## Identifying cost drivers for water utilities: an empirical analysis on Denmark A study on Danmark utilities for year 2010-2011-2012 A. Guerrini, G. Romano, R. Cunha Margues





# The Danish context



low population density: 129.7 (inh/km<sup>2</sup>) in 2011, less than that of Italy (201.5 inh/km<sup>2</sup>), Germany (229 inh/km<sup>2</sup>), England and Wales (371 inh/km<sup>2</sup>) and the Netherlands (494.5 inh/km<sup>2</sup>) (Eurostat 2011);

## The Danish water sector

- The approximately **2.800 water companies** are spread over some **2.500** water companies and about **300 wastewater** companies.
- In 2003 **there were 4.155 public entities** in the water sector spread over 2.792 water companies and 1.363 waste water companies, while there are currently about 2.500 entities in total.

Drinking Water			Waste Water		
Type of ownership	Companies	Share of water production	Type of ownership	Companies	Share of water production
Municipality	87	About 67%	Municipality	97	About. 98%
Private regulated	135	About 20%	Private regulated	0	-
Private – non regualed	About 2.300	About 10%	Private – non regualed	214	About. 0,5%

# One of the highest tariff and investments in Europe

Danish water utilities account for 1.4% of EU water industry.





The water price covers not only clean, high-quality drinking water and the efficient discharge of waste water, but also environmental protection and recreational areas, such as a rainwater drainage system, a skatepark and new woodland.



## **R**ECREATIONAL RAINWATER RESERVOIRS, AFFORESTATION, BIKE ROUTES AND SKATE PARK





# **Research design**

# Data collection

- Analysis of 75 Danish water utilities (57 provide only water services, 18 water and wastewater services)
- The dataset was made of 178 observations concerned these items (DANVA Report 2011):

## Operations

Population served, nr. of bores and waterworks, km of mains, volume of water sold and population density

## Costs:

Production unit cost, distribution unit cost, customer handling unit cost, investment cost (without VAT and taxes, 1:1 costs, environmental and service goals, associated activities and depreciation).

# The data availability

Adobe Acrobat

Denmark has experienced a voluntary banchmarking since 1999, through the support of the national association of water utilities (DANVA)

A total of 136 drinking water and waste-water companies have completed DANVA's benchmarking 2013 using data from 2012. They supply approx. **55% of the Danish population with clean drinking water** and treat **waste water from approx. 73%** of the population.



# **Research key findings**

## **Descriptive statistics**



## The effect of «size»



## Average unit cost for production and distribution



#### total unit cost



## unit cost for production

### unit cost for distribution



## The effect of «density»



### production costs

# production costs Lineare (production costs) Log. (production costs)



## costumer handling costs



#### distribution costs

## Evidence from the panel regression model

in production costs			<u></u>		
bores	0.001*	In distribution costs		In customer handling costs	
waterworks	0.028	In density	0.124*	multiutility	-0.379*
multiutility	0.139	multiutility	0.004	In water sold	-0.116
In water sold	-0.201***	In water sold	-0.194***	In density	-0.012
In unit investments realized	-0.029	In unit investments realized	0.058	vear	-0.088**
year	-0.003	year	-0.071***	2	

<b>Production costs</b>	<b>Distribution costs</b>	Customer handling cost
+1% of water sold = -		Multiutility (yes) = -37.9% of
0.201% of costs	+1% of density = +0.124 of costs	costs
+10% of water sold = -	+10% of water sold = +1.24% of	
2.01% of costs	costs	
+1 bores = +0.1% of	+1% of water sold = -0.194% of	
costs	costs	
+10 bores = +1% of	+10% of water sold = -1.94% of	
costs	costs	

# Key findings

- Scale economies positively affect production and distrubution;
- Multi-utilities get cost savings in providing customer handling activities (scope economies);
- Density is negatively related to efficiency, (counterintuitive, and weak result but depreciation is not examined. See also Vewin report 2012);
- Nr. of bores increase unit production costs. In some areas, investments have had to be made in new well-drilling areas due to contamination;
- Efficiency is progressivly increased for all cost items during the period observed

## Comparison with our prior research

Guerrini and Romano (2015) studies the performance of Danish wastewater utilities:

- Population density contributes to decrease costs incurred to trasport wastewater (density economies);
- The integration of water and wastewater services ensure cost savings for transport and customer handling activities.