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# Performance and incentives in the European water utilities

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## Agenda



**1 Introduction** 

**2 Literature review** 

**3 Performance and regulation** 

4 Rankings

**5 Providing incentives** 

6 How should prices be set?

7 Concluding remarks





### INTRODUCTION



### Introduction: Context



- Policy-makers do not always seek transparency, since that might reveal that social objectives are not being met;
- Managers may also fear that performance comparisons are inaccurate and misused (or accurate in ways that cause problems);
- "Executives manage what they measure";
- Pressure for improved sector performance: Data availability has increased in the last decade (e.g. IBNET);
- Researchers have shown interest conducting quantitative studies of the water sector and in PUBLISHING the results.



### Water sector is significant...







## Policy issues









## LITERATURE REVIEW



### Water benchmarking studies







### Water benchmarking studies



**Evolution of the number of benchmarking studies** 



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### Benchmarking studies







### Methodologies adopted



In the literature of water benchmarking:





### Non-parametric studies



Inputs most used:

**Outputs most used:** 

35% of the non-parametric studies include explanatory factors

Almost all studies use an input oriented model specification



### Parametric studies



About half of the parametric studies use cross-sectional data (and the other half panel data)



The most employed estimation methods are ordinary least squares (OLS), followed by seemingly unrelated regression (SUR)







Four main objectives were identified for Benchmarking Studies







#### Market structure

61 studies identified

Market structure – 51 studies

**Economies of scale – 47 studies** 

**Economies of scope – 21 studies** 

Vertical integration economies- 7 studies

**Economies of density – 9 studies** 





**Economies of scale** 

**Economies of scope** 

Vertical integration economies

**Economies of density** 





#### Ownership

47 studies examine the private/public sector performance

18 studies consider private sector more efficient

17 are not conclusive

12 studies consider the public sector more efficient

The private sector tends to improve labour productivity but often increases capital expenses, too.

However, public sector under-invests and has a reduced labour productivity





#### Incentives

42 studies were identified

Regulatory methods - 21 studies

Most of the studies find a positive effect of regulation on efficiency and productivity

Benchmarking (as value for money) – 18 studies

Commercialization or corporatization – 8 studies





#### Performance

66 studies in the literature

Most of them intend to determine the efficiency of a particular country, region or sample

Studies which propose, apply, or compare new models, for example to estimate the allocative efficiency or to apply additive models or employ the bootstrap technique

We found a few papers addressing the potential of rankings for performance or that take into account service quality.





#### **PERFORMANCE, INCENTIVES AND REGULATION**



## Why measure performance?









Performance assessment (benchmarking) generally reveals very high potential efficiency and productivity earnings;



In this context, the application of **benchmarking** can turn out to be a very significant tool to **save resources and improve the quality of service delivered**.



### Performance cycle







### Performance measurement



Areas of application ...





What are the benefits of Metric Benchmarking?



the greater the market failures the greater is the importance of benchmarking analysis.

Two major benchmarking applications:

- Price regulation
- Quality of service regulation



## How to Apply?







#### Using benchmarking (British water regulator)



- Econometric models to assess relative efficiency;
- Companies performance measurement against their rivals;
- Imitates a competitive market;
- Supports company-specific efficiency targets;
- More demanding targets for the less efficient;
- Comparison of standard costs used to challenge forecasts of capital work costs;
- Published models and data based on standard definitions;
- Subject to challenge and review;
- Special factors taken into account.











### Price regulation







### Price regulation: Price cap



Focus directly on price (and not on costs) increases - a performance based method

• Less intrusive price regulation.

Price cap schemes, mostly, restrict price increases to the rate of inflation less an agreed "X factor", *i.e.*, "CPI - X"

- CPI (Consumer Price Index) is a inflation rate;
- The "X" factor is based (mainly) on the potential productivity improvement of the regulated company.

No restrictions on the level of profits that receive

• More incentives for the company to 'beat' the 'X' factor.





### Sunshine regulation...

- ... It is based on the <u>public display of</u> the operators performance results and on the comparison with the remaining operators;
- ... the awareness of their performance is accomplished by <u>pressure exerted</u> over them from the customers and citizens at large, by means of their defense and representative groups, the media, the politicians (Government and political parties) and NGOs;
- The providers with a poor performance become <u>"embarrassed"</u> and will try to <u>correct</u> the deviations.







#### 33

## The goals...

- This method does <u>not fix rates</u> and its coercive power is, generally, limited;
- The comparison, <u>public display and</u> <u>discussion</u> of regulated entities performance triggers positive effects;

The "*name and shaming*" effect and the introduction of competition among providers stimulates a progressive increase in the industry's performance.









