WATER UNDER THE BRIDGE:

WHEN AND HOW DO MUNICIPALITIES CHANGE ORGANIZATIONAL FORMS IN THE PROVISION OF WATER?

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chaire eppp
IAE - PANTHEON-SORBONNE

International Conference
"Contracts, Procurement and Public-Private Agreements"
Paris, May 30th & 31st 2012

Context

- Policy trend towards more private sector participation in (local) public services
  - EU Green Papers (2003, 2004), EU Communication (2009), New European directive on concession contracts (2012) …
- A flourishing economic literature
  - Hart, Shleifer and Vishny (1997), Bajari and Tadelis (2001), Bennett and Iossa (2006), Guasch, Laffont and Straub (2006, 2008), Levin and Tadelis (2010) etc.
- Several empirical questions are still remaining
  - Few empirical studies with performance measures to evaluate alternative organizational choices -- direct public management vs. PPPs (Chong et al. 2006, Yvrande-Billon et Roy 2007, Klien 2011…)
  - Some empirical studies suggesting strong inertia in organizational choices (Zupan 1989, Lopez de Silanes et al. 1997, Canneva and Garcia 2010…)
  - Some studies pointing out the importance of political dimensions in organizational choices (Boycko et al. 1996, Lopez de Silanes et al. 1997, Picazo & al 2012)

Questions adressed by the paper

- Do local public authorities care about efficiency?
  - Do potential efficiency improvements motivate public authorities to change their organizational choices?

- Contribution of our study
  - Huge dataset concerning water distribution
    - Access to panel data concerning 5 000 local authorities over 10 years, representing more than 75% of French consumers
  - Panel data allowing to account for unobservable heterogeneity at municipalities' level
  - We develop a performance indicator to study the impact of organizational choice and observed switches.

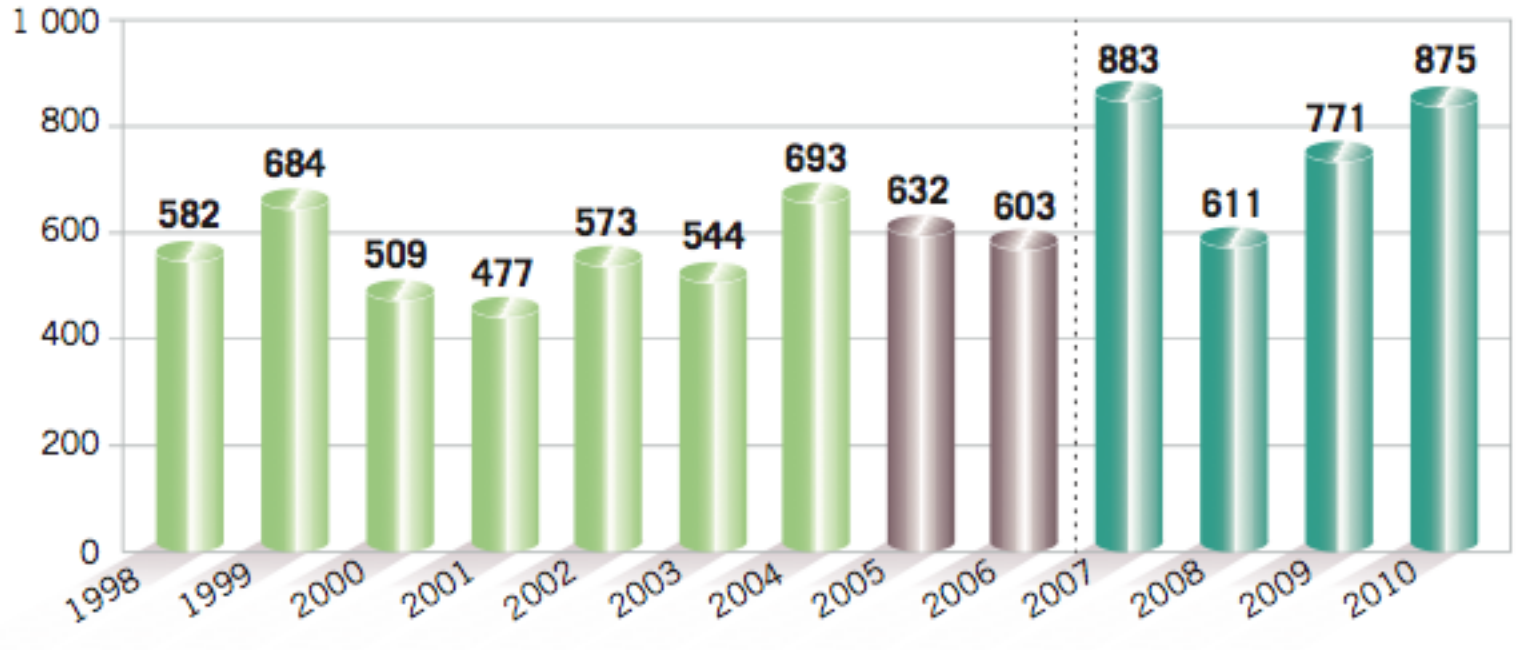
The French institutional context

- Water services are managed at the local level
  - Municipalities decide to “make or buy” through direct public management or lease contracts with a private operator
  - Municipalities may decide to regroup their water services together leading to a unique contract for several municipalities
  - 36 600 municipalities leading to about 15 000 services to manage

