An assessment of water utilities efficiency using the Portuguese case

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Introduction

- Portuguese experience in water management sector

- Measuring companies performance (operational, financial and global)

- Assessing Variables that affect performance

Water sector in Portugal

Water sector in Portugal

Water sector in Portugal has 3 subsector:

Drinking water supply service to domestic households:

- Upstream – Groundwater abstraction, treatment, elevation, adduction

- Downstream – Storage, distribution, consumption

Wastewater management service from domestic households:

- Downstream – Discharge, drainage, retention

- Upstream – Elevation, transport, treatment, rejection

Solid waste management services from domestic households:

- Downstream – Waste production, Municipal waste collection / Separate collection

- Upstream – Organic recovery/recycling, incineration, landfill

Water sector in Portugal

Figure 1: Evolution of Coverage Rate in the Water Sector
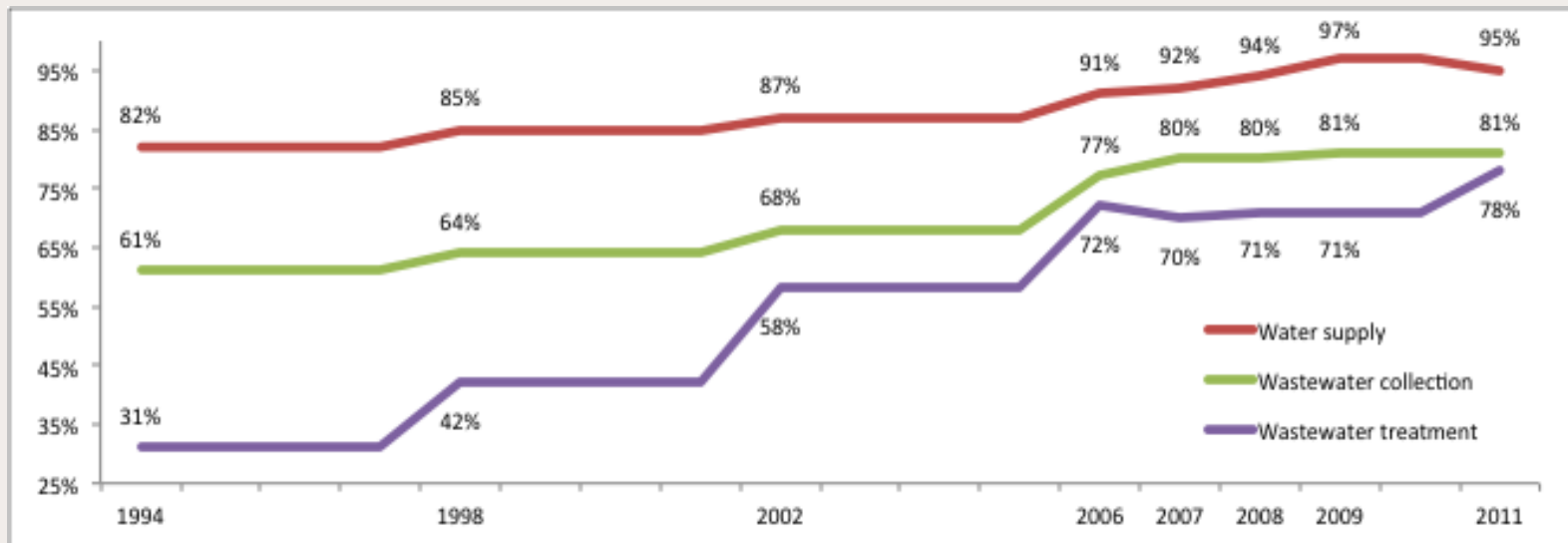
Coverage rates for population in water supply, wastewater collection and treatment according to National Water Regulator Report (source: RASAARP 2012).
Coverage for 2011 refers to households.

