly concerned about water price in their water-management decisions. For all of these reasons, price is a salient indicator of performance for local authorities.[3]

3. Local authorities are undoubtedly also concerned with the quality of water provided. France has nationwide thresholds (more than 63 parameters following European obligations — Directive 98/83/CE) for the amount of bacteria and chemicals present in a liter of water. Water is checked in each municipality at a frequency that depends on the number of inhabitants. There is relatively little variation in water quality according to these measures; the average municipality's water meets the standard more than 95% of the time, with a narrow standard deviation.

3. Competition, Self-Provision, and the Ability to Discipline Incumbent Franchisees

What types of problems might arise in franchise contracts for monopoly services? Williamson (1976) argued that such contracts were likely to be plagued by three classes of problems. First, identifying clear criteria for awarding the initial franchise can be difficult, particularly if the franchised service is complex. Second, there are likely to be execution problems in enforcing performance; to the extent that enforcement is costly or embarrassing to the franchisor, a municipality may not be able to penalize a franchisee that performs poorly. Third—and the problem that has received the most attention over the last 35 years—even if the franchisee performs appropriately during the first franchise contract, "bidding parity between the incumbent and prospective rivals at the contract renewal interval is unlikely to be realized (p. 81)." An incumbent will likely be in a privileged bidding position due to its ownership of specialized assets already in place and to specialized knowledge developed during the operation of the initial franchise award. Consequently, to the extent that these features characterize a particular service, franchise bidding is likely to be plagued by governance problems such that an incumbent franchisee will be able to extract quasi-rents from the municipality.

Yet in a bilateral monopoly, it is not clear why one party should have greater ability to claim quasi-rents than the other. Zupan (1989) proposed several reasons why an incumbent franchisee might be constrained from engaging in opportunistic behavior even if in a privileged bidding position at the time of contract renewal. The first is reputation; to the extent that behaving opportunistically in one city hurts a franchisee's chances of winning contracts in other cities, the franchisee will refrain from such behavior. The second is the city's threat to backward integrate if the franchisee misbehaves. Thus, a franchisee is likely to be neither willing nor able to extract quasi-rents from a city at renewal time. Empirically, Zupan compared new franchise contracts with franchise renewals in the US cable television industry in 1984–1988 along five criteria of price and quality. Although he found that renewal contracts had 12% higher prices for non-basic TV and, in some specifications, provided fewer channels, he found no difference across contracts for the other criteria and concluded that overall the renewal contracts did not appear substantially different than new contracts. Similarly, Prager (1990) proposed that reputation and city latitude over the bidding process would constrain opportunism by franchisees. Using surveys of community representatives concerning their cable television firms' behavior, she concluded that most communities were satisfied with their service (although roughly 20% of respondents reported encountering some problems with their cable provider). By the end of the 1980s, then, many scholars interpreted these as evidence that, at least for cable television, "with some exceptions, reneging on franchise agreements and renegotiation problems at the refranchising stage have not been a serious problem in practice" (Joskow 1988: 99, citing the dissertations that yielded Zupan [1989] and Prager [1990]).

However, more recent evidence suggests that this conclusion may be too sanguine. Goolsbee and Petrin (2004) study the effect of satellite television, which competes directly with cable providers in every municipality in the United States, on the price of cable television. Exploiting geographic variation in the quality of satellite signals, they find that the advent of satellite television leads to a price reduction of up to 15% for premium cable packages. Relatedly, Malatesta and Smith (2011) explore the effect of a 2004 legal change that facilitated entry by a New Jersey telecom provider, Verizon, into provision of television services through telephone wires. They find that the terms of renewal for New Jersey cable television franchises are much more favorable for the municipality after the legal change, but only for those municipalities in which Verizon already has telecom equipment. Finally, Moreton and Spiller (1998) find that telecommunications incumbents' bargaining power increases with their holding concessions in neighboring areas; an incumbent with adjacent franchises can spread costs more readily than rivals, and thus deter rival bids. Together, these studies indicate that the latent competition in a franchise renewal is not sufficient to prevent incumbent franchisees from extracting quasi-rents. They also suggest that municipalities may vary in their ability to attract competition with which to discipline franchisees.

Municipalities may also vary in the degree to which they can credibly threaten to integrate backwards. In particular, Seamans (2012) notes that cities that own their own municipal electric utilities are better situated than those without such utilities to launch a city-owned television system, because it is technologically feasible to carry television signals along electric utility lines. Thus, such cities can more credibly threaten to integrate into cable television provision. Seamans finds that cable television franchisees invest in technological upgrades more rapidly when serving a municipality that has a municipal electric utility, presumably in response to this threat of public provision. More generally, this study indicates that heterogeneity in the ease of public provision is likely to affect the ability of a city to discipline an incumbent franchisee.

One source of heterogeneity in municipalities' ability to attract bids and threaten backward integration likely relates to size. As Levin and Tadelis (2010) note, there may be a minimum size below which a city cannot efficiently produce a given service in-house. To the extent that direct management of a service benefits from scale, a larger city will enjoy lower per-resident costs of provision than a smaller city. At the same time, to the extent that a larger city represents a larger market than a smaller city, it should attract more interest from suppliers, ceteris paribus. Finally, to the extent that reputation does matter to a private water provider, large cities will likely be more visible references than small cities, because they attract more attention from both news media and other cities. Thus, it is likely that city size will be directly related to a city's ability to discipline private franchisees.

Will water provision be affected by transaction-cost problems? Franchises for French water provision appear to be less subject to hazards than many other potentially privatizable activities. In contrast to services for which there are multiple dimensions of quality, such as cable television (clarity of reception, number of channels, availability of specialty channels, etc.), the criteria for awarding a water franchise appear relatively straightforward: water should meet basic health standards, and the fewer contaminants the better. Similarly, water treatment and delivery appears to be fairly straightforward to monitor. In their analysis of a survey of US city administrators, Levin and Tadelis (2010: 523) note that respondents "viewed water treatment as . . . being fairly routine and saw measuring performance as not unduly difficult." Finally, the idiosyncrasies of the French franchise system should reduce the influence of specialized assets on bidding parity. Whereas US administrators consider potential hold-up regarding specialized assets to be the most daunting contractual problem in water services (Levin and Tadelis 2010), the French regulation stipulating that all infrastructure is owned by the municipality reduces the likelihood that ownership of assets will affect bidding parity.

Nevertheless, water service franchisees do have recourse to actions that can affect franchise execution and bidding parity. Absent an unusually detailed contract, water providers are able to renegotiate rates during a contract as new contingencies arise. A recent analysis of virtually all water contracts in effect in 2009, for French municipalities exceeding 15,000 people, found that more than 40% of the contracts had experienced at least one renegotiation since initiation (Porcher 2012). Further, those contracts that experienced at least one renegotiation tended to experience multiple renegotiations, averaging nearly six distinct renegotiations per contract, or roughly one every 2–3 years. As Masten (2011) notes in his study of the shift to public ownership of water utilities in the United States, during such negotiations water providers can cause pain for residents, and presumably generate pressure on the municipality administrators, by scheduling repairs and upgrades to be as disruptive as possible.

Finally, we note that although a franchisee does not own the physical water system in a municipality, the franchisee does possess privileged access to detailed data on the condition of the system. Although general information on the layout of the system must be shared with the municipality, specific knowledge on the location of leaks, the condition of particular conduits and pieces of equipment, etc., resides in the information systems of the incumbent operator or in the heads of its employees and therefore is commonly withheld from the municipality. Thus, although French water service franchises are likely to be less afflicted by hazards than the "typical" municipal service, there is still reason to anticipate problems of the transaction cost kind, and to expect that a municipality's ability to discipline a franchisee will influence water prices and renewal patterns.

4. Data and Empirical Strategy

4.1 Data and Sample

In order to conduct the analysis, we combined data from two government sources, the French Environment Institute (IFEN) and the French Health Ministry (DGS), concerning nearly 5000 municipal public water authorities out of the 15,000 water authorities in France. Beginning in the late 1990s, IFEN and DGS have collected information from 4986 water authorities four times at roughly 3-year intervals: 1998, 2001, 2004, and 2008. We thus were able to develop a unique panel data set. The sample is representative of the total population of French municipal public water authorities. All sizes of municipalities are proportionately represented, with the exception that all municipalities of 10,000 or more residents are included. The sample represents more than 75% of the entire French population for which water services are provided. Consistent with prior research (Chong et al. 2006), we eliminate 567 municipalities that use a different governance mode for water production than for water distribution (e.g., in-house provision and private distribution). Although these municipalities are interesting in their own right, it is not feasible to compare their prices to pure in-house or pure private provision because the pure forms do not specify distinct prices for production and distribution. We eliminate another 955 municipalities due to missing or inconsistent information about the identity of the water operator. This leaves us with a final sample of 3464 municipalities that appear in each of the 4 years, or 13,856 municipality-year observations. Missing information on price and other variables reduces the sample to 11,363 municipality-year observations.