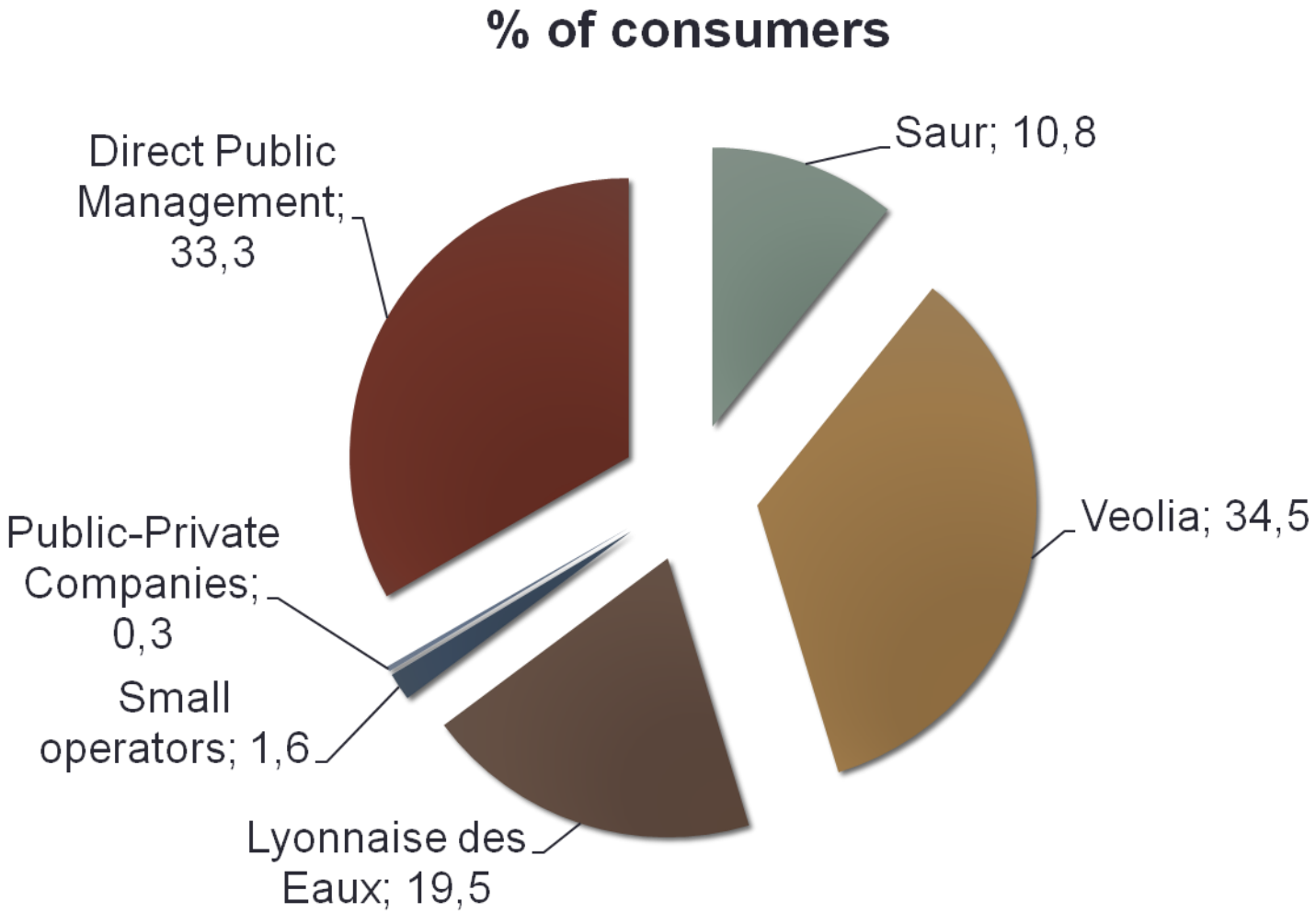
Number of renewed contracts each year

Since 1993, call for tenders in order to attribute contracts are mandatory

Sources : Engref 1998-2004, TNS-Sofres 2005-2006, enquête opérateurs depuis 2007 (nombre de contrats arrivant à échéance)