Water sector in Portugal

Figure 2: Distribution of different models of water supply downstream companies
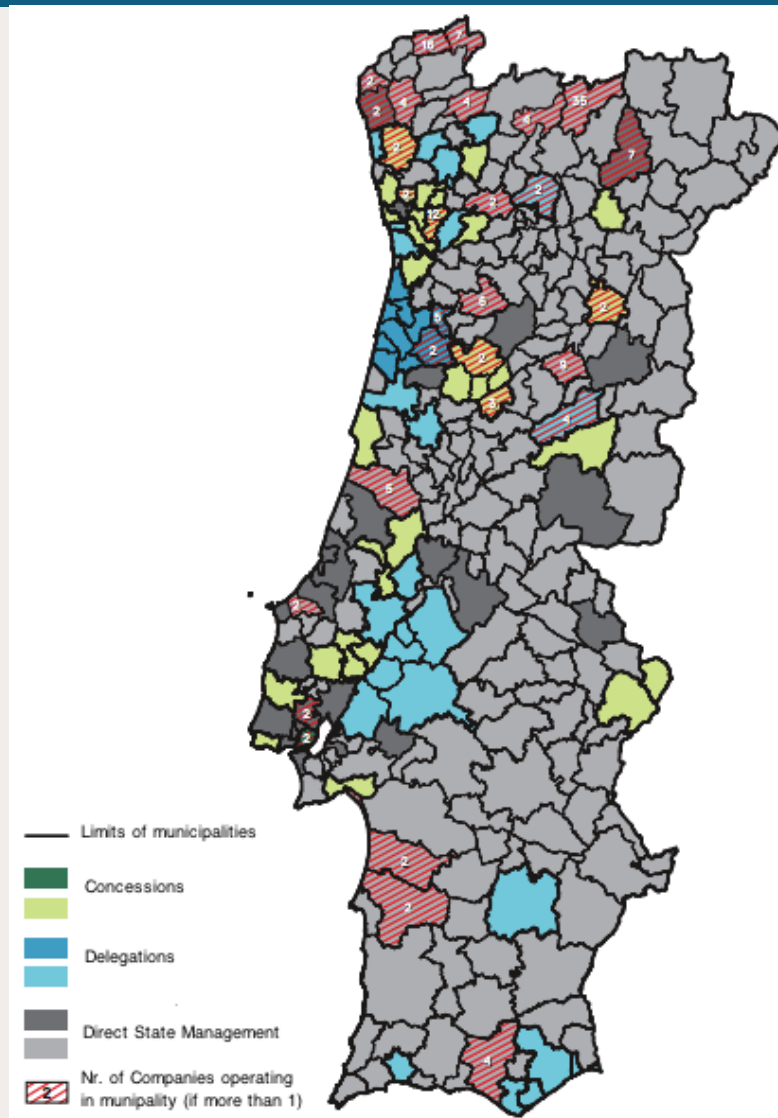
Distribution of different models of water supply downstream companies

(source: RASAARP 2012, adapted and translated by the authors)

Methodology

Methodology

- 3 performance levels (overall, financial and quality)

- "Quality" addresses quality of service and sustainability

- Financial and quality performance are computed separately

- Each indicator is measured in a score from 1 to 5

- Overall efficiency = 40% financial performance + 60% quality performance

Assessment Methodology

- Scorecards for each concession

- 3 groups of risk measurements

  » Financial Risk

  » Quality of Service Risk

  » Construction Risk

- Weighted average of individual risk grades

- Simple methodology

  » Common to the different industries

  » Comparable among different entities

  » Easy to aggregate to industry level

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Methodology– risk assessment

- Risk grade from 1 to 5

5 Best grade	4	3	2	1 Worst grade
Minimal risk				Maximal risk

Methodology – uniform assessment

- Looking for a uniform measurement of risk, through common criteria in defining the scale (trying to remove subjectivity, which is impossible!)

5	4	3	2	1
Beat expectations	In line with expectations (base scenario or contract scenario)	Slightly below expectations	Below expectations	Way below expectations

Methodology

Table 1 – Financial and quality indicators

Financial Performance	
Indicator	**Formula**
Equity Ratio	Equity / Assets
Exploration Margin	Operational Profit / Revenues
Permanent Capital Coverage	Operational Profit / Permanent Capital
Capitalization	Equity / Share Capital
ACP	Average Collection Period
% owned by AdP on the concession	

Quality Performance
Service Availability
Occurence of failures on the network
Water safe for consumption
Coverage Ratio
Unbilled Water
Reabilitation of distribution networks
Suitability of Human Resources
Respect of legal parameters

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Methodology

Yi is the explained performance variable and can be the financial efficiency grade ($FinancialPerf_i$), the quality efficiency grade ($ServiceQual_i$) or the global ($GlobalPerf_i$) efficiency grade. All 3 grades are defined in a range between 1 and 5

- **concyear** is the year that the concession was awarded.
- **concper** is the number of year of the concession.
- **contractchanges** is the number of changes in the contract, in terms of contract extensions.
- **public** is a dummy variable capturing whether the project is managed by private companies or state owned entities
- **land** is defined as the area served by the company, measured in square kilometres.
- **houses** is a variable that considers the number (in thousand) of households covered in the area of the concession.
- **workers** measures the number of workers in each company.
- **EPAL** is a dummy variable referring to the upstream water supply company in Lisbon, named EPAL.