4.2 Empirical Strategy

To explore whether overpricing of water leads municipalities to decide against renewing their private water provider, we first need to identify instances of overpricing; then we can assess whether such overpricing affects the likelihood of organizational change. We follow the general approach of Nickerson and Silverman (2003) by first estimating a linear model of water price. We then use the coefficients from this model to generate an "expected" price for each municipality under both in-house provision and private provision of water—that is, the price that the linear model predicts for that municipality given the municipality's characteristics in a given year t. The differences between actual price charged in the municipality and these expected prices represent the degree of overpricing (or underpricing) of water in the municipality as of year t. We then estimate models of non-renewal in which the overpricing measures appear as independent variables.

4.2.1 Estimation of Water Price. Our first challenge is to estimate the effect of governance form on water price. Although scholars have previously explored this issue (Carpentier et al. 2006; Chong et al. 2006), prior research has relied on cross-sectional data. We exploit the panel dimension of our data to deal with the issue of endogenous organizational choice. We assume that the price paid by a municipality for water provision depends on characteristics of the water infrastructure, the water services provided, the municipality itself, and the organizational form chosen by the municipality to ensure the provision of water. Specifically:

$$\text{Price} = \boldsymbol{x}'_{it}\beta + u_{it},$$

where Price_{it} is the price paid by consumers for water in municipality i at time t, $\boldsymbol{x}_{it}$ is a vector of characteristics of the water infrastructure, water services provided, and municipality for municipality i at time t, and u_{it} is the usual regression error term. A first difficulty encountered in evaluating the impact of organizational choices on prices stems from the fact that prices are only observable for a chosen organizational form:

$$\text{Price}_{it}^{\text{observed}} = \begin{cases} \text{Price}_{it}^{\text{Private}} = \boldsymbol{x}'_{it}\beta^{\text{Private}} + u_{it}^{\text{Private}} & \text{if municipality } i \text{ uses} \\ & \text{private provision at time } t \\ \text{Price}_{it}^{\text{Inhouse}} = \boldsymbol{x}'_{it}\beta^{\text{Inhouse}} + u_{it}^{\text{Inhouse}} & \text{if municipality } i \text{ uses} \\ & \text{inhouse provision at time } t \end{cases}.$$

The above equation can also be written as follows:

$$\text{Price}_{it}^{\text{observed}} = \text{Private} \times \text{Price}_{it}^{\text{Private}} + (1 - \text{Private}_{it}) \times \text{Price}_{it}^{\text{Inhouse}}$$

where Private_{it} is an indicator variable that is equal to 1 when municipality i has chosen to organize its water services through a private provider during time t, and 0 otherwise. If we are willing to assume that $\beta^{\text{Private}} = \beta^{\text{Inhouse}}$ and $u_{it}^{\text{Private}} = u_{it}^{\text{Inhouse}}$, then it can be shown that the impact of Private on water prices can be obtained by estimating the following equation:

$$\text{Price}_{it}^{\text{observed}} = \boldsymbol{x}'_{it}\,\beta + \pi\text{Private}_{it} + u_{it}$$

In particular, the estimate of π should correspond to the average effect on prices paid by consumers when their water service is organized as a franchised private operator, ceteris paribus.

However, consistent estimates on π are obtained only if the error term in the above equation is uncorrelated with various explanatory variables in the equation. Such an assumption is likely to be violated if organizational forms are chosen by municipalities based on considerations that are unobservable by the researcher (and therefore not accounted for in the estimation equation), and could imply that the error term is correlated with the observed organizational choice. In this case, estimating the above equation using ordinary least-squares estimation will yield a biased estimate for π.

To address this, we assume that the error term can be decomposed into two terms:

$$u_{it} = v_i + \varepsilon_{it},$$

where v_i captures heterogeneity across different municipalities that is invariant through time, and ε_{it} is a random error term. The endogeneity bias discussed above can therefore arise if v_i is correlated with the explanatory variables. For instance, it is possible that the topology of a municipality may influence the cost of water provision, and may systematically drive a municipality to favor one organizational mode. If this dimension is not accounted for among our explanatory variables, then a correlation arises between v_i and the explanatory variables, leading to a biased estimation of π.

There are two means to resolve this issue. First, one can rely on an endogenous switching regression model to account for organizational choices directly in the estimation procedure (e.g., Chong et al. 2006). Second, with panel data one can control for potential correlation using fixed-effect regressions such as the within estimator, the first-difference estimator or the least square dummy variable (LSDV) estimator. The first of these methods requires the use of at least one instrument. As for the latter of these methods, the endogeneity bias can be addressed without need of an instrument as long as any unobserved heterogeneity that leads a municipality to favor an organization form is time-invariant (Hamilton and Nickerson 2003). In our analysis, we appeal to a fixed-effects LSDV specification to obtain consistent estimates for the impact of organizational choice on prices.[4]

4.2.2 Estimation of Overpricing. We then use the results of the pricing model to determine the degree to which municipality i at time t overpays for its water given the expected prices generated by the model. In essence, each municipality i faces two "expected" prices. $\overline{\text{Price}}_{it}^{\text{Inhouse}}$ is the expected price of water for municipality i at time t if the municipality were to govern its water authority as an in-house public entity. $\overline{\text{Price}}_{it}^{\text{Private}}$ is the expected price of water for municipality i at time t if the municipality were to govern its water authority via a franchised private provider. If the municipality's actual price of water, $\text{Price}_{it}^{\text{observed}}$, exceeds either of these expected prices, then we expect that the municipality should be motivated to

4. In unreported results, we also run a switching regression model using as instrument the organizational mode chosen for sanitation services. The obtained estimations are comparable with those obtained using a fixed-effects specification. For the sake of expositional simplicity, we report only the fixed-effects estimations. The estimation results from the endogenous switching regressions are available upon request.

not renew with its incumbent private provider. To allow for a more flexible estimation of these expected prices, we extend the pricing model to allow for coefficients of various explanatory variables to change between organization modes. The Appendix provides a complete description of the computation of expected prices, and presents the specific estimations used.

4.2.3 Renewal of Incumbent Water Providers. Our final step is to estimate the likelihood that a municipality will renew its incumbent private provider of water. As noted above, there are two possible types of non-renewals. First, upon contract termination a municipality can choose to switch to in-house provision. Second, upon contract termination a municipality can choose to switch to an alternate private provider.[5]

We appeal to regression analysis to understand the factors that drive the renewal decision. Since renewal is a dichotomous choice, we use Probit models to estimate the probability that a municipality renews the incumbent provider. In our data, we observe in year t whether a municipality whose franchise contract expired between $t-1$ and t renewed the incumbent private provider, contracted with a different private provider, or brought water provision in-house. In our estimations, we therefore estimate the likelihood of renewing the incumbent in year t as a function of independent variables from $t-1$. But what if an incumbent operator gouges a municipality in the final years of a contract and then offers a competitive bid for the next contract? As noted above in the institutional details section, French municipal water authorities are explicitly allowed to take into account non-price factors when awarding franchises. We assume that a municipality will—or certainly should—take into account the past pricing behavior of an incumbent when making current franchise decisions, and thus overpricing in $t-1$ will affect renewal decisions in t.

4.3 Dependent Variables

In our main results, we seek to estimate the effect of water price on the likelihood that a municipality will renew its incumbent private provider of water. As noted above, this requires three steps: estimation of a price function, construction of measures of overpricing, and estimation of the effect of overpricing on the likelihood of renewal. This necessitates construction of distinct dependent variables for price and for renewal.

$Price_{it}$ is the price paid by residents of municipality i in year t for 120 cubic meters of water, which is the standard measure of water in Europe (it is approximately the average annual per-capita consumption of water). This price is measured in inflation-adjusted Euros.

5. Our attribution of choice to the municipality assumes that incumbent private providers are always willing to bid for a new contract with the municipality (and that at least one rival is willing to bid as well). This is consistent with the observations of Canneva et al. (2012). Studying all the contracts that expired and were put out for new bid in France during 2007, they found that in 99.5% of the cases the incumbent submitted a bid for renewal.

Non-Renewal$_{it}$ is a categorical variable set equal to 1 if municipality i switched from its incumbent private provider of water at time $t-1$ to either in-house provision of water or to a different private provider at time t, and 0 if municipality i relied on the same provider in both time periods. The variable is undefined if municipality i's contract with the provider did not terminate between $t-1$ and t, and therefore the estimations employing this dependent variable exclude municipalities whose contracts did not terminate between $t-1$ and t.

In sensitivity analyses, we explore whether municipalities exhibit systematic differences in the two types of non-renewals—bringing water provision in-house and switching to a new private provider. For these estimations we disaggregate non-renewal events into two distinct dependent variables representing the two non-renewal types.