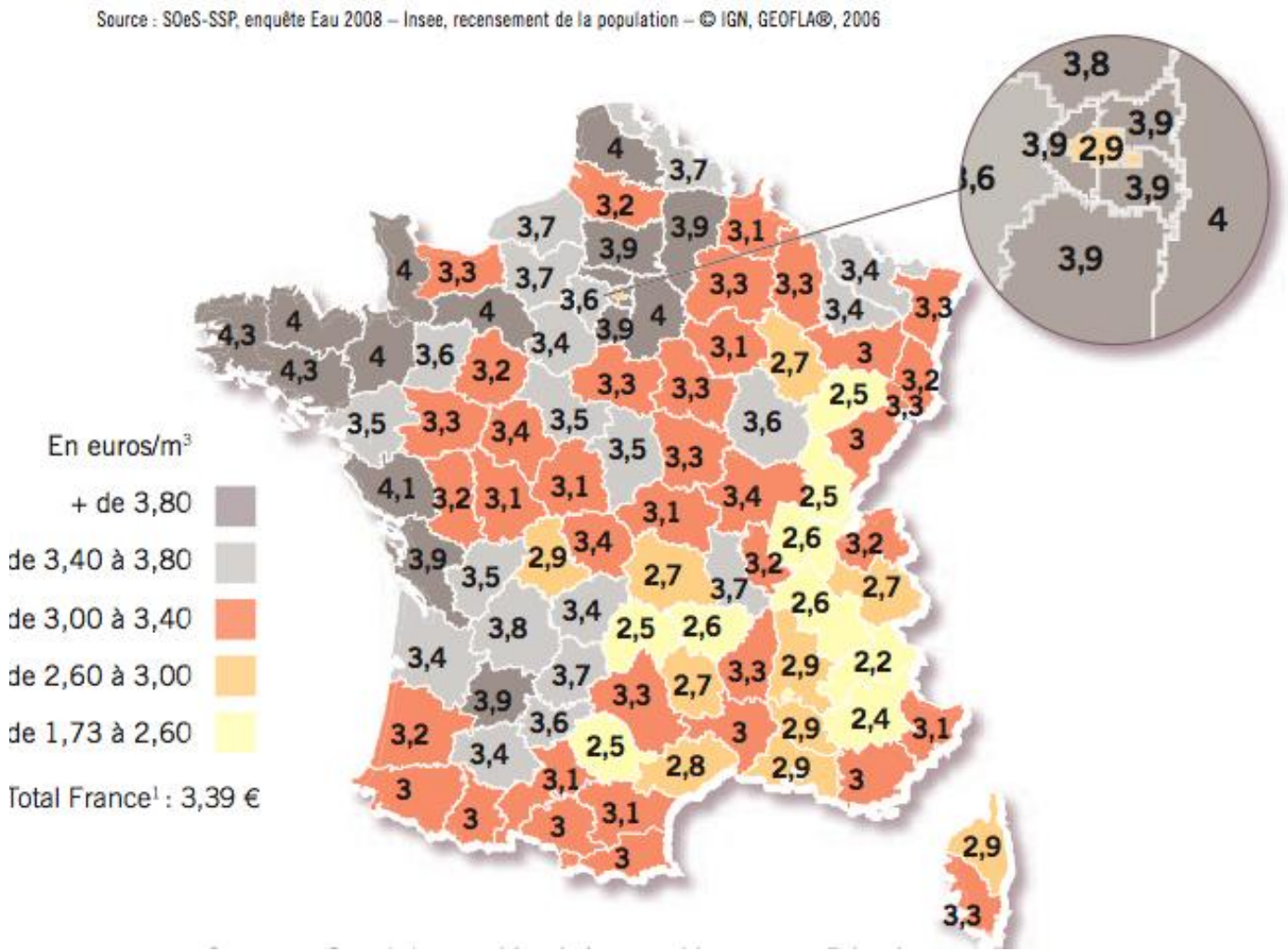


Distribution of water: a concentrated market



Sources : FP2E - BIPE d'après enquête opérateurs 2011, Insee

Water prices (distribution + sewage)



Our Data Set

- Data coming from the French Environment Institute (IFEN) and Insee (SOeS), the French Ministry of Agriculture and the French Health Ministry (DGS).
- Focus on the distribution of water
- Panel data concerning 5 000 municipalities observed in 1998, 2001, 2004 and 2008.
  - *Leading to 3463 usable observations per year*
- Information concerning water networks, organizational choices and prices