Results

Results

Figure 1 – Histogram of global performance
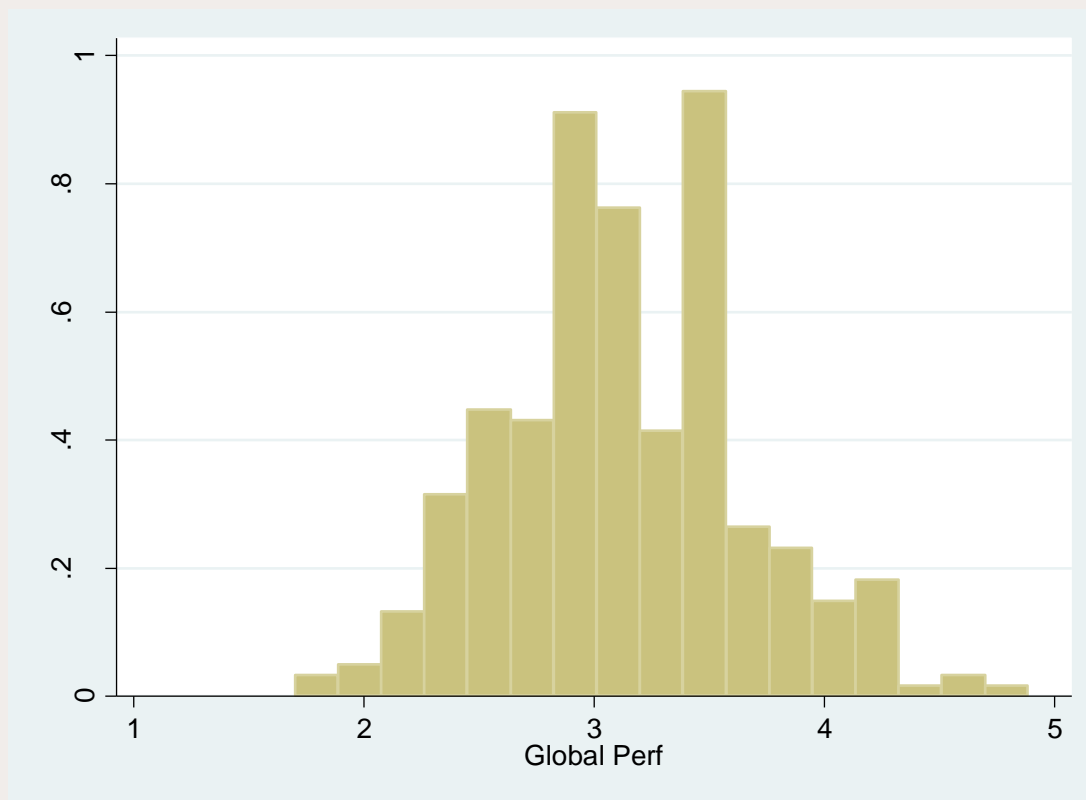
Results – entire sample

VARIABLES	(1) GlobalPerf	(2) FinancialPerf	(3) ServiceQual	(4) GlobalPerf	(5) FinancialPerf	(6) ServiceQual
Concyear	-0.0358***	-0.0357***	-0,0358***	-0.043***	-0.0378***	-0.04643***
	(0.01)	(0.01)	(0,01)	(0.01)	(0.01)	(0.01)
Concper	-0.0005	-0.0068	0,0037	0.001	-0.0065	0.00596
	(0.01)	(0.01)	(0,01)	(0.01)	(0.01)	(0.01)
Contractchanges	0.0467	0.0114	0,0702	0.0226	0.0066	0.03335
	(0.06)	(0.07)	(0,07)	(0.06)	(0.07)	(0.07)
Public	-0.1308	-0.0360	-0,1943*	-0.1551*	-0.0438	-0.22958**
	(0.09)	(0.11)	(0,12)	(0.09)	(0.11)	(0.11)
Land	-0.00006***	-0.00009***	0**	-0.0001***	-0.0001***	-0.00003*
	(0.00)	(0.00)	(0)	(0.00)	(0)	(0.00)
Houses	0.0003	-0.0001	0,0006**	0.0004*	-0.00004	0.00065**
	(0.00)	(0.00)	(0)	(0.00)	(0)	(0.00)
Workers	0.0011**	0.0023***	0,0003	0.0009*	0.0022***	-0.00004
	(0.00)	(0.00)	(0)	(0.00)	(0)	(0.00)
EPAL	-1.1996***	-1.1713**	-1,2171**	-1.3169***	-1.2011**	-1.3928**
	(0.43)	(0.54)	(0,57)	(0.42)	(0.55)	(0.55)
2008.Year				0.0413	-0.0649	0.11269
				(0.09)	(0.12)	(0.12)
2009.Year				0.1192	-0.0617	0.24024**
				(0.09)	(0.12)	(0.12)
2010.Year				0.167*	0.009	0.27243**
				(0.09)	(0.12)	(0.12)
2011.Year				0.2872***	0.0463	0.44805***
				(0.09)	(0.11)	(0.12)
Intercept	74.64***	75.23***	74,189***	89.02***	79.55***	95.26***
	(16.93)	(21.38)	(22,24)	(17.12)	(22.08)	(22.33)
Observations	280	280	280	280	280	280
R-squared	0.23	0.22	0.13	0.27	0.23	0.18

