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Economies of Scale and Scope in Network Industries: Lessons for UK water and sewerage sectors

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Plan

- History of network industry structure
- Evolution of industries
- Economies of Scale and Scope
- Econometric evidence on water and sewerage
- Evidence from other sectors
- Evidence from water industry reforms
- Conclusions

Water and sewerage industries

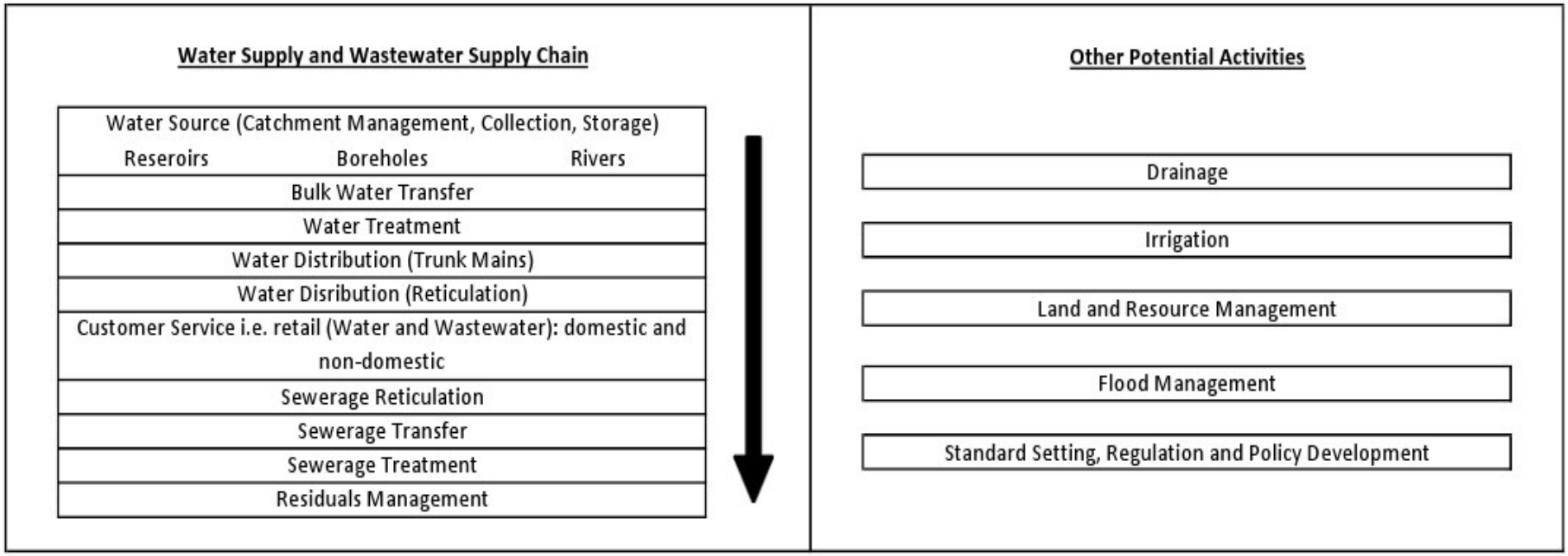


Figure 1.1: Key activities in the water and sewerage supply chain. Original source: Abbott and Cohen (2009, Figure 1, p.234); modifications informed by: Saal, et al. (2011a).

History of UK Gas industry

- 1948: 1046 firms merged into 12 Gas Boards
- 1972: Single, British Gas.
- 1986: British Gas privatised.
- 1996-2005: Divestitures and competition.
- 2005: National Grid Gas owns 4/8 distribution businesses; 3 other companies own 4/8.

History of UK Telecoms

- 1896-1912 takeovers by GPO of local telcos.
- 1969: Internal unbundling of GPO into Posts and Telecoms, under PO.
- 1980: British Telecom created.
- 1981: Competitor licensed.
- 1984: Privatisation
- 2005: Creation of Openreach, now 22% of local loops unbundled and operated by third parties.

History of E+W electricity supply sector

- 1926: National transmission system.
- 1947: 505 firms merged into 12 area boards.
- 1957: CEGB for generation and transmission.
- 1990-96: Power pool, divestitures and privatisation.
- 2005: single system operator for GB.

History of Water and Sewerage sector in E+W

- At privatisation: 10 WaSCos, 33 WoCs.
- Now: 10 WaSCos, 12 WoCs
- In Scotland, now single company with retail competition for non-domestic water.

Table 1.4: Sizes of water only and water and sewerage firms in England and Wales (Ofwat, 2010).

