Does water utilities ownership affect water consumption in Italy? An empirical analysis of the determinants of water demand

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Our prior studies

- Determinants of cost efficiency in European water utilities, as Italy, Portugal & Denmark (Guerrini et al., 2011 and 2014; Romano & Guerrini, 2011).
- The investment policy of water utilities (Romano et al., 2013).
- Factors boosting the willingness to promote a sustainable consumption of water (Romano et al., 2014)
- Guerrini & Romano (2014). Water Management Italy, Springer

Research aims

The aim of this study was to estimate the determinants of residential water demand for chief towns of every Italian province in the period 2007–2009.

Even if most Europeans have historically been shielded from the social, economic, and environmental effects of severe water shortages, the gap between demand and availability of water resources is reaching critical levels in many parts of Europe for these reasons:

- 1. Climate change
- 2. Demographic flows toward towns
- 3. Poor availability of underground water

Prior studies on water demand

The independent variables chosen are:

- I. Per-capita income and water tariff (see next table)
- II. Climate [Domene & Sauri (researching the Metropolitan Region of Barcelona); Martínez-Espiñeira (researching northwest Spain); Schleich & Hillenbrand (Germany); Martins & Fortunato (Portugal)]
- III. Geographical features [Mazzanti and Montini; and Statzu and Strazzera (researching the altitude effect in Italy)]
- IV. House features [Nauges and Thomas; Fielding et al. reported that residential water consumption was significantly lower when a water-meter was present]
- V. Household features [Statzu and Strazzera found that home owners consumed less water than renters did, probably because rent often covers the water bill]

The «price» and «income» effects

Authors	Country	Price	Income
March et al. (2012)	Spain		+
March and Saurì (2010)	Spain		+
Bartczak et al. (2009)	Poland	-	+
Schleich and Hillenbrand (2009)	Germany	-	+
Statzu and Strazzera (2009)	Italy	_	+
Musolesi and Nosvelli (2007)	Italy	_	+
Martins and Fortunato (2007)	Portugal	—	=
Domene and Sauri (2006)	Spain	=	+
Arbués and Villanua (2006)	Spain		+
Mazzanti and Montini (2006)	Italy	_	+
Bithas and Stoforos (2006)	Greece	_	+
García-Valiñas (2005)	Spain	_	+
Arbués et al. (2004)	Spain	_	+
Garcia and Reynaud (2004)	France	-	+
Martínez-Espiñeira and Nauges (2004)	Spain	_	+
Martínez-Espiñeira (2003)	Spain		+
Martínez-Espiñeira (2002)	Spain	_	+
Hajispyrou et al. (2002)	Cyprus	_	+
Nauges and Thomas (2000)	France	_	+
Höglund (1999)	Sweden	_	=
Hansen (1996)	Denmark	_	

Scant attention paid to the effect of «water utilities ownership»

Over the past 25 years, the global water industry has been the focus of debate on how best to improve the economic performance, organizational efficiency and financial viability of water utilities.

- In 1989 begun the privatization process in UK;
- In 2008 Ronchi Law imposed a privatization process for Italian public utilities, then abrogated with in 2011 with the public referendum;
- In 2010 the water service in Paris was entrusted to a wholly public owned utility (Eau de Paris) after a prior process of privatization (Veolia and Suez)

Research hypothesis

Literature on tariff often demonstrates that private owned utilities and «public-private partnership» applied higher water rate than wholly public firm (for Italy see Guerrini et al., 2011).

This occurs since the private shareholder wants to maximize its own profits.

Consequently, it is reasonable to hypothesize that private and public-private utilities sell less water than wholly public firm.

Research method – data collection

We collected the following data for 2007-2009 from ISTAT, the Italian Ministry of Economy and Finance, and from Cittadinanzattiva.

Variable	Description
CONSUMPTION	Average consumption of drinking water for domestic use in the chief towns of each Italian province (liters per
	capita per day)
ALT	Altitude at the center (in meters)
TEMP	Average annual mean temperature (in °C)
TARIFF	Annual expenditure for residential household use of 192 cubic meters of water
INCOME	Average taxable income of individuals per capita in the chief town of each Italian province
OWNERSHIP	Wholly publicly owned utilities (1) or not publicly owned utilities (0)
PREC	Average annual precipitation (in mm)
YEARS	Observed year (1 for the first year, 2 for the second and 3 for the third)
GEOGR. AREA	The location of the chief town: north, center and south of Italy
POP	Population served

Research method – statistic model

 $TARIFF_{ij} = \beta_0 + \beta_1 YEARS + \beta_2 INCOME + \beta_3 (north) + \beta_4 (south) + \beta_3 ALT + \beta_6 PREC + \beta_7 TEMP + \beta_8 POP + \beta_9 (Public) + company,.$

Research results – the first model

Variables	Value	Std. Error	DF	<i>t</i> -value
(Intercept)	188.82	27.60	200	6.84***
YEARS	0.126	1.29	200	0.92
TARIFF	-0.169	0.03	200	-4.80***
INCOME	0.002	0.00	200	1.63*
Geographical area (north)	3.324	7.59	98	0.43
Geographical area (south)	-9.675	9.46	98	-1.02
ALT	-0.027	0.01	98	-2.01**
PREC	-0.010	0.00	200	-1.62*
TEMP	0.687	1.01	200	0.68
OWNERSHIP (Public)	5.991	5.53	98	1.08
РОР	0.000	0.00	200	2.47**
	23.108	AIC	2722.22	
	12.207	BIC	2770.282	

Research results – tariff used as response variable

Considering TARIFF as the response variable instead of CONSUMPTION, the data demonstrated that the TARIFF was significantly lower in publicly owned water utilities than in mixed-ownership or wholly private water utilities. As such, the effect of TARIFF on water consumption prevails on the effect of

OWNERSHIP.

Variables	Value	Std. Error	DF	<i>t</i> -value
(Intercept)	329.32	45.51	201	7.23***
YEARS	15.438	1.31	201	11.73***
INCOME	-0.003	0.00	201	-1.00
Geographical area (north)	-56.622	17.16	98	-3.30***
Geographical area (south)	-52.268	20.69	98	-2.52**
ALT	-0.036	0.03	98	-1.18
PREC	-0.019	0.00	201	-2.59**
ТЕМР	1.19	1.65	201	0.72
OWNERSHIP (Public)	-43.609	12.83	98	-3.39***
POP	-0.000	0.00	201	1.69*
	57.911	AIC	2926.764	
	13.512	BIC	2971.169	

Research results – a second model without tariff as independent variable

When the variable TARIFF was excluded from Model 1 (see Table 8), OWNERSHIP significantly affected CONSUMPTION, that is, residential water consumption was significantly higher in towns where the water service was managed by publicly owned water utilities.

Variables	Value	Std. Error	DF	<i>t</i> -value	<i>P</i> -value
(Intercept)	124.777	14.50	203	8.60	0.0000***
ALT	-0.027	0.01	100	-2.03	0.0446**
YEARS	-3.516	0.85	203	-4.13	0.0001***
OWNERSHIP (Public)	13.948	5.43	100	2.56	0.0118**
INCOME	0.003	0.00	203	3.52	0.0005***
POPULATION	0.000	0.00	203	2.67	0.0081***
	25.917	AIC	2737.163		
	12.168	BIC	2766.873		

Results discussion

- 1. Privatization is likely to increase water prices;
- 2. Publicly owned water utilities might be more interested in satisfying citizens' water needs applying lower tariffs;
- 3. Consequently publicly owned utilities might face an "environmental risk"

The triple bottom line of Italian water utilities (water demand side)