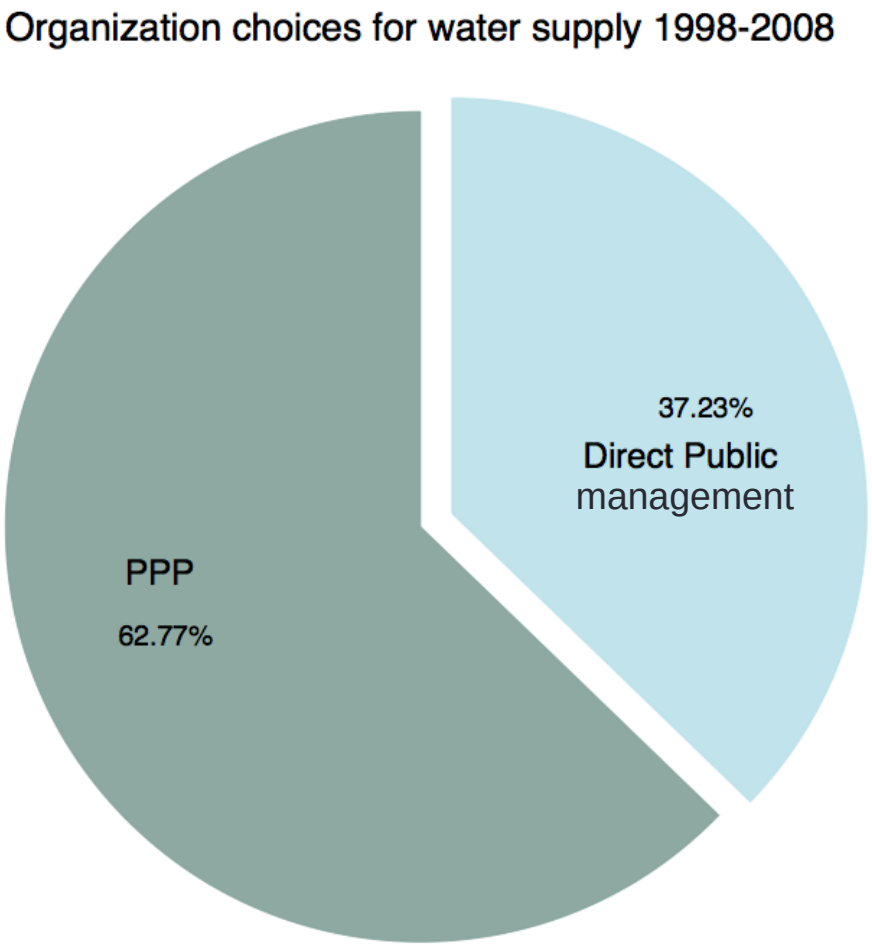
Our Data Set

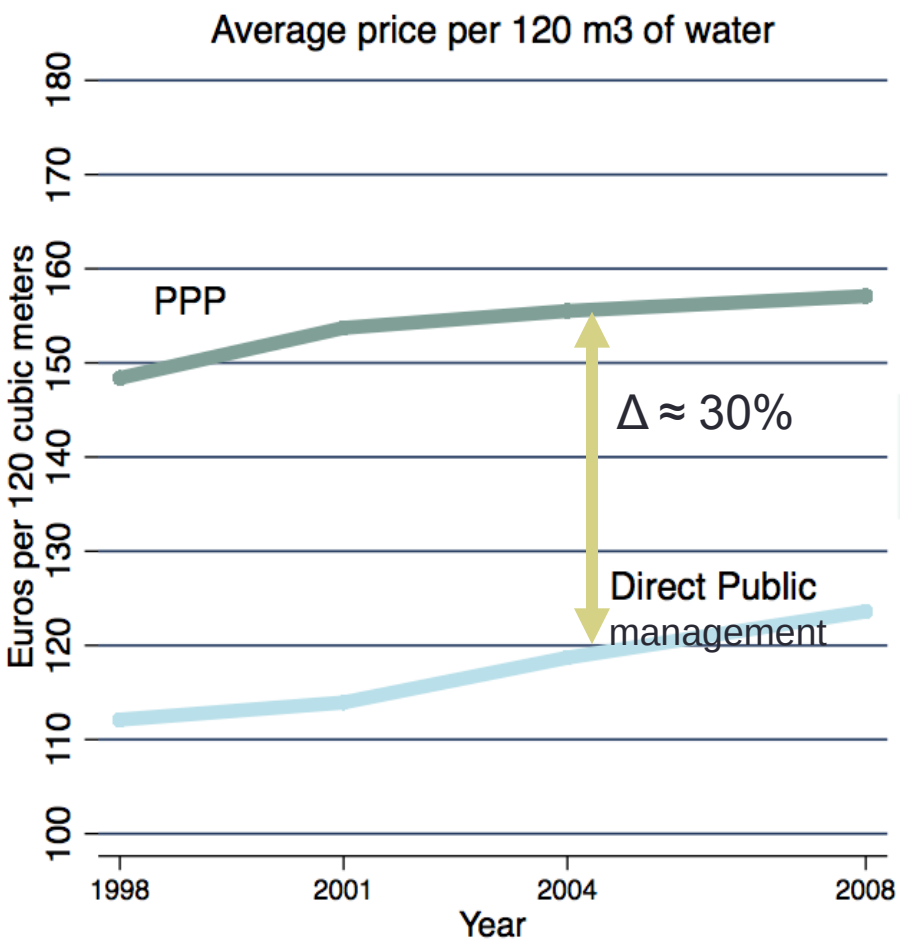
- Price:
  - *Price for a consumption of 120m3 without any taxe*

Data concerning:

- Technical differences:
  - Network Size,
  - Consumption,
  - Population Growth,
  - Network Renewals,
  - Rate of Leakages,
  - The complexity of the water treatments performed by the operator prior to the distribution of the water
  - The origin of the water (Surface / underground),
  - Water Abundance,
  - Touristic area.
- Contractual choices
  - Contract duration
  - Date of signature
  - Identity of the contracting partners