Switch to In-House$_{it}$ is a categorical variable set equal to 1 if municipality i switched from its incumbent private provider of water at time $t-1$ to in-house provision of water at time t, and 0 if municipality i relied on the incumbent provider in both time periods. The variable is undefined if municipality i relied on in-house provision at time $t-1$ or if municipality i's contract with the provider did not terminate between $t-1$ and t, and therefore the estimations employing this dependent variable exclude such municipalities. The variable is also undefined if the municipality i switched from one private provider to another; the estimations employing this dependent variable exclude municipalities that switch providers.

Switch Providers$_{it}$ is a categorical variable set equal to 1 if municipality i switched from its incumbent private provider of water at time $t-1$ to a different private provider at time t, and 0 if municipality i relied on the incumbent provider in both time periods. The variable is undefined if municipality i relied on in-house provision at time $t-1$ or if municipality i's contract with a private provider did not terminate between $t-1$ and t. Therefore, the estimations using this variable exclude municipalities that relied on in-house provision at $t-1$ or whose contracts did not terminate between $t-1$ and t. The variable is also undefined if the municipality i switched from private to in-house provision; thus, the estimations employing this dependent variable exclude municipalities that brought water provision in-house.

4.4 Independent Variables

4.4.1 Governance Mode.

Private$_{it}$ is a categorical variable set equal to 1 if municipality i relied on private water provision at time t, and 0 if it relied on in-house provision.

4.4.2 Water Treatment.

Water utilities typically must disinfect water to ensure its fitness for human consumption. The IFEN survey assesses the extent of disinfection treatment applied to each municipality's water as falling into one of six categories: no treatment, light treatment, light–medium treatment, medium treatment, medium–heavy treatment, and heavy treatment. Each municipality is assigned to exactly one category in a given year. We created a scale variable, Treatment Intensity$_{it}$, that was coded 0 for no treatment and progressively higher for more intense treatment levels, up to 5 for heavy treatment. One potential concern about such a scale is that it imposes a linear relationship among the categories when such a relationship may be unwarranted. In unreported results we replaced Treatment Intensity with six categorical variables, each representing one of the IFEN categories. Our main results were qualitatively unchanged. To conserve on degrees of freedom, we present the results with the Treatment Intensity variable.

IFEN also identifies the source of a municipality's raw water. This can be surface water, underground water, or a combination of both. The source of water has implications for the extent of filtering it will need, which is distinct from disinfection. In general, surface water is likely to have more pollutants and thus require more filtering than will underground water. We created a scale variable, Water Origin$_{it}$, set equal to 0 for underground water, 1 for a mixture of underground and surface water, and 2 for surface water. As with the treatment data, in unreported results we replace Water Origin with three categorical variables, each representing one of the IFEN categories. Our main results were qualitatively unchanged.

4.4.3 Water Quality. The French Health Ministry collects information on the degree to which each municipality's water supply meets national standards for absence of bacteria and chemicals. Using these data we create three variables to measure water quality. Water Safety_Bacteria$_{it}$ is defined as the proportion of tests during year t that municipality i's water met national standards regarding the presence of bacteria. Water Safety_Chemical$_{it}$ is defined analogously for the presence of chemicals. Water Safety$_{jt}$ is defined as the minimum of the two variables for a given municipality-year observation.

Leaks in a municipal water system are proxies for the quality of the infrastructure. IFEN collects data on the amount of water that is produced (i.e., pumped out of reservoirs) as well as the amount that is billed to customers in each municipality. The difference between these is the amount of water that leaks out somewhere in the municipality's infrastructure system. Leakage is costly to the municipality because customers only pay for the water that they use, and a private water provider (if any) only pays the municipal government for water that is paid for by customers. We include the variable Leak Ratio$_{it}$, defined as:

$$Leak\ Ratio_{it} = \frac{Total\ volume\ of\ leaks_{it}}{Volume\ of\ produced\ water_{it} + Volume\ of\ imported\ warer_{it}},$$

where volume of imported water$_{it}$ is the volume of water that municipality i purchases from another municipality in year t.

4.4.4 Over- and Under-pricing. We construct measures of the extent of overpricing as follows:.

$$Overpriced\ vs\ Inhouse = \frac{\text{Price}_{it} - \overline{\text{Price}}_{it}^{\text{Inhouse}}}{\text{Price}_{it}},$$

$$Overpriced\ vs\ Private = \frac{\text{Price}_{it} - \overline{\text{Price}}_{it}^{\text{Private}}}{\text{Price}_{it}},$$

where $Price_{it}$ is the observed price of water in municipality i at time t, $\overline{\text{Price}}_{it}^{\text{Inhouse}}$ is the expected price of water for municipality i at time t if the municipality were to govern its water authority as an in-house public entity, and $\overline{\text{Price}}_{it}^{\text{Private}}$ is the expected price of water for municipality i at time t if the municipality were to govern its water authority through private provision.

If either Overpriced vs In-house$_{it}$ or Overpriced vs Private$_{it}$ is positive at contract expiration, then the municipality should be motivated to not renew the incumbent. For example, if municipality i relies on a private provider at time t and Overpriced vs In-house$_{it} > 0$, then the municipality should have an economic motivation to bring water provision in-house. Similarly, if municipality i relies on a private provider at time t and Overpriced vs Private$_{it} > 0$, then the municipality should have an economic motivation to switch providers. Of course, many municipalities will pay actual prices that are below their expected prices; these municipalities are unlikely to switch provider or governance mode.

4.4.5 Control Variables that may Affect Price. Consistent with prior research, we include several variables to control for other municipality characteristics that could affect price. The precise definition of these variables appears in Table 1. Population$_{it}$ controls for the size of municipality i's population. To the extent that there are scale economies in the production and distribution of water, Population should be negatively associated with the price of water. Inter Authority$_{it}$ is a categorical variable that controls for instances in which municipality i collaborated with neighboring municipalities to purchase or manage its water services. Limitation$_{it}$ is a categorical variable that controls for the existence of regulatory restrictions regarding water usage in a municipality in a given year, while Investment Program$_{it}$ is a categorical variable that controls for the presence of an investment program to augment the water infrastructure in a municipality. Tourist Area$_{it}$ is a categorical variable that identifies municipalities that are officially designated as tourist centers. Finally, Indep Ratio$_{it}$, measured as the proportion of water used by municipality i that was produced by that municipality (as opposed to being imported from outside of the municipality), controls for a municipality's reliance on water from outside its jurisdiction.

As noted above, the dominance of an incumbent provider in neighboring areas may affect its relative cost of water provision in the focal

Table 1. Definition of Variables and Summary Statistics

Variable	Definition	Mean	SD	Min	Max
For price estimations	*(N= 11,363 municipality-year observations)*				
$Price_{it}$	Deflated Price per 120 m^3 of water in municipality i in year t	142.513	41.689	50.153	298.288
$Private_{it}$	1 if municipality i relies on private provision in year t, else 0	0.614	0.487	0.000	1.000
Treatment $Intensity_{it}$	Six-point scale variable measuring the intensity of water treatment required by municipality i in year t: 0 = no treatment, 5 = heavy treatment	2.123	1.563	0.000	5.000
Water $Origin_{it}$	Three-point scale variable identifying source of water in municipality i in year t: 0 = underground, 1 = mixture of underground and surface, 2 = surface	0.466	0.760	0.000	2.000
Water Safety-$Bacteria_{it}$	% of tests during the year t for which municipality i's water meets legal standard for bacteria	0.953	0.161	0.000	1.000
Water Safety-$Chemical_{it}$	% of tests during the year t for which municipality i's water meets legal standard for chemicals	0.935	0.187	0.000	1.000
Water $Safety_{it}$	Minimum of Water Safety-Bacteria and Water Safety-Chemical	0.920	0.190	0.000	1.000
Leak $Ratio_{it}$	$\frac{\text{Total volume of leaks}}{\text{Volume of water produced + Volume of water imported}}$ for municipality i at time t	0.229	0.131	0.000	0.944
Ln $Population_{it}$	Natural log of the number of inhabitants in municipality i in year t	7.721	1.687	2.079	13.042
Inter $Authority_{it}$	1 if municipality i organizes water services jointly with other municipalities in year t, else 0	0.720	0.449	0.000	1.000
$Limitation_{it}$	1 if water consumption in municipality i is constrained by regulations in year t, else 0	0.650	0.477	0.000	1.000
Investment $Program_{it}$	1 if municipality i is undertaking an infrastructure investment program in year t, else 0	0.063	0.243	0.000	1.000
Tourist $Area_{it}$	1 if municipality i is defined as a tourist area in year t, else 0	0.130	0.336	0.000	1.000
Indep $Ratio_{it}$	$\frac{\text{Volume of water produced}}{\text{Volume of water produced + Volume of water imported}}$ for municipality i at time t	0.907	0.203	0.000	1.000
Market Share $In\text{-}house_{it}$	Excluding municipality i, the population served through in-house provision in municipality i's département divided by total population in the département[a]	0.302	0.251	0.000	0.993
Market Share $Incumbent_{it}$	Excluding municipality i, the population served by municipality i's operator in municipality i's département divided by total population in the département. For municipalities whose services are run in-house, the population served by the département's dominant operator divided by total population in the département[a]	0.348	0.257	0.000	0.963

