

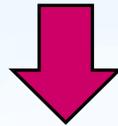
ECONOMIC GROUP´S INFLUENCE ON THE EFFICIENCY AND QUALITY OF SERVICE OF WATER COMPANIES UNDER MODEL-FIRM REGULATION

María Molinos-Senante^a
Rodrigo Farías^b

^a Pontificia Universidad Católica de Chile

^b Universidad Técnica Federico Santa María

**Performance of private vs. public water companies:
inconclusive results**



**World Bank and International Monetary Fund have
promoted the privatization of water and sanitation services**



2015: 1 billion of people were served by private operators



**Foundation of economic groups (EG): 50 largest private EG
served water to 280 million people in 24 countries**

Grouping water companies in EG:

- ✗ Reduce competition accentuating monopoly problems
- ✗ Few incentives to improve quality of service
- ✓ Share know-how, innovations and procedures: improving efficiency



Important role of the regulation to protect customers interests and quality of service

Chile as a paradigmatic case study: **90%** of the customers are served by 16 water companies belonging to **5 EG**



- Small country: 18 million people (90% urban)
- Water industry was **privatized**: 96% of customers
- Water companies provide water and sewerage services
- **Regulation model: efficient company**

CASE STUDY

Water company	Customers in the total national (%)	Economic group	Customers in the total national (%)
1	35.85	1	43.53
2	4.31		
3	3.12		
4	0.25		
5	15.09	2	35.88
6	11.92		
7	4.6		
8	4.26		
9	3.97	3	8.93
10	3.07		
11	1.00		
12	0.89		
13	1.78	4	2.32
14	0.54		
15	0.43	5	0.57
16	0.14		
17	0.07	Independent	0.07
18	3.83	Independent	3.83
19	3.32	Independent	3.32
20	0.35	Independent	0.35
21	0.28	Independent	0.28
22	0.1	Independent	0.10

79.41%

7.95%

Investigate the **influence of economic groups** on quantity and quality-adjusted **efficiency** scores of water companies

Explore whether the introduction of **quality variables** in the assessment **affects to efficiency** scores of water companies

Efficiency assessment: **DEA method**

- Involves multiple inputs and outputs expressed in different units.
- Does not require any assumption of a function representing the production frontier
- Can integrate quality of service variables as undesirable outputs

DEA method

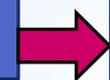
$$\begin{aligned}
 & \text{Min } \theta \\
 & \text{s. t.} \\
 & \sum_{j=1}^N \lambda_j x_{ij} \leq \theta x_{i0} \quad 1 \leq i \leq M \\
 & \sum_{j=1}^N \lambda_j y_{rj} \geq y_{r0} \quad 1 \leq r \leq S \\
 & \lambda_j \geq 0 \quad 1 \leq k \leq N
 \end{aligned}$$

Quantitative

$$\begin{aligned}
 & \text{Min } \theta \\
 & \text{s. t.} \\
 & \sum_{j=1}^N \lambda_j x_{ij} \leq \theta^* x_{i0} \quad 1 \leq i \leq M \\
 & \sum_{j=1}^N \lambda_j y_{rj} \geq y_{r0} \quad 1 \leq r \leq S \\
 & \sum_{j=1}^N \lambda_j b_{zj} = b_{z0} \quad 1 \leq z \leq H \\
 & \lambda_j \geq 0 \quad 1 \leq k \leq N
 \end{aligned}$$