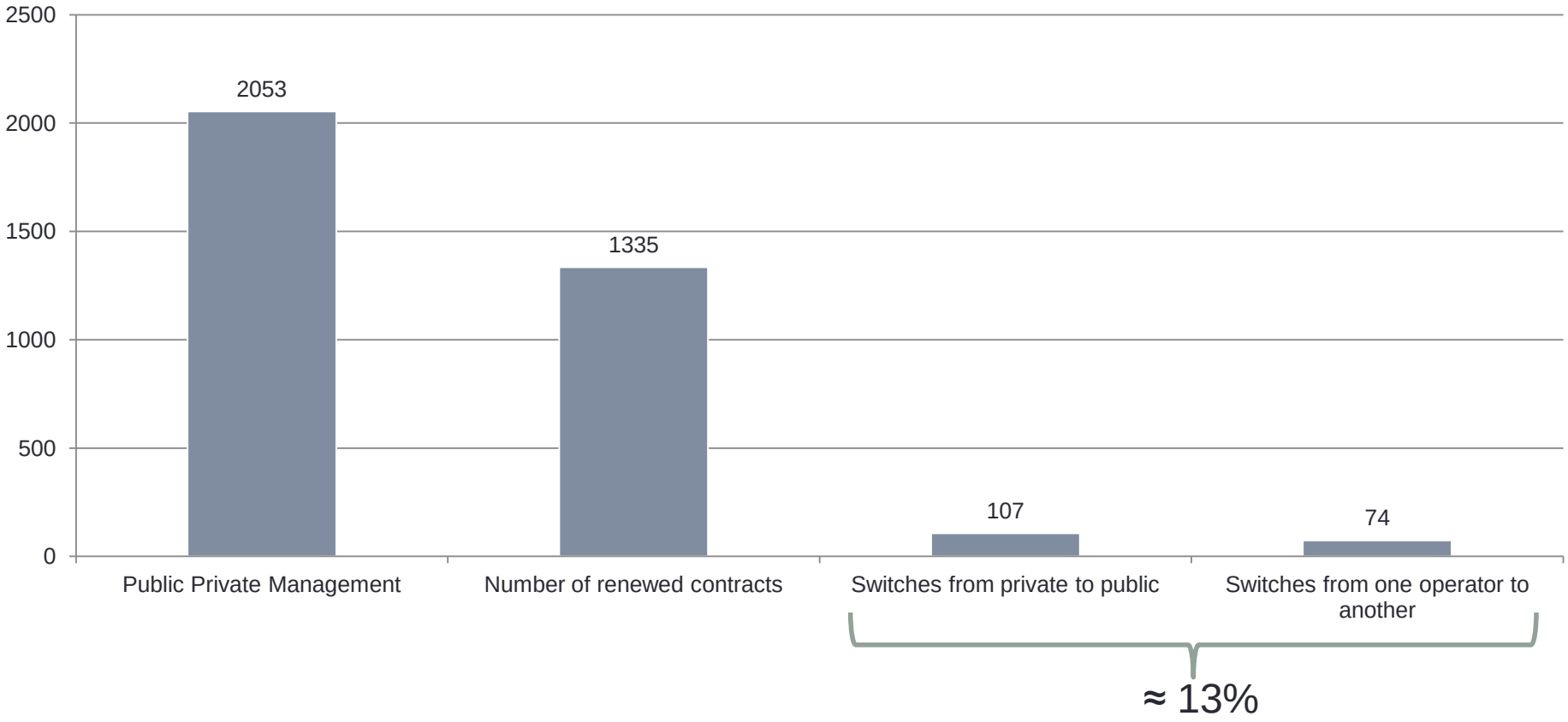
Organization of water services in France: A snapshot





Switches: A snapshot

Public private contracts: observed switches on the 1998-2008 period



Switches: A snapshot

Municipalities in direct public management: observed switches on the 1998-2008 period

Empirical strategy

- A first step of our analysis is concerned by the impact of organizational choices on water price to determine if there exist gains to switch.
  - Does private involvement impact on prices, *all things being equal*?
- Explained variable:
  - *Deflated price per 120 m3 paid by consumers as performance measure*
- A second step of our analysis is concerned by the determinants of observed switches
  - Do switches reflect the willingness of local authorities to reduce price paid by consumers

First Step – Prices and Organizational Choices

- Panel regressions (fixed effects)

$$p_{it} = x'_{it}\beta + \pi PPP_{it} + \upsilon_i + \varepsilon_{it}$$

- Explaining variables in *x* vector:
  - *Inhabitants, origin of the water, treatment of the water, inter-municipality, quality of distributed water, touristic area, independence ratio, investment program, restrictions during summer, year fixed effect, municipality fixed effects.*