(continued)

Table 1. Continued

Variable	Definition	Mean	SD	Min	Max
For renewal estimations[b]	*(N= 701 municipality-year observations)*				
Non-Renewal$_{it}$	1 if municipality *i* did not renew the incumbent private operator in year *t*, else 0	0.120	0.325	0.000	1.000
Switch to In-House$_{it}$	1 if municipality changed from private to in-house provision in year *t*, else 0	0.057	0.232	0.000	1.000
Switch Providers$_{it}$	1 if municipality changed to a different private provider in year *t*, else 0	0.063	0.243	0.000	1.000
Overpriced versus In-house$_{it}$	$\frac{\text{Observed price} - \text{Expected price if in-house provision}}{\text{Observed price}}$ for municipality *i* at time *t*	0.089	0.111	−1.024	0.438
Overpriced versus Private$_{it}$	$\frac{\text{Observed price} - \text{Expected price if private provision}}{\text{Observed price}}$ for municipality *i* at time *t*	−0.005	0.108	−1.202	0.348
Overpriced$_{it}$	Maximum of Overpriced versus In-house and Overpriced versus Private	0.091	0.108	−1.024	0.438
Duration$_{it}$	The duration of the franchise contract that expired in municipality *i* in year *t*−1	16.545	8.878	0.000	53.000
Sanitation Operator$_{it}$	1 if incumbent operator also provided sanitation services in municipality *i* in year *t*−1, else 0	0.535	0.499	0.000	1.000
Mayor Change$_{it}$[c]	1 if the mayor of municipality *i* has changed since initiation of the expired franchise contract, else 0	0.369	0.484	0.000	1.000
Right Wing$_{it}$[c]	1 if municipality *i*'s town council is governed by a right-wing party, else 0	0.530	0.500	0.000	1.000
Industry Price Different$_{it}$[d]	1 if Industry customers do not pay the same price compared with residential consumers, else 0	0.466	0.500	0.000	1.000

[a]In France, the département is the administrative level of government immediately above the municipality. France consists of roughly 100 départements. Départe-ment boundaries were established in the 1800s such that all municipalities would be within a 24-hour horseback ride of the département's geographic center.

[b]The renewal estimations are restricted to observations for municipality *i* in year *t* for which: (1) water was provided by a private operator in $t-1$, and (2) the franchise contract for water provision expired between $t-1$ and *t*.

[c]*N* for the political variables is 214. Political information is not available for municipalities with populations below 5000.

[d]Industry Price Different data are available only for 2008. We assume that this variable takes on the same value for all periods; *N* for this variable, computed on the subset of municipalities used in our regressions on non-renewal, is 129.

municipality. To control for this, we exploit information on the organization of water provision in all other municipalities that are in a focal municipality's "département," which is the administrative level of government immediately above the municipality.[6] We construct two control variables. Market Share Incumbent$_{it}$ is defined as the share of the département's population, excluding that of municipality *i*, whose water is provided by the same franchisee that serves municipality *i*. Market Share In-house$_{it}$ is defined as the share of the département's population, excluding that of municipality *i*, whose water is produced via in-house provision. Market Share Incumbent is intended to proxy for the advantage that the incumbent private provider has over rival providers in providing water to municipality *i*. Market Share In-house is intended to proxy for the feasibility that municipality *i* can switch to in-house water provision.

4.4.6 Control Variables that may Affect Renewal. For our estimations of municipalities' renewal behavior, we include additional variables that may affect the propensity to renew an incumbent water provider. Sanitation Operator$_{it}$ is set equal to 1 if municipality *i* at time *t* uses the same private provider for its sanitation services and for its water services, and 0 otherwise. Although there is no technological interdependence between water services and sanitation services, it is possible that a commitment to a specific firm for both water and sanitation service may reduce the likelihood that a municipality will remove its water provision from that firm. Duration$_{it}$ is set equal to the life, in years, of the water contract whose expiration has confronted municipality *i* with a renewal/non-renewal decision at time *t*. Conventional transaction cost theory would suggest that contracts of longer duration would facilitate idiosyncratic investments that could hinder competition by non-incumbents and would therefore reduce the likelihood of switching by the municipality.

We also include a set of variables to capture political factors that may encourage certain types of switches. We include Mayor Change$_{it}$ set equal to 1 if the mayor of municipality *i* was a different individual at time *t* than at the time when the just-expired franchise contract was awarded, and 0 otherwise. We also include the categorical variables Right Wing$_{it}$, and, by omission, Left Wing$_{it}$, to control for the political persuasion of the municipal government at time *t*. (There is too little change in party control over time to incorporate a change-in-party variable.) Conventional wisdom would suggest that, ceteris paribus, right-wing governments would be more receptive than left-wing governments to privatization and less receptive to switching to in-house provision. As Table 1 notes, the data on political factors are available for only a subset of our total sample.

6. France is divided into roughly 100 départements. Département boundaries were established in the 1800s such that all municipalities within a département would be within a 24-hour horseback ride of that département‘s geographic center.

Table 2 elaborates the descriptive statistics by presenting the means of key variables for different subsets of the data, categorized according to municipality size and organization form for water provision. As the table indicates, for both small and large municipalities, the price of water is significantly higher under private provision than under in-house provision. However, privately provided water undergoes significantly more filtering and disinfection treatment than in-house water; further, privately provided water is generally of higher quality in terms of bacteria, chemicals, and leaky infrastructure than its in-house-provided counterpart. Thus, the higher water price under private provision may be driven by reliance on private operators when water requires more treatment, and/or may reflect the higher quality of water delivered. To explore this properly, we turn to multivariate estimation.

5. Results

5.1 Pricing

We first estimate the price of water as a function of organization form. Table 3 shows the results of these estimations. Models 1 and 2 estimate the baseline model, where Model 1 is a "naive" ordinary least squares (OLS) estimation and Model 2 uses the LSDV estimation described in Section 4.2.1. In Model 1, the coefficient on Private, 25.751, is positive and statistically significant. Taken at face value, this implies that, ceteris paribus, a municipality will pay nearly 26 Euros more per 120 m^3 of water when the water is provided by a private operator than when it is provided via direct public management. This is economically significant; given the average price of roughly 142 Euros for 120 m^3 water in the data, the private-operator price premium is nearly 20%.

Although it is a useful baseline, OLS estimation does not account for endogeneity in the organization choice of a municipality. We therefore turn to LSDV estimation in Model 2. In this model, the coefficient on Private remains positive and significant. However, its magnitude is reduced by more than half, to 12.090. A municipality will pay roughly 12 Euros more per 120 m^3 of water when the water is provided by a private operator than when the water is provided via direct public management. This is still economically significant, reflecting an 8% price premium for private provision. This premium exists after controlling for differences in water quality, the extent of water treatment provided, and other characteristics of the water and municipality.

The theoretical discussion above suggests that the private-provision price premium is likely to differ with municipality size. We therefore follow Levin and Tadelis (2010) by creating "bins" of different municipality sizes, based on population, and then interacting Private with the bin categorical variables. Models 3 and 4 present two versions of these estimations, employing different bin sizes. Model 3 includes 13 bins with gradations of 2000 residents up to a population of 20,000, and larger

Table 2. Summary Statistics, by Organizational Form and Municipality Size

	Municipalities with fewer than 5000 inhabitants		Municipalities with 5,000–10,000 inhabitants		Municipalities with more than 10,000 inhabitants		
	In-house	Private	In-house	Private	In-house	Private	All
Number of observations	3264	4170	589	1264	533	1543	11,363
Price	125.00	161.41***	117.01	146.14***	115.28	144.66***	142.51
Treatment Intensity	1.55	2.05***	1.90	2.42***	2.35	3.28***	2.123
Water Origin	0.25	0.43***	0.43	0.55***	0.73	0.90***	0.466
Water Safety_Bacteria	0.91	0.96***	0.97	0.98	0.97	0.99***	0.953
Water Safety_Chemical	0.90	0.94***	0.96	0.95	0.96	0.97*	0.935
Water Safety	0.87	0.92***	0.95	0.95	0.95	0.97**	0.920
Leak Ratio	0.24	0.24	0.23	0.22*	0.21	0.18***	0.229
Population	1411.9	1719.9***	6729.7	7003.4***	36,251.0	32,078.8*	8221.1
Ln Population	7.25	7.45***	8.81	8.85***	10.50	10.38	9.01
Inter Authority	0.68	0.83***	0.58	0.65***	0.51	0.70***	0.720
Limitation	0.06	0.06	0.06	0.06	0.07	0.07	0.650
Investment Program	0.56	0.61***	0.75	0.70**	0.84	0.81	0.063
Tourist Area	0.10	0.13***	0.20	0.21	0.11	0.11	0.130
Indep Ratio	0.94	0.89***	0.93	0.88***	0.93	0.89***	0.907
Market Share In-house	0.41	0.27***	0.43	0.21***	0.47	0.13***	0.302
Market Share Incumbent	0.36	0.28***	0.31	0.41***	0.28	0.44***	0.348