Regarding the results to be achieved...

- The **purely economic** side is not so effective (because an improvement implies a similar decrease in profits);
- In aspects related to the **<u>quality of service</u>**, the consequences are very perceptible.



### Sunshine regulation...



... It always contains a *benchmarking* application mechanism (through indicators or other methods), to a greater or lesser degree;

For water and wastewater services, the advantages are increased, since quality of service standards are of paramount importance and the traditional economic regulation (tariff setting) is, in some circumstances, more difficult to implement (given its local level).



### Sunshine regulation...



... to be effective, some requirements must be assured:

The results should be published , not only covering the regulated entities, but also, whenever possible, with further providers

The results should be published with the reference values

The publication of results has to be easily accessed by the customers

Public participation should be promoted through public consultations, all the different stakeholders should be considered (*e.g.*, their presence)



### Sunshine regulation



It is essential to adopt a classification system, in which the results achieved are measured in accordance with their distance to defined *targets* 

Classification	Result vs. Targets
• • • •	Excellent
•••	Good
••	Neutral
•	Poor



### Benchmarking and regulation in Europe







### Practical issues: Data Availability

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It needs adequate data of sufficient quality 'garbage in' => garbage out.

Consultants and academics recognize that:

"If you torture the data enough they will confess."



Regulators should note that not all elements that <u>can</u> be counted really "count":

"Make what's 'important' measurable not what's measurable important."





## Practical issues: Model Specification



Better simple models with robust analysis and consistency checks

than complex models with superficial analysis

Model specification:

- OPEX/CAPEX/TOPEX models;
- Physical or monetary units;
- The degrees of freedom;
- Production/cost models;
- Panel data/cross sectional data;
- Number of comparators/international comparators;
- Adjusting for environment;
- Outliers;
- Quality versus economical issues.



### Practical issues: Inputs



What are the inputs of the network utilities?

- OPEX Operating Expenditures
- CAPEX Capital Expenditures (annual outlays on investments)
- CAPITAL ASSETS (cumulative investment less economic depreciation)

or

- TOPEX (Total Costs)
- Is this disaggregation enough? Or should it be divided into staff and other OPEX, recognizing outsourcing and other factors?
- Using just OPEX does not seem credible!... But, how should Capital be measured?





In physical units, as in network length?

Solution  $\mathbb{R}^{2}$  Other assets ? What about the quality or age of assets?

Solution Might rural utilities be penalized if density ignored?

Sut isn't the task easier in monetary units?

Sook value, market value or replacement value?

Solution What about the historical subsidies and stranded costs: how are they taken into account?



#### Practical issues: Outputs



The most used outputs are:

- Volume of water/... delivered (sold);
- With the second seco
- ↔ What is the importance of the percentage of industrial customers?
- ♦ What features of rural utilities influence costs?

♦ Why do not consider the network length or the capacity of network length available to the customers?

S Is there data on quality of output? What about 'bad' outputs (environmental damages)? What about financial or resource sustainability?



### Practical issues: Explanatory Factors

**EXAMPLES** from the water sector:

- ✓ Weather;
- ✓ Assets' age;
- $\checkmark$  % of non-residential customers;
- ✓ Water source:
- ✓ Availability of water resources and their quality;
- $\checkmark$  Topography;
- ✓ Peak factor:
- Customer density;
- $\checkmark$  Kind of soil:
- Local regulations and environment policies;
- $\checkmark$  Ownership;
- ✓ Regulation, ...

 $\succ$  They influence efficiency significantly. A particular variable may not be statistically significant but it can influence softly the utilities efficiency or, in particular, a single utility's ranking can be dramatically affected.





Thus, efficiency is influenced by a set of external factors not controlled by the utility managers, such as:

- ✓ Market structure factors (scale, scope and density economies);
- ✓ Historical factors (past investments interfere with CAPEX/OPEX ...);
- Social factors (% of industrial customers, bigger customers, consuming habits, peak factor/density economies, GDP,...);
- ✓ Environmental factors (weather, ...);
- Regulatory factors (regulation, prices policies, taxes, demand policies, ...);

✓ Local factors (topography, availability of resources, ...).





### RANKINGS





Data on twenty water distribution utilities.

- 1. Rankings: Identify the three best and the three worst performing firms.
- 2. Rationale: Explain why you placed these firms in these categories.
- 3. Robustness: How would you determine whether your rankings (or performance scores) are robust?



### Which technique should be used here?



- Partial measures (performance indicators);
- Partial measures (efficiency matrices);
- Total measures
  - Composite indicators;
  - ✓ DEA;
  - ✓ OLS/COLS;
  - ✓ SFA;
  - **√**...