- LSDV models

Water Prices

Table 3: Organizational choices and prices

	(1) OLS	(2) LSDV	(3) LSDV	(4) LSDV
PPP	26.852***	11.295***	12.722***	4.318
	(0.674)	(1.978)	(2.235)	(4.062)
TreatA1	8.243***	2.358	0.975	17.988
	(2.369)	(2.969)	(2.974)	(12.467)
TreatA2	19.257***	7.597*	5.546+	26.681*
	(2.569)	(3.241)	(3.342)	(12.494)
TreatMix	17.750***	5.355+	4.743	21.407+
	(2.723)	(3.203)	(3.334)	(12.187)
TreatA3	17.179***	5.789+	4.091	23.312+
	(2.665)	(3.354)	(3.519)	(12.514)
TreatMixA3	19.954***	4.273	0.661	23.110+
	(2.963)	(3.507)	(3.776)	(12.373)
Surface	16.258***	-2.056	-1.576	-5.416+
	(1.212)	(1.738)	(2.094)	(2.798)
MixOrigin	8.172***	-1.010	-0.192	-4.642+
	(1.230)	(1.586)	(1.900)	(2.542)
LnPopulation	-5.542***	-6.666	-1.780	-49.259**
	(0.220)	(6.470)	(6.942)	(17.155)
Intermuni	18.566***	11.388***	14.069***	4.622+
	(0.810)	(1.548)	(1.896)	(2.551)
	(1.368)	(0.839)	(0.907)	(2.124)
Tourist	5.578***	2.877	2.014	6.016
	(1.131)	(2.282)	(2.457)	(5.752)
IndepRatio	-18.224***	-4.403*	-6.263*	2.213
	(1.920)	(2.239)	(2.607)	(4.204)
LeakRatio	0.883	-1.314	-1.456	2.417
	(2.744)	(2.387)	(2.589)	(5.394)
Conform	7.587***	6.109***	5.908***	10.732*
	(1.676)	(1.566)	(1.657)	(5.400)
Const	144.233***	170.562***	134.464**	586.916***
	(3.603)	(50.354)	(50.320)	(172.920)
Year FE	Yes	Yes	Yes	Yes
Muni. FE	No	Yes	Yes	Yes
Estimator	OLS	LSDV	LSDV	LSDV
Sample	All	All	Municipalities $\leq 10,000$	Municipalities b/w 10,000 and 200,000
R^2	0.2885	0.8606	0.8657	0.8341
Adj. R^2	0.2873	0.8047	0.8111	0.7641
Obs	11824	11824	9558	2266

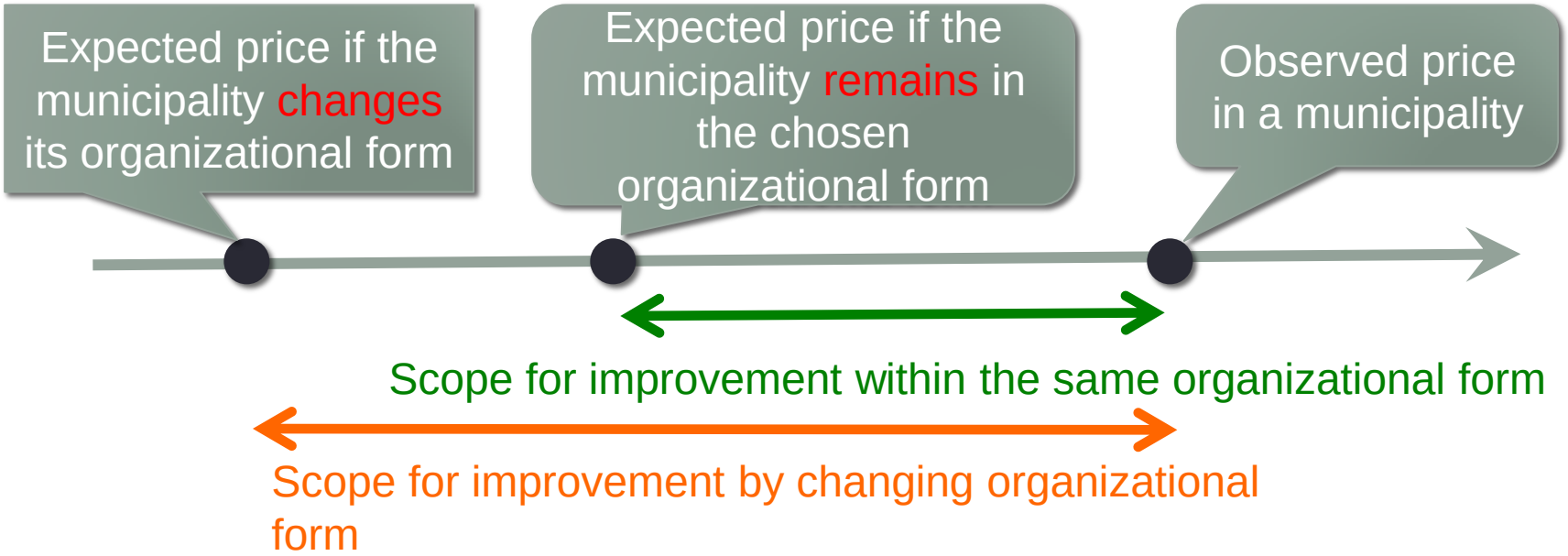
Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results and discussion
Performance

- Main results on the relative efficiency of PPPs
  - On average, water prices are 11€ higher under PPPs (≈8% of the average bill)
  - This effect is only present in small municipalities (<10,000 inhabitants)
  - No significant impact for large municipalities
  - On line with Carpentier & al 2006 and Chong & al 2006

Second Step – How can we explain switches?