Notes: For binary variables, we perform *z*-test comparing proportions between groups (in-house vs private); for continuous variables, we perform a *t*-test comparing means between groups (in-house vs private). Significance level reported in the table relates to *t*-test with equal variance when variance of a variable between groups are not significantly different at the 5% threshold (based on Levene's test). Otherwise, significance level reported corresponds to a *t*-test under the assumption of unequal variance. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

bins above 20,000. Model 4 includes three bins: municipalities with fewer than 5000 residents (very small towns), municipalities with 5000–10,000 residents (small towns), and municipalities with more than 10,000 residents ("large towns" or "cities"). Models 3 and 4 reveal a striking pattern: whereas the coefficient on Private * bin is positive, significant, and of substantial magnitude for municipalities of 10,000 or fewer residents, it is statistically insignificant and generally smaller for municipalities above 10,000 residents. Based on the point estimates in Model 3, municipalities below 6000 residents will pay between 13 and 18 Euros more for privately provided water, while municipalities between 6000 and 10,000 residents pay between 6 and 10 Euros more, and larger municipalities generally pay a premium of less than 7 Euros. The point estimates in Model 4 are comparable, with a very small town paying a private-provision premium of 16 Euros, a small town paying roughly a 10-Euro premium, and a large town paying a statistically insignificant 5-Euro premium for privately provided

Table 3. Price of Water as a Function of Organizational Form

	(1) OLS	(2) LSDV	(3) LSDV	(4) LSDV
Private	25.751***	12.090***		
	(0.733)	(2.175)		
Private × Pop < 2 k			16.346***	
			(3.411)	
Private × Pop 2 k–4 k			17.305***	
			(3.177)	
Private × Pop 4 k–6 k			13.905***	
			(3.346)	
Private × Pop 6 k–8 k			6.198*	
			(3.613)	
Private × Pop 8 k–10 k			10.097**	
			(4.575)	
Private × Pop 10 k–12 k			7.174	
			(4.395)	
Private × Pop 12 k–14 k			5.637	
			(5.295)	
Private × Pop 14 k–16 k			10.579	
			(6.796)	
Private × Pop 16 k–18 k			4.233	
			(8.811)	
Private × Pop 18 k–20 k			−1.361	
			(6.817)	
Private × Pop 20 k–50 k			1.023	
			(6.795)	
Private × Pop >50 k			7.947	
			(12.094)	
Private x Pop < 5 k				15.624***
				(2.598)
Private × Pop 5 k–10 k				9.700***
				(3.169)
Private × Pop > 10 k				5.316
				(3.790)
Ln Population	−5.410***	−7.316		
	(0.221)	(6.754)		
Treatment Intensity	3.029***	0.841**	0.819**	0.842**
	(0.310)	(0.360)	(0.360)	(0.360)
Water Origin	8.116***	−1.471*	−1.535*	−1.549*
	(0.620)	(0.816)	(0.816)	(0.815)
Water Safety	8.624***	5.254***	5.344***	5.264***
	(1.712)	(1.559)	(1.562)	(1.559)
Leak Ratio	1.151	−1.490	−1.267	−1.301
	(2.761)	(2.452)	(2.449)	(2.452)
Inter Authority	18.872***	11.309***	11.306***	11.237***
	(0.819)	(1.594)	(1.596)	(1.597)
Limitation	−2.069	−1.618*	−1.584*	−1.620*
	(1.381)	(0.855)	(0.852)	(0.856)

(continued)

Table 3. Continued

	(1) OLS	(2) LSDV	(3) LSDV	(4) LSDV
Investment Program	2.474***	−0.439	−0.486	−0.466
	(0.771)	(0.533)	(0.533)	(0.532)
Tourist Area	5.386***	2.926	3.024	2.941
	(1.129)	(2.320)	(2.319)	(2.322)
Indep Ratio	−17.453***	−3.979*	−4.007*	−3.886*
	(1.936)	(2.285)	(2.279)	(2.281)
Market Share In-house	−10.629***	−4.709	−5.134	−4.907
	(1.673)	(4.682)	(4.680)	(4.693)
Market Share Incumbent	−1.361	−8.469*	−7.122	−7.273
	(1.533)	(4.977)	(5.007)	(4.995)
Constant	152.822***	182.605***	125.736***	125.744***
	(3.094)	(52.335)	(4.329)	(4.310)
Year fixed effects	Yes	Yes	Yes	Yes
Municipality fixed effects	No	Yes	Yes	Yes
R^2	0.3028	0.8611	0.8614	0.8612
Adjusted R^2	0.3018	0.8050	0.8052	0.8052
Number of observations	11,363	11,363	11,363	11,363

Notes: Estimation method in Model (1) is ordinary least squares. Estimation method in Models (2)–(4) is LSDV. SEs in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

water. Overall, these results indicate that the private-operator price premium, which has been noted in prior research, is in fact concentrated among small and very small towns.

Several control variables exhibit interesting associations or non-associations with price. We highlight three of them. First, the coefficients on Water Safety and Treatment are consistently significant and positive. Water that more consistently meets national standards for chemical and bacteriological safety commands a higher price. Similarly, the intensity of disinfection treatment is positively associated with price. Second, although Water Origin and Tourist Area are positively associated with price in the OLS estimation, they are far less associated with price in the LSDV models. This likely reflects the time-invariance associated with these variables; few municipalities change from surface water to underground water, or suddenly gain or lose tourist interest, over the sample time frame. Third, municipalities that purchase water in collaboration with other municipalities tend to pay significantly higher prices. Additional unreported estimations indicate that this effect is driven by collaboration among very small and small towns. It is likely that those towns that choose to pursue collaborative water provision have characteristics that make them vulnerable to high prices ex ante.

5.2 Non-renewal of Incumbent Private Operators

As noted in Section 4.2.2, we next calculate the extent to which each municipality in each year encounters overpricing or underpricing, measured as the difference between the price it actually pays for water and the predicted price for both its current organization mode and for the alternate organization mode. This yields the variables Overpriced, Overpriced versus In-house and Overpriced versus Private. Additional details, along with tables, are provided in the Appendix.

Having constructed these variables, we then estimate the likelihood that a municipality will not renew its incumbent private water provider at contract expiration. Note that, since the Overpriced variables are generated using output from the pricing estimation, they incorporate error from that estimation. This affects the calculation of standard errors in our renewal estimation, such that conventional Probit estimation of non-renewal will underestimate the standard errors.[7] We therefore created bootstrapped standard errors to accurately reflect the estimation error from the first stage (bootstrapping program available from authors). Table 4 shows the results of Probit estimations of the likelihood that a municipality that relies on a private operator at time $t-1$, and whose contract terminates between $t-1$ and t, will choose not to contract with the incumbent operator. The dependent variable is Non-Renewal$_{it}$. Independent variables include the extent of overpricing, measures of water and infrastructure quality, other water and water authority characteristics, and measures of the municipal government's political bent.

Models 1 and 2 present the main non-renewal results. Model 1 imposes the constraint that all municipalities, regardless of size, respond similarly to overpricing. Model 2 relaxes this constraint by introducing interaction terms between population bins and overpricing. In Model 1, the coefficient on Overpriced is positive and statistically significant, implying that municipalities respond to incumbents' excessive pricing by reducing their likelihood of renewing the incumbent at contract expiration. In the less constrained Model 2, however, the coefficients on Overpriced * Pop < 5 K and Overpriced * Pop 5 K–10 K are statistically insignificant and of small magnitude, while the coefficient on Overpriced * Pop > 10 K is significant and of substantial magnitude. For very small and small towns, there is no association between the extent of overpricing at time $t-1$ and the likelihood that the municipality will choose not to renew the incumbent at time t. In contrast, in large towns/cities, an increase in overpricing by a private operator is associated with a greater likelihood of the city's not renewing that operator after contract expiration. The marginal effects indicate that this relationship is substantial; in Model 2, at the mean level of overpricing, a 1% increase in overpricing is associated with a nearly 1.15 percentage-point increase in the probability of non-renewal. Since the base rate of non-renewal is roughly 15%, this means that a city facing 4% overpricing above the mean has a non-renewal likelihood of nearly 20%, ceteris paribus. These results imply that although cities are willing and able to discipline private operators that overprice for

7. We are grateful to an anonymous reviewer for pointing this out.

Table 4. Likelihood of Non-renewal of Incumbent Private Operator at End of Contract