Quality-adjusted

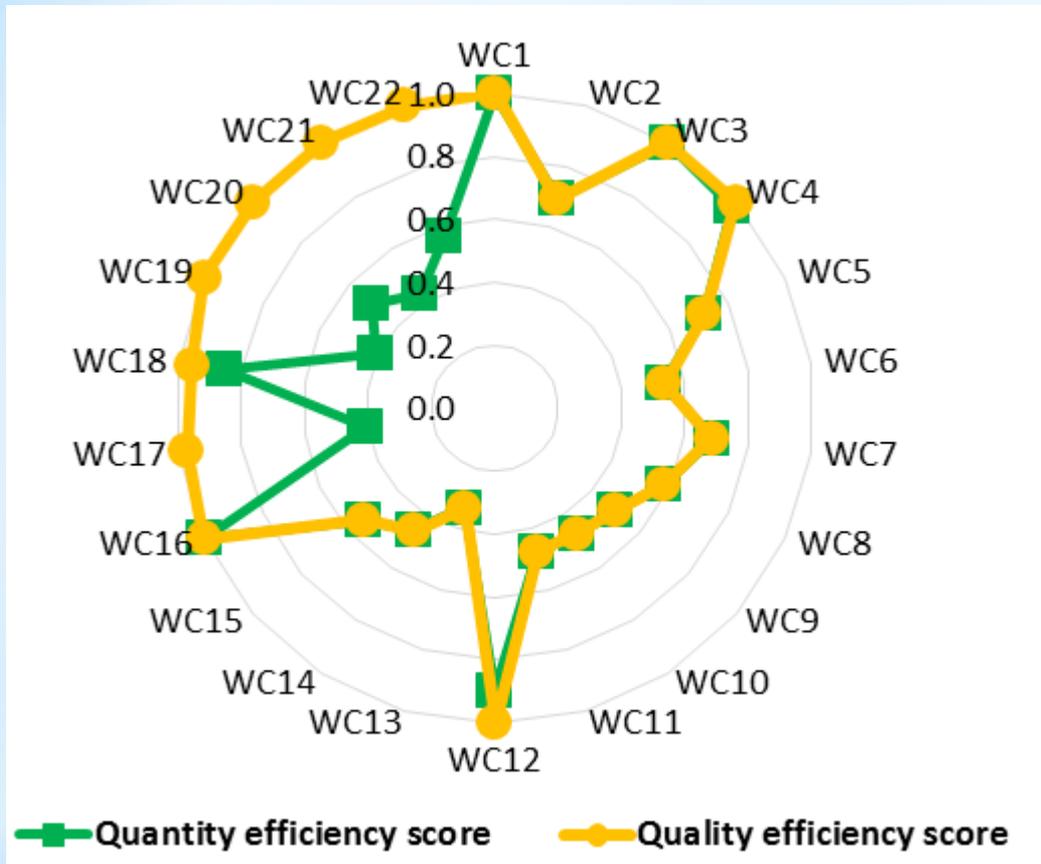
$$\theta \in (0,1]$$



$$\theta = 1: \text{Efficient}$$

$$\theta < 1: \text{Inefficient}$$

- 22 Chilean water companies: 96% urban customer .
- Year 2015
- **Inputs:** Operational costs and number of employees.
- **Desirable Outputs:** Volume of water billed and number of customers with access to wastewater treatment.
- **Quality of service:** Total number of written complaints and total number of unplanned interruptions on water supply and wastewater collection networks



**WC 1-WC16:
Belong to EG**

**WC 17-WC22:
Independent**

Independent WC provide WSS with better quality

RESULTS

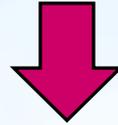
	Total sample		Sub-sample WC membership to EG		Sub-sample WC do NOT membership to EG	
	Quantity efficiency	Quality efficiency	Quantity efficiency	Quality efficiency	Quantity efficiency	Quality efficiency
Average score	0.639	0.769	0.680	0.687	0.530	0.988
% of efficient WC	13.6	40.9	18.8	31.3	0.0	66.7

- Increase of efficient WC whether quality of service is integrated in the assessment
- WC belong to EG: average similar based on quantity and quality variables.
- WC do not belong to EG: average increases notably whether quality variables are included.

	EG1	EG 2	EG 3	EG 4	EG 5	Not EG
Quantity efficiency	0.918	0.631	0.587	0.396	0.770	0.530
Quality efficiency	0.922	0.631	0.612	0.396	0.770	0.988
Market share (%)	43.5	35.9	8.9	2.3	0.6	8.0

- ***p*-value: 0.032 and 0.023: Efficiency differences among EGs are statistically significant.**
- **EG1: large number of efficient water companies: 2 out of 4 for quantity and 3 out of 4 for quality**
- **EG5: high efficiency scores although they are small WCs.**

Efficiency of WCs depends on its membership to EGs



Managerial decisions are relevant vs. technical decisions associated to Chilean geographic diversity.

Implications from tariffs point of view: costs are not mainly associated to water availability and other geographic issues but the EG managed water resources is really relevant: Asymmetric information problems



Should be modified the regulatory model in Chile?

THANK YOU FOR YOUR ATTENTION

mmolinos@uc.cl