- Economic Rationality : switches should occur when performances can be improved
  - Economic incentives to change is measured by the distance between observed price and potential expected price if switch occurs



$$ImproveChange_{it} = \frac{p_{it} - \hat{p}_{it}^{Chg}}{P_{it}}$$

How can we explain switches? Other reasons.

- Switches may also be driven by political reasons / restriction of our sample (inhabitants > 5000)
  - Political color of the mayor at the time the switch is considered
  - Mayor change between time of the original contract and the time the switch is considered
- Distinction between large (>10,000), small and very small (<5,000) municipalities
- Probit analysis

How can we explain switches from direct public management to PPP?

Switches from direct public management to PPP

	Probit	Probit	Probit
ImproveChange	**-0.661** (0.331)**	**0.311** (0.127)**	**0.360*** (0.093)**
MayorChange		-0.105 (0.345)	-0.595 (0.543)
LeftWing		4.467*** (0.498)	-0.265 (0.800)
RightWing		4.125*** (0.472)	0.519 (0.757)
UltraLeftWing		5.326*** (0.536)	0.154 (0.872)
Network Characteristics	Yes	Yes	Yes
Constant	-1.875*** (0.384)	-5.436***(0.972)	-5.616*** (1.432)
Municipality Size	<5000	5 000-10 000	10 000 – 200 000
Pseudo R2	0.05	0.31	0.42

How can we explain switches from PPP to direct public management?

Switches from PPP to direct public management

	Probit	Probit	Probit
ImproveChange	**0.855 (1.237)**	**-2.355 (1.869)**	**6.695** (3.024)**
MayorChange		-0.037 (0.341)	-0.403 (0.774)
LeftWing		-0.886 (0.779)	-0.480 (0.427)
RightWing		-0.495 (0.739)	
UltraLeftWing		-0.089 (0.976)	
Network Characteristics	Yes	Yes	Yes
Constant	-1.492** (0.824)	5.655** (3.678)	-3.200 (5.649)
Municipality Size	<5000	5 000-10 000	10 000 – 200 000
Pseudo R2	0.04	0.16	0.40

How can we explain switches from PPP to PPP?

Changes from one operator to another

	Probit	Probit	Probit
ImproveChange	**1.695 (1.131)**	**2.711 (3.295)**	**13.468*** (5.181)**
MayorChange			-0.387 (0.854)
LeftWing		3.910*** (0.668)	-0.359 (1.456)
RightWing		4.403*** (0.730)	-1.591 (1.122)
UltraLeftWing			
Network Characteristics	Yes	Yes	Yes
Constant	-7.355*** (2.177)	-1.262 (3.236)	-15.654 (9.817)
Municipality Size	<5000	5 000-10 000	10 000 – 200 000
Pseudo R2	0.09	0.10	0.50

Results and discussion

Organizational switches

- Whatever the kind of switches considered:
  - Political color of municipalities seems to play a minor role
  - The seniority of the mayor does not impact on the decision to switch
- Potential efficiency gains (i.e. price decrease) do impact to understand:
  - Switches from direct public management to PPP for medium and big municipalities
    - Strange effect for small municipalities <5000
  - Switches from PPP to direct public management or from one operator to another for big municipalities only (> 10000 inhabitants)
    - We have no idea of what are the driving forces explaining the decision to switch for small and medium municipalities!
- Interpretation of the results ?

WATER UNDER THE BRIDGE:

WHEN AND HOW DO MUNICIPALITIES CHANGE ORGANIZATIONAL FORMS IN THE PROVISION OF WATER?

QUESTIONS?

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How can we explain switches from in-house to PPP

Table 6: Switches from inhouse to PPP: By municipality size

	(1) Probit IH → PPP	(2) Probit IH → PPP	(3) Probit IH → PPP	(4) Probit IH → PPP	(5) Probit IH → PPP	(6) Probit IH → PPP	(7) Probit IH → PPP	(8) Probit IH → PPP	(9) Probit IH → PPP	(10) Probit IH → PPP
ImproveChange	-0.702*	-0.661*	0.319**	0.322**	0.280*	0.311*	0.300***	0.278***	0.388***	0.360***
	(0.308)	(0.331)	(0.101)	(0.107)	(0.120)	(0.127)	(0.067)	(0.068)	(0.094)	(0.093)
Duration										
MayorChange				-0.161		-0.105		-0.635		-0.595
				(0.325)		(0.345)		(0.422)		(0.543)
LeftWing				4.226***		4.467***		-0.461		-0.265
				(0.390)		(0.498)		(0.704)		(0.800)
RightWing				3.821***		4.125***		-0.087		0.519
				(0.355)		(0.472)		(0.679)		(0.757)
UltraLeftWing				4.895***		5.326***		0.048		0.154
				(0.437)		(0.536)		(0.750)		(0.872)
		NC			NC	NC			NC	NC
Municipality size	≤ 5,000	≤ 5,000	5,000-10,000	5,000-10,000	5,000-10,000	5,000-10,000	10,000-200,000	10,000-200,000	10,000-200,000	10,000-200,000
pseudo-R^2	0.01100	0.05060	0.04491	0.1418	0.2224	0.3129	0.1036	0.1448	0.3756	0.4188
Obs	2127	2127	294	294	294	294	279	279	279	279