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Overpriced	1.714**							
	(0.668)							
	[0.314]							
Overpriced × Pop < 5 k		1.425			1.337		1.406	
		(0.868)			(0.850)		(0.871)	
		[0.240]			[0.215]		[0.235]	
Overpriced × Pop 5 k–10 k		0.230	−0.106	−0.293	0.712	−0.334	0.252	−0.305
		(1.190)	(1.474)	(1.729)	(1.179)	(1.855)	(1.206)	(1.748)
		[0.051]	[−0.022]	[−0.059]	[0.151]	[−0.067]	[0.056]	[−0.061]
Overpriced × Pop > 10 k		5.902***	6.104**	6.282**	4.826**	5.928*	5.958**	6.409**
		(2.151)	(2.475)	(2.913)	(2.366)	(3.235)	(2.186)	(3.000)
		[1.145]	[0.825]	[0.820]	[0.987]	[0.861]	[1.140]	[0.817]
Duration	−0.014*	−0.015*	−0.022	−0.022	−0.010	−0.022	−0.015*	−0.023
	(0.008)	(0.008)	(0.016)	(0.018)	(0.008)	(0.019)	(0.008)	(0.018)
	[−0.003]	[−0.003]	[−0.004]	[−0.004]	[−0.002]	[−0.004]	[−0.003]	[−0.004]
Treatment Intensity	−0.087*	−0.088*	−0.019	−0.040	−0.095*	−0.039	−0.102*	−0.056
	(0.052)	(0.053)	(0.120)	(0.126)	(0.057)	(0.135)	(0.054)	(0.135)
	[−0.016]	[−0.016]	[−0.003]	[−0.007]	[−0.017]	[−0.003]	[−0.019]	[−0.010]
Water Origin	0.199**	0.204**	0.282	0.274	0.230**	0.265	0.200**	0.267
	(0.099)	(0.101)	(0.189)	(0.203)	(0.108)	(0.221)	(0.101)	(0.208)
	[0.036]	[0.038]	[0.052]	[0.048]	[0.041]	[0.046]	[0.037]	[0.046]
Water Safety	0.133	0.159	−2.727	−2.461	−0.028	−2.624	0.108	−2.404
	(1.138)	(1.188)	(3.340)	(3.591)	(1.150)	(3.662)	(1.201)	(3.633)
	[0.024]	[0.030]	[−0.505]	[−0.434]	[−0.005]	[−0.496]	[0.020]	[−0.418]

(continued)

Table 4. Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Leak Ratio	1.297***	1.298***	2.272*	2.021	1.628***	2.003	1.355***	2.117
	(0.479)	(0.485)	(1.163)	(1.257)	(0.506)	(1.289)	(0.497)	(1.301)
	[0.238]	[0.242]	[0.421]	[0.356]	[0.291]	[0.354]	[0.252]	[0.368]
Inter Authority	−0.196	−0.212	−0.606**	−0.477	−0.238	−0.472	−0.216	−0.471
	(0.152)	(0.159)	(0.300)	(0.319)	(0.164)	(0.341)	(0.160)	(0.334)
	[−0.036]	[−0.040]	[−0.112]	[−0.084]	[−0.042]	[−0.079]	[−0.040]	[−0.082]
Sanitation Operator	−0.269**	−0.272**	−0.549**	−0.545*	−0.343**	−0.557*	−0.274**	−0.567*
	(0.129)	(0.130)	(0.270)	(0.298)	(0.133)	(0.320)	(0.132)	(0.305)
	[−0.049]	[−0.051]	[−0.102]	[−0.096]	[−0.061]	[−0.101]	[−0.051]	[−0.099]
Mayor Change * Pop 5 K–10 K				−0.572		−0.598		−0.562
				(0.431)		(0.461)		(0.436)
				[−0.114]		[−0.119]		[−0.112]
Mayor Change * Pop > 10 K				0.110		0.101		0.104
				(0.380)		(0.452)		(0.387)
				[0.022]		[0.020]		[0.021]
Right Wing * Pop 5 K–10 K				−0.393		−0.365		−0.337
				(0.496)		(0.565)		(0.506)
				[−0.050]		[−0.052]		[−0.042]
Right Wing * Pop > 10 K				−0.603		−0.604		−0.648
				(0.462)		(0.500)		(0.471)
				[−0.075]		[−0.084]		[−0.077]
Market Share Incumbent					0.031	0.186		
					(0.349)	(0.840)		
					[0.006]	[0.029]		

(continued)

Table 4. Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Share In-House					1.118***	0.218		
					(0.316)	(0.834)		
					[0.200]	[0.040]		
Industry Price Different							0.217	0.168
							(0.149)	(0.342)
							[0.040]	[0.029]
Pop < 5 k	−0.384**	−0.075			−0.194		−0.038	
	(0.192)	(0.271)			(0.285)		(0.275)	
	[−0.384]	[−0.104]			[−0.109]		[−0.057]	
Pop 5 k–10 k	−0.042	0.343	0.626*	0.244	0.203	0.224	0.361	0.267
	(0.213)	(0.297)	(0.360)	(0.524)	(0.315)	(0.587)	(0.301)	(0.533)
	[−0.042]	[0.044]	[0.052]	[0.029]	[0.044]	[0.023]	[0.096]	[0.031]
Constant	−1.078	−1.419	0.829	−1.276	0.743	0.815	−1.424	−1.256
	(1.089)	(1.182)	(3.237)	(3.337)	(1.207)	(3.683)	(1.186)	(3.406)
Number of observations	701	701	206	206	691	199	701	206
Pseudo-R^2	0.063	0.076	0.190	0.218	0.100	0.208	0.081	0.220
Log Pseudolikelihood	−240.9	−237.3	−70.7	−68.2	−230.0	−68.1	−236.1	−68.1
Test of equality of coefficients:								
Overpriced × Pop < 5 k versus Overpriced × Pop > 10 k		Reject**			Insignificant		Reject**	
Overpriced × Pop 5 k–10 k versus Overpriced × Pop > 10 k		Reject**	Reject**	Reject**	Insignificant	Reject**	Reject**	Reject**

Notes: Probit estimation. Bootstrapped SEs, based on 999 replications of estimation, in parentheses. Marginal effects in brackets. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

water, small and very small towns are either unwilling or unable to do so. Put differently, for small and very small towns, overpricing by a private operator before contract expiration is "water under the bridge."[8]

It is possible that political considerations play a role in water provision that biases these results. In Models 3 and 4, we introduce municipality-level measures of political preferences and political change. Since these variables are not available for municipalities with populations below 5000 residents, in Model 3 we first replicate the estimation in Model 2 excluding very small towns, to ensure that any change in results is not an artifact of the restricted sample size. Model 4 then introduces the political variables. The basic results remain the same in Models 3 and 4: whereas the coefficient on Overpriced * Pop 5 K–10 K remains statistically insignificant, the coefficient on Overpriced * Pop > 10 K remains positive, significant, and large, and with a marginal effect comparable to that in Model 2.

Models 1–4 of Table 4 yield three other insights. First, the coefficient on Water Safety is not significant in these estimations. At first blush, this is somewhat surprising given the likely salience of failing to meet bacteria and chemical standards. However, the high overall level of water safety in France, particularly in private provision of water, means that there is little variation in the measure: the median value for Water Safety is 0.994 and the first-quartile value is 0.935. Second, the coefficient on Sanitation Operator is negative and significant throughout the estimations. A municipality is more likely to renew the incumbent water provider when that provider also handles the municipality's sanitation contract. This may reflect superior political entrenchment of the provider vis-à-vis a municipality, or it may reflect a municipality's concern that a spurned water provider that continues to handle sanitation may be in a position to behave opportunistically in the sanitation activity. Third, political factors appear to play little role in renewal decisions; none of the four political variables is statistically significant.

8. These results raise the question: why do franchisees ever charge an "excessive" price to a large town, given the credibility of the non-renewal threat? Conventional models of pricing predict that a franchisee would price just below the level that would trigger non-renewal. For small towns, our empirical results suggest that the franchisee can "overprice" by 10–15 Euros due to the high switching costs faced by these towns, and presumably if the franchisee were to overprice more aggressively than the observed rate, then this would trigger non-renewal. As for large towns, which respond to overpricing with higher likelihood of non-renewal, there appear to be two plausible rationales. First, it may be more difficult for franchisees to estimate the switching costs of large towns than of small towns, particularly if small towns uniformly lack relevant capabilities for self-provision, while large towns have more scope for variation on this dimension. Second, franchisees may have a greater incentive in larger towns to "test the waters" with overpricing that potentially triggers non-renewal. To the extent that the "safe price" that will not trigger non-renewal is closer to costs in larger towns than in smaller towns, the potential benefit of "aggressive price" profits (in the absence of non-renewal) is larger relative to the potential cost of lost profits should the aggressive price induce non-renewal.