Firm Structure	Number of Connections for households and non-household			Water Delivered (million US gallons / year)		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Water Only	401,000	74,000	1,273,000	13,700	2,420	71,148
Water and Sewerage	2,024,000	577,000	3,601,000	93,700	27,522	200,755

Water industry globally

- Water and sewerage integrated in E+W, Canada and Greece.
- Water and sewerage separate in Netherlands and Germany.
- Some countries thousands of companies (e.g. US).
- Some have a few large companies (e.g. US).
- Some have holding companies (e.g. Spain and Egypt).
- Multi-utilities in Switzerland and Italy.
- Separate bulk water and distribution in Australia.
- Local private concessions in France.

- England and Wales firms are large internationally.
- Many different structures.

Evolving structure of firms

- Smith, 1776: Division of labour.
- Stigler, 1951: Young industries integrated, old disintegrate.
- Levy, 1984: Industry factors matter, particularly small numbers bargaining (Williamson, 75).
- Growing markets imply advantages to unbundling.
- Clearly need to identify markets and relation between them.

Economies of Scale and Scope

- Economies of Scale:

$$Sca = \frac{C(q)}{\sum_{i=1}^{n} q_i C_i(q)}$$

- Economies of Scope:

$$Sco = \frac{C(q_1, 0) + C(0, q_2) - C(q_1, q_2)}{C(q_1, q_2)}$$

Difficulties with concepts

- EoScope implies EoScale.
- Measurement of different outputs.
- EoScope can be exploited by non-integrated firms – e.g. Orchard/Sheep, Teece (1980).
- Asset specificity is endogenous.
- Access regulation can support separation.

- Production vs Governance costs the issue.

Application to Water Industry

- Garcia et al. (2007), need to distinguish:
- 1. Technological economies.
- 2. Transactional economies.
- 3. Market imperfections.

- Look at 211 Wisconsin water firms, with variety of structures.
- If production and treatment firms sell at marginal price, then transmission&distribution firms more efficient separate.

Benefits of Competition *(Hay and Liu (1997)*

- In general (across industries):
- There are two behavioural benefits:
  - Discovery and selection
  - A sharpening of managerial incentives
- Less competition reduces larger firms incentives to cut costs.
- R&D important for long run efficiency.
- Loss of market share stimulates firms to improve their efficiency.

Conclusions on theory

- Competition allows scale and scope economies to be exploited without integration.
- Different degrees of asset specificity can make the degree of integration endogenous.
- Industry and history are significant in determining optimal scale and scope at any time.

The Evidence on Scale

- Table 4.1: Numerical summary of the review of econometric studies in the water and sewerage industries as reported by Abbott and Cohen (2009; page 237, Table 1) for water only and water and sewerage scale (dis)economies

Country[a]	Number of Studies	(Dis)economies of Scale		Economies of scale followed by diseconomies beyond a certain firm size	Economies *and* diseconomies of scale in different parts of the supply chain	Inconclusive/ no conclusion as per Abbott and Cohen (2009; page 237, Table 1)
		Economies	Diseconomies			
England and Wales	7	1	5			1
USA	7	3		1	3	
Italy	4	2		2		
Korea	1	1				
Canada	1	1				
Japan	1	1				
France	1			1		
Germany	1	1				
Portugal	1			1		
Brazil[b]	1					1
Colombia[b]	1	1				
Moldova[b]	1	1				
Vietnam[b]	1	1				

Notes on scale papers

- 7 UK papers: 2 pre-1973, 4 use only WaSCos, only 1 uses water only companies as well (Stone and Webster, 2004).

- 7 US studies: variety of national and state level studies.

The Evidence on Scope

Table 4.2. Numerical summary of the review of econometric studies in the water and sewerage industries as reported by Abbott and Cohen (2009; page 238, Table 2) for water only and water and sewerage scope(dis)economies.

Country	Number of Studies	(Dis)economies of Scope		Economies of scope followed by diseconomies beyond a certain firm size	Economies *and* diseconomies of scale in different parts of the supply chain	Inconclusive/ no conclusion as per Abbott and Cohen (2009; page 237, Table 1)
		Economies	Diseconomies			
England and Wales	4	2	1			1
USA	3	1	1	1		
Italy	1	1				
France	1	1				
Portugal	1			1		

Notes on scope papers

- Smaller number of studies.
- Smaller water companies exhibit economies of scope.
- Largest firms seem to exhibit diseconomies of scope.

General issues with studies

- Definition of small and large firms. 'Large' firms in some studies are much smaller than smallest firms in UK sample.

- Saal et al. (2011a) and Abbott and Cohen (2009) reviews only overlap on 14 studies out of 33 and 26 reviewed. Some of Saal et al. descriptions of papers questionable.

Recent E&W papers

- Saal et al. (2011b) water only finds:
  - Diseconomies of scale.
  - Economies of scope.