Which variables should be included in the analysis?



### Rankings



- Ordinal vs. Scalar
- Analysis of Trends
- Scale Economies
- Selection of Indicators



## Rankings



#### Many benefits:

- Very useful. They are effective in calling attention of stakeholders to issues!...
- Sunshine (name and shame) regulation;
- Consequences for tariff-setting (carrot and stick approach).

#### Several shortcomings:

- Selection of performance measures (often partial ones);
- Weighting the indicators;
- Dealing with bad and missing data;
- Reliability;
- Stability (over time).



### Robustness of rankings

#### **Empirical rules:**

- Minimum and maximum scores;
- The same trend;
- Comparable means, standard deviations, and other distributional properties;
- Stability over time;
- Correlation with intuitive partial measures.

#### Statistical tests:

Spearman and Pearson tests (Kendall Tau when there are ties)





### **PROVIDING INCENTIVES**



### Importance of **performance incentives**



#### Advantages:

- →Offering strong incentives towards efficiency and innovation;
- → Fostering the sharing and transparency of information;

#### **Problems:**

- → The difficulties intrinsic to its working principles;
- $\rightarrow$  The adopted methodology can be attacked;
- ➔ The "collusive hypothesis and behavior manipulation among utilities;
- → The degree of commitment of the regulator and the utilities.



### Which incentive scheme should we apply?



- a) Price, revenue or hybrid cap regimes;
- b) Carrot and stick regimes;
- c) Efficient company model;
- d) Use of yardsticks comparisons to set indirectly tariffs;
- e) Inclusion of yardstick comparisons explicitly in tariffs computation methods (direct way);
- Noteworthy in the cap formulas: CPI X
- CPI consumer price index
- X expected productivity growth in the future regulatory period



### The problem of X factor computation



X Factor decomposition = Technical change + efficiency change

- Technical change (the efficient frontier shift) associated with the productivity of the sector (or the economy in general);
- Efficiency change is related to movement towards the efficient frontier (the catch-up factor).







The international experience:

Telecoms – Mainly TFP (index numbers or others);

Electricity – Mainly DEA (and SFA as well);

Water – Several (TFP in Australia, OLS in the UK, DEA in Colombia, ...);

Transportation (highways, airports,...) – Mainly TFP



### The case of England an Wales



Water regulation in England and Wales is pointed out, in the literature, as one of the successful examples of using incentives





#### **HOW SHOULD PRICES/TARIFFS BE SET?**



## X Factor



- Problems of price cap regulation when compared with rate-of-return (attention to quality);
- The regulatory period (incentive versus risk);
- X Factor for the whole sector or individually (to each firm) or even depending on the activity regulated?
- How can each firm get close to the frontier? What is a reasonable target?
- The annual target should reflect gradual (not instantaneous) attainment (trying to attain the fourth quartile (75%);



## X Factor



- The target should be gradually set (trying to attain the fourth quartile at least (75%);
- The business plan is essential. How is it evaluated and monitored?
- The dichotomy between CAPEX and OPEX
- And the quality of service? And the penalties?

The regulatory method depends on ownership or on the financial health of the utilities?



### Example of computation of X Factor



Technical change - obtained by industry average TFP (Törnqvist) – 1.5% per year

Efficiency change obtained by DEA (SFA) technique Firm A - 0.775

Assume a six-year regulatory period; ask firms to achieve 1.5% per year plus catch-up factor of 75% towards frontier

For firm A: X Factor =  $1.5 + 0.75 \times (1-0.775)/6 =$ 1.5 + 2.8 = 4.3% per year





### **CONCLUDING REMARKS**



## Concluding remarks



Regulatory benchmarking leads to several benefits:

- Encouraging the operators to be efficient (both regarding the OPEX and CAPEX);
- Assuring a "fair" recovery of the costs and enabling a "fair" rate of return on investment;
- Improving information sharing and transparency;

However, in its use we should take some care:

Its use cannot be subjective and/or discretionary.



## Concluding remarks



Heterogeneity is impossible to be completely eliminated (comparing "apples with oranges");

- Not all the kind of costs are known or satisfactorily considered and included in the analysis (e. g. quality);
- The differences between the cost of the different peers might be imputed to inefficiency, to measurement errors, or to historical factors beyond current management's control;
- The X Factor based on differences of efficiency between regulated firms might not be suitable.





Quoting an earlier Scottish Water Industry Commissioner:

" Ultimately the best way of promoting customer interests in a public sector model is by improving the economic efficiency of the industry, and thereby the value for money generated"





### Questions



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