5.3 Alternative Explanations

5.3.1 Are Switching and Pricing Driven by Heterogeneity of Water-Provision Costs? The above results indicate that small and very small towns' contract renewal decisions are not affected by incumbent providers' overpricing before contract expiration, while cities' decisions are influenced by incumbent overpricing. We interpret the non-responsiveness of towns as evidence of an inability to discipline incumbents through non-renewal. An alternative explanation would attribute the results to heterogeneous costs of water provision across private providers and municipalities that line up systematically with municipality size. Consider two municipalities that are identical in most characteristics. For municipality 1, the cost of water provision is the same for providers A and B. For municipality 2, the cost of water provision is sharply higher for provider B than for A. In municipality 2, we should expect to see A charge a high price (that just undercuts the price that B could offer), and the municipality will not switch providers at renewal time. In contrast, municipality 1 will switch readily if A charges a high price.

What might lead one municipality to have a higher disparity in water-provision costs across potential providers? Different providers use generally similar production technologies, and appear to have broadly similar production costs. As noted above, Moreton and Spiller (1998) suggest that one source of disparity is likely to arise from disparities in the number of geographically proximate municipalities served. To the extent that water production involves lumpy assets that are usable across multiple municipalities—for example, maintenance or repair equipment, or technical personnel—if provider A serves several municipalities that are geographically proximate to municipality 2, then it may have lower costs to serve municipality 2 than does provider B.

Models 5 and 6 of Table 4 show the results of estimations that incorporate the Market Share Incumbent and Market Share In-house variables. In Model 5, Market Share In-house is positively associated with non-renewal; to the extent that the prevalence of in-house provision within a department reflects the feasibility of a focal municipality's bringing water provision in-house, this suggests that feasibility of in-house provision is associated with greater incidence of non-renewal. However, this relationship disappears when political variables are included. Perhaps more important, Market Share Incumbent bears no association with renewal decisions, suggesting that heterogeneity in cost of private provision is not driving the main results. The results in Models 5 and 6 regarding switching behavior by municipality size are qualitatively identical to the results in Models 1–4.

5.3.2 Are Switching and Pricing Driven by Heterogeneity of Ancillary Prices? Another potential alternative explanation would attribute the results to heterogeneous (and unobserved) prices of ancillary services. Our data measure the price paid by residential customers. As noted in Section 2, industrial customers may pay a different price for water than residential customers. If towns of different sizes have systematically different rates for industrial customers, then it is possible that our results are driven by unobserved differences in industrial-customer prices.

To explore this, we exploit information that is available in a subset of our data. For 2008 only, the IFEN data provide a dummy variable denoting whether the price paid by industrial customers in a given municipality is different than that paid by residential customers. We estimate pricing and switching models while including this measure for our full specification equations.[9] The results of the non-renewal model appear as Models 7 and 8 of Table 4. As the table indicates, the coefficient on Industry Price Different is not significant, and its inclusion does not qualitatively change our results.

5.4 Further Exploration of Non-renewals—Switching Operator versus Bringing In-house

Finally, we explore differences between the decision to bring water provision in-house and to switch private operator. We estimate Probit models of the likelihood that a municipality that relies on a private operator at $t-1$, and whose contract terminates between $t-1$ and t, will choose to bring water provision in-house—that is, to switch to direct public management of water provision rather than continue to contract it out. In these estimations, the relevant measure of overpricing is Overpriced vs In-house. The results are presented in Table 5, Models 1 and 2. Analogous to Models 1 and 2 in Table 4, the coefficients on the measure of overpricing are insignificant for very small and small towns, but are positive and significant for cities. The marginal effect for overpricing in cities is large, indicating that a city's decision to bring water provision in-house is positively and substantially influenced by the degree of overpricing that it faces from its incumbent provider. Overall, then, we find consistent evidence that overpricing by a private operator at time $t-1$ is associated with non-renewal of that operator at time t in municipalities with populations exceeding 10,000 people. And, we find consistent evidence that overpricing by a private operator at time $t-1$ has no impact on renewal of that operator at time t in municipalities with populations of 10,000 or fewer people.

We next estimate Probit models of the likelihood that a municipality that relies on a private operator at $t-1$, and whose contract terminates between $t-1$ and t, will choose to switch to a different private operator rather than renew the incumbent operator. In these estimations, the relevant measure of overpricing is Overpriced vs Private. Table 5, Models 3 and 4 present the results. These results differ somewhat from prior results. Specifically, although the point estimates for Overpriced * Pop $<$ 5 K and Overpriced * Pop 5 K–10 K are modestly smaller than the point estimate

9. We therefore assume in our switching models that the variable Industry Price Different takes the same value throughout the 1998–2008 period.

Table 5. Likelihood of Bringing In-house or of Switching Operators at End of Contract

	Bring in-house		Switch operator	
	(1)	(2)	(3)	(4)
Overpriced	0.187		3.631***	
	(0.803)		(0.754)	
	[0.021]		[0.317]	
Overpriced × Pop < 5 k		−0.494		3.077***
		(0.922)		(0.947)
		[−0.046]		[0.281]
Overpriced × Pop 5 k–10 k		−1.410		3.863*
		(1.902)		(2.029)
		[−0.177]		[0.469]
Overpriced × Pop > 10 k		10.111***		5.162
		(2.979)		(69.903)
		[0.754]		[0.471]
Duration	−0.016	−0.016	−0.014	−0.014
	(0.010)	(0.010)	(0.011)	(0.011)
	[−0.002]	[−0.002]	[−0.001]	[−0.001]
Treatment Intensity	−0.048	−0.065	−0.152**	−0.151**
	(0.072)	(0.076)	(0.072)	(0.073)
	[−0.005]	[−0.007]	[−0.014]	[−0.015]
Water Origin	0.195	0.228*	0.215*	0.219
	(0.129)	(0.136)	(0.128)	(0.133)
	[0.021]	[0.025]	[0.020]	[0.021]
Water Safety	−0.331	−0.361	0.917	0.958
	(2.087)	(2.174)	(2.193)	(2.335)
	[−0.036]	[−0.040]	[0.087]	[0.092]
Leak Ratio	1.643***	1.632***	−0.169	−0.175
	(0.550)	(0.559)	(0.560)	(0.570)
	[0.180]	[0.182]	[−0.016]	[−0.017]
Inter Authority	−0.108	−0.111	−0.3522*	−0.346*
	(0.205)	(0.213)	(0.180)	(0.184)
	[−0.012]	[−0.012]	[−0.034]	[−0.033]
Sanitation Operator	−0.355**	−0.369**	−0.168	−0.173
	(0.175)	(0.180)	(0.163)	(0.165)
	[−0.039]	[−0.041]	[−0.016]	[−0.017]
Pop < 5 k	−0.443*	0.338	−0.099	−0.080
	(0.242)	(0.335)	(0.244)	(11.263)
	[−0.059]	[0.085]	[−0.010]	[−0.006]
Pop 5 k–10 k	−0.161	0.643*	0.099	0.098
	(0.280)	(0.381)	(0.294)	(11.265)
	[−0.026]	[0.060]	[0.011]	[0.012]
Constant	−0.833	−1.485	−1.615	−1.656
	(2.064)	(2.166)	(2.175)	(11.542)
Number of observations	669	669	657	657
Pseudo-R^2	0.077	0.120	0.089	0.091
Log Pseudolikelihood	−149.7	−142.8	−137.3	−137.0

(continued)

Table 5. Continued

	Bring in-house		Switch operator	
	(1)	(2)	(3)	(4)
Test of equality of coefficients:				
Overpriced × Pop < 5 k versus Overpriced × Pop > 10 k		Reject**		Insignificant
Overpriced × Pop 5 k–10 k versus Overpriced × Pop > 10 k		Reject**		Insignificant

Notes: Probit estimation. Overpriced is defined as Overpriced versus In-house for Columns 1 and 2, and as Overpriced versus Private for Columns 3 and 4. Bootstrapped SEs, based on 999 replications of estimation, in parentheses. Marginal effects in brackets. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

for Overpriced * Pop > 10 K, the coefficients are statistically significant while the coefficient on Overpriced * Pop > 10 K is not, and tests of equality of coefficients cannot reject the hypothesis that the coefficients are all equal. In contrast to small and very small towns' inability to discipline franchisees by moving water provision in-house, such towns appear to have some ability to respond to overpricing by switching operators, although the marginal effects indicate that the magnitude of this response is substantially smaller than that of large towns in Table 4 and the first half of Table 5.