Note: We have no information on political variables for municipalities with population size ≤ 5000.
Note: Robust standard errors within parentheses. Significance stars: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

NC: network characteristics

How can we explain switches from PPP to in-house

Table 4: Switches from PPP to inhouse: By municipality size

	(1) Probit PPP→IH	(2) Probit PPP→IH	(3) Probit PPP→IH	(4) Probit PPP→IH	(5) Probit PPP→IH	(6) Probit PPP→IH	(7) Probit PPP→IH	(8) Probit PPP→IH	(9) Probit PPP→IH	(10) Probit PPP→IH
ImproveChange	0.364	0.855	-0.916	-1.196	-2.170	-2.355	3.526*	3.914*	6.598*	6.695*
	(1.189)	(1.237)	(1.533)	(1.514)	(1.847)	(1.869)	(1.581)	(1.688)	(3.168)	(3.024)
Duration	-0.006	-0.004	-0.019	-0.021+	-0.018	-0.017	-0.031*	-0.023	-0.028	-0.028
	(0.011)	(0.011)	(0.013)	(0.011)	(0.015)	(0.013)	(0.013)	(0.019)	(0.022)	(0.032)
MayorChange				-0.193		-0.037		-0.561		-0.403
				(0.337)		(0.341)		(0.483)		(0.774)
LeftWing				-0.787		-0.886		0.456		0.480
				(0.705)		(0.779)		(0.447)		(0.427)
RightWing				-0.372		-0.495				
				(0.711)		(0.739)				
UltraLeftWing				0.131		-0.089				
				(0.918)		(0.976)				
		NC			NC	NC			NC	NC
Municipality size	≤ 5,000	≤ 5,000	5,000-10,000	5,000-10,000	5,000-10,000	5,000-10,000	10,000-200,000	10,000-200,000	10,000-200,000	10,000-200,000
pseudo-R^2	0.002371	0.04323	0.02308	0.06185	0.1241	0.1565	0.09763	0.1419	0.3765	0.3998
Obs	510	510	111	111	111	111	66	66	66	66

Note: We have no information on political variables for municipalities with population size ≤ 5000.
Note: Robust standard errors within parentheses. Significance stars: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

How can we explain switches from PPP to PPP

Table 5: Changes from one operator to another: By municipality size

	(1) Probit Op. → Op.	(2) Probit Op. → Op.	(3) Probit Op. → Op.	(4) Probit Op. → Op.	(5) Probit Op. → Op.	(6) Probit Op. → Op.	(7) Probit Op. → Op.	(8) Probit Op. → Op.	(9) Probit Op. → Op.	(10) Probit Op. → Op.
ImproveSame	1.879	1.695	3.214	2.906	3.017	2.711	6.006*	7.112*	12.581**	13.468**
	(1.248)	(1.131)	(3.321)	(3.370)	(3.337)	(3.295)	(3.010)	(3.296)	(3.976)	(5.181)
Duration	-0.019	-0.018	-0.007	-0.003		-0.003	0.026	0.025	0.089	0.102
	(0.013)	(0.012)	(0.019)	(0.020)		(0.020)	(0.032)	(0.034)	(0.055)	(0.069)
MayorChange								-0.143		-0.387
								(0.550)		(0.854)
LeftWing				3.568***		3.910***		-0.851		-0.369
				(0.364)		(0.668)		(0.988)		(1.456)
RightWing				3.927***		4.403***		-1.508		-1.591
				(0.317)		(0.730)		(0.994)		(1.122)
UltraLeftWing		⋮ NC			⋮ NC	⋮ NC			⋮ NC	⋮ NC
Const	-1.342***	-7.355***	-1.217***	-5.030***	2.908	-1.262	-1.363*	-0.384	-16.908*	-15.653
	(0.207)	(2.177)	(0.360)	(0.305)	(3.063)	(3.236)	(0.611)	(1.083)	(8.047)	(9.817)
Municipality size	≤ 5,000	≤ 5,000	5,000-10,000	5,000-10,000	5,000-10,000	5,000-10,000	10,000-200,000	10,000-200,000	10,000-200,000	10,000-200,000
pseudo-R^2	0.0238	0.0876	0.0310	0.0513	0.0760	0.108	0.219	0.291	0.449	0.509
Obs	503	503	88	88	88	88	41	41	41	41

Note: We have no information on political variables for municipalities with population size ≤ 5000.
Note: Robust standard errors within parentheses. Significance stars: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$