Results summary – entire sample

Variable	Global perf	Financial perf	Service Qual
Concyear	- ***	- ***	- ***
Public	- *	n.s	- **
Land	- ***	- ***	- ***
Houses	+ *	n.s	+ **
Workers	+ **	+ **	n.s
EPAL	- ***	- **	- **

Results – upstream

VARIABLES	(1) GlobalPerf	(2) FinancialPerf	(3) ServiceQual
Concyear	-0.0505***	-0.0358*	-0.0602***
	(0.01)	(0.02)	(0.02)
Concper	0.0004	-0.0272***	0.0188*
	(0.01)	(0.01)	(0.01)
Contractchanges	-0.0032	0.1819	-0.1265
	(0.09)	(0.12)	(0.12)
Public	-0.1562	-0.1523	-0.1596
	(0.14)	(0.18)	(0.19)
Land	-0.00004**	-0.0001***	0.
	(0)	(0)	(0.00)
Houses	0.0007**	0.0002	0.001***
	(0)	(0)	(0.00)
Workers	-0.0001	0.0014	-0.0011
	(0)	(0)	(0.00)
EPAL	-1.151*	-0.3876	-1.6577**
	(0.6)	(0.79)	(0.82)
2008.Year	0.0427	-0.1113	0.1457
	(0.11)	(0.15)	(0.16)
2009.Year	0.1292	-0.2295	0.3685**
	(0.11)	(0.15)	(0.15)
2010.Year	0.1713	-0.2257	0.4353***
	(0.11)	(0.15)	(0.16)
2011.Year	0.3089***	-0.1056	0.5852***
	(0.11)	(0.15)	(0.15)
Intercept	104.08***	76.39**	122.34***
	(27.96)	(36.46)	(37.91)
Observations	158	158	158
R-squared	0.35	0.36	0.25

Results summary - upstream

Variable	Global perf	Financial perf	Service Qual
Concyear	- ***	- ***	- ***
Public	n.s	n.s	n.s
Land	- ***	- ***	n.s
Houses	+ *	n.s	+ **
Workers	n.s	n.s	n.s
EPAL	- ***	n.s	- **

Results - downstream

VARIABLES	(1) GlobalPerf	(2) FinancialPerf	(3) ServiceQual
Concyear	-0.0380***	-0.0367***	-0.0389***
	(0.01)	(0.01)	(0.01)
Concper	0.0021	0.0169*	-0.0078
	(0.01)	(0.01)	(0.01)
Contractchanges	0.0347	-0.1385	0.1502
	(0.08)	(0.09)	(0.1)
Public	-0.2208	-0.1761	-0.25
	(0.3)	(0.35)	(0.36)
Land	0.00005	-0.0001	0
	(0.00)	(0.00)	(0.00)
Houses	-0.0028	0.0012	-0.0054
	(0.00)	(0.00)	(0.00)
Workers	0.0024	0.002	0.0026
	(0.00)	(0.00)	(0.00)
2008.Year	0.0454	0.0269	0.0587
	(0.16)	(0.19)	(0.19)
2009.Year	0.1165	0.1998	0.062
	(0.16)	(0.18)	(0.19)
2010.Year	0.1734	0.3745	0.0407
	(0.15)	(0.18)	(0.19)
2011.Year	0.2594*	0.2679**	0.2546
	(0.15)	(0.18)	(0.18)
Intercept	78.96***	76.43***	80.69***
	(24.03)	(27.88)	(28.88)
Observations	122	122	122
R-squared	0.17	0.20	0.15

Results summary - downstream

Variable	Global perf	Financial perf	Service Qual
Concyear	- ***	- ***	- ***
Public	n.s	n.s	n.s
Land	n.s	n.s	n.s
Houses	n.s	n.s	n.s
Workers	n.s	n.s	n.s

Conclusions

Conclusions

- Early concessions perform better

- Experience (age of concession) is a significant variable in improving performance

- Private sector performs better in quality but not in financial performance