This raises an apparent paradox: If, for small towns, franchisee overpricing is positively related to switching operators (which is one form of non-renewal), then why is there no overall relationship between overpricing and non-renewal? Although our data are not sufficiently detailed to inform this, we speculate that this pattern stems from the above-described potential difficulty that small towns face in attracting credible bids. Whereas a municipality requires scale or skill to bring water provision in-house, it requires neither to switch operators. Hence, switching in response to overpricing is more feasible than bringing in-house. However, to switch operators, a municipality needs to attract a bid from a credible and motivated rival; small towns (which represent small markets) tend to be less attractive to operators and consequently are less likely to attract such bids. Overall, then, those small towns that can attract bids are able to respond to overpricing with non-renewal, whereas those that cannot attract bids face the more daunting challenge of responding to overpricing with reversion. A fruitful avenue for future research, with substantial policy implications, would entail further exploration of those heterogeneous characteristics that enable some small municipalities to attract multiple bids.

6. Discussion and Conclusion

This study contributes to the debate sparked by Williamson's (1976) seminal article on franchising for government services. By focusing on municipal water services in France, an empirical setting that exhibits a mix of public and private provision, we were able to overcome empirical challenges that have long afflicted large-sample analysis of franchised government services. We examined the price differential between public and private water provision, and franchisee renewal patterns, for municipalities of different sizes. Our results indicate that while cities with populations exceeding 10,000 residents tend to discipline franchisees that overprice by not renewing their contracts, the renewal pattern of towns with 10,000 or fewer residents is not influenced by franchisee overpricing. We interpret this as evidence that cities are able to attract competitive bids or bring service in-house at renewal time if necessary, while small towns are not. We also find that small towns pay a significant price premium for water when compared with in-house provision, while cities do not; we interpret this as evidence that cities' ability to attract competitive bids and/or move to direct public provision serves to discipline franchisees, while small towns are not able to discipline franchisees as effectively. Put differently, while cities in France appear to have sufficient bargaining power to prevent water franchisees from extracting significant quasi-rents, small towns appear to suffer from the problems described by Williamson (1976).

In 2006, France had roughly 950 municipalities with populations in excess of 10,000, with 49% of its population living in those municipalities. The remaining 51% lived in municipalities with fewer than 10,000 inhabitants each. Thus, just over half of the French population lived in municipalities that confront transaction-cost problems in franchise renewals. We noted above that provision of water under the French legal regime is likely to be less subject to transaction-cost issues than the typical franchised service. To the extent that this is accurate, franchise bidding, execution, and renewal problems are likely to be more pervasive for a variety of other municipal services. We leave it to future research to document this effect in practice in other municipal services.

Conflict of interest statement. None declared.

Appendix A: Estimation of Efficiency Scores

In order to determine whether municipalities are overpaying or underpaying for their water services, we use the information available to us to estimate an expected water price for each municipalities and each year, using the following specification:

$$\text{Price}_{it} = \text{Private}_{it}(X'_{it}\beta^{\text{private}})+(1-\text{Private})(X'_{it}\beta^{\text{Inhouse}})+u_{it},$$

where the vector $\boldsymbol{x}_{it}$ contains a set of control variables. In this specification, we allow for the possibility that explanatory variables (such as water treatment technology used) have a distinct impact across organizational modes on water prices. This entails inclusion of interaction terms between

Private and other independent variables. In order to further account for the fact that the coefficients of our control variables may vary according to the size of municipalities (as suggested by our results in Table 3), we interact the above specification with an indicator variable of municipalities (less than 5000, between 5000 and 10,000, and more than 10,000). We allow coefficients of our explanatory variables to vary according the population size of a municipality. Moreover, our specification includes municipality fixed effects, so that unobservable time-invariant heterogeneity across municipalities can be taken into account to compute the expected water prices for each municipality. The following table (Table A1) shows the estimation results for this specification used to compute the scope for efficiency improvement. For this specification, we retain only explanatory variables that have a significant impact of water price in at least one category of municipalities based on their size. Note that the sample size in this regression is slightly higher than in Table 3 because some of the excluded variables have missing values.[10]

Based on the estimated coefficients, we are then able to compute, for each municipality, the expected water prices in the current organizational form and in the alternative organizational form. The extent of this underpricing or overpricing is then normalized using the observed water prices in order to obtain our Overpriced vs In-house and Overpriced vs Private variables, the former measuring the extent of under- or over-pricing compared with the expected price of in-house provision of water, and the latter corresponding to the extent of under- or over-pricing compared with the expected price of private provision. Therefore, these measures give an idea of the economic incentives for a municipality to forego renewal of a franchisee.

10. We thank Silke Forbes for several suggestions related to this estimation, notably (1) to include interactions only for independent variables whose main effects were significant in Table 3 in order to reduce noise in estimation, and (2) to replicate this estimation using a model that includes no interactions. The model specification choice depends on one's belief about the locus of relevant variation in overpricing. Given our assumption that overpricing varies across towns based on town-specific characteristics, we present the results from the specification that includes interaction terms. In the no-interaction specification (available from the authors), our main results are qualitatively unchanged.

Table A1. LSDV Estimation for the Computation of Efficiency Scores (First Stage of Organizational Change Estimations)

	(1)	
	Coefficient	SE
Pop < 5 k × Private	15.529*	(8.910)
Pop < 5 k × Inter Authority	13.945***	(3.217)
Pop < 5 k × Investment Program	−0.271	(0.897)
Pop < 5 k × Market Share In-house	−1.786	(6.936)
Pop < 5 k × Market Share Incumbent	−3.002	(8.470)
Pop < 5 k × Treatment Intensity	0.789*	(0.470)
Pop < 5 k × Water Safety	1.479	(2.032)
Pop < 5 k × Leak Ratio	−2.663	(3.167)
Pop < 5 k × Indep Ratio	0.797	(3.802)
Pop < 5 k × Private × Inter Authority	1.259	(4.075)
Pop < 5 k × Private × Investment Program	−0.686	(1.239)
Pop < 5 k × Private × Market Share In-house	2.135	(9.167)
Pop < 5 k × Private × Market Share Incumbent	−0.061	(10.216)
Pop < 5 k × Private × Treatment Intensity	−0.389	(0.747)
Pop < 5 k × Private × Water Safety	6.558*	(3.728)
Pop < 5 k × Private Leak Ratio	−4.624	(5.613)
Pop < 5 k × Private × Indep Ratio	−8.512	(5.532)
Pop 5 k–10 k × Private	12.128	(11.902)
Pop 5 k–10 k × Inter Authority	12.491***	(3.283)
Pop 5 k–10 k × Investment Program	−2.830	(2.043)
Pop 5 k–10 k × Market Share In-house	−16.797	(10.584)
Pop 5 k–10 k × Market Share Incumbent	−18.344*	(10.954)
Pop 5 k–10 k × Treatment Intensity	1.176	(0.900)
Pop 5 k–10 k × Water Safety	7.919*	(4.540)
Pop 5 k–10 k × Leak Ratio	22.019*	(11.373)
Pop 5 k–10 k × Indep Ratio	−1.740	(6.085)
Pop 5 k–10 k × Private × Inter Authority	−1.407	(4.879)
Pop 5 k–10 k × Private × Investment Program	4.660*	(2.741)
Pop 5 k–10 k × Private × Market Share In-house	−0.856	(16.312)
Pop 5 k–10 k × Private × Market Share Incumbent	12.549	(13.933)
Pop 5 k–10 k × Private × Treatment Intensity	−1.769	(1.173)
Pop 5 k–10 k × Private × Water Safety	−0.764	(6.279)
Pop 5 k–10 k × Private × Leak Ratio	−10.275	(16.098)
Pop 5 k–10 k × Private × Indep Ratio	−4.987	(8.595)
Pop > 10 k × Private	5.382	(12.655)
Pop > 10 k × Inter Authority	7.332**	(3.287)
Pop > 10 k × Investment Program	−0.146	(2.063)
Pop > 10 k × Market Share In-house	−15.935*	(9.265)
Pop > 10 k × Market Share Incumbent	−17.069	(11.227)
Pop > 10 k × Treatment Intensity	−1.043	(1.069)
Pop > 10 k × Water Safety	18.139***	(5.372)
Pop > 10 k × Leak Ratio	9.525	(7.089)
Pop > 10 k × Indep Ratio	−7.118*	(4.289)
Pop > 10 k × Private × Inter Authority	−1.776	(4.272)
Pop > 10 k × Private × Investment Program	−1.362	(2.529)
Pop > 10 k × Private × Market Share In-house	19.117	(14.741)

(continued)

Table A1. Continued

	(1)	
	Coefficient	SE
Pop > 10 k × Private × Market Share Incumbent	−11.198	(14.115)
Pop > 10 k × Private × Treatment Intensity	0.408	(1.355)
Pop > 10 k × Private × Water Safety	−7.640	(8.790)
Pop > 10 k × Private × Leak Ratio	−10.465	(10.944)
Pop > 10 k × Private × Indep Ratio	11.830*	(6.886)
Constant	129.662***	(5.921)
Municipality fixed effects	Yes	
Year fixed effects	Yes	
R^2	0.861	
Adjusted R^2	0.804	
N	11,509	

Notes: LSDV estimation. SEs in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

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