- Saal et al. (2011c) WoCs and WaSCos finds:
  - Scope economies within sewerage and within water.
  - No economies of scope between water and sewerage.

Problems with cost function analysis

- Unwise to put too much emphasis on any parameter in flexible functional form equation.
- Impact of separation on costs often extrapolated from marginal differences in degree of integration.
- Cannot model impact on input prices as a result of competition.
- Capital costs notoriously difficult to measure.
- Selection bias in mixed samples e.g. Only most efficient water cos remain.
- Most cost function studies measure average cost function, not frontier cost function.

Other sectors: Telecoms

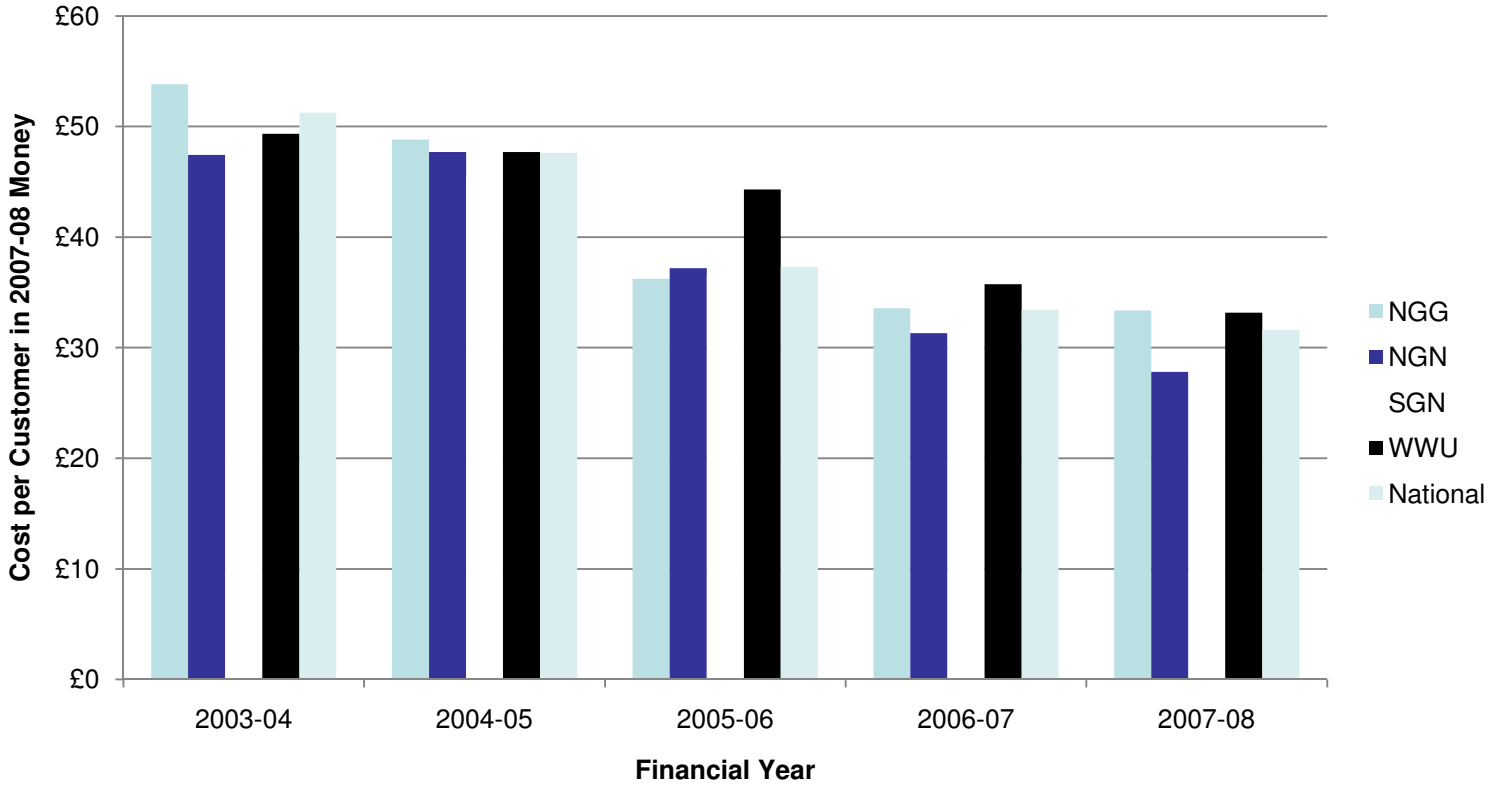
- Babe (1981) looks at Canadian industry which did include integrated and non-integrated telcos.

- Non-integrated cos more cost efficient, due to ability to exploit innovations.

- This highlights the importance of having the right dataset, to make robust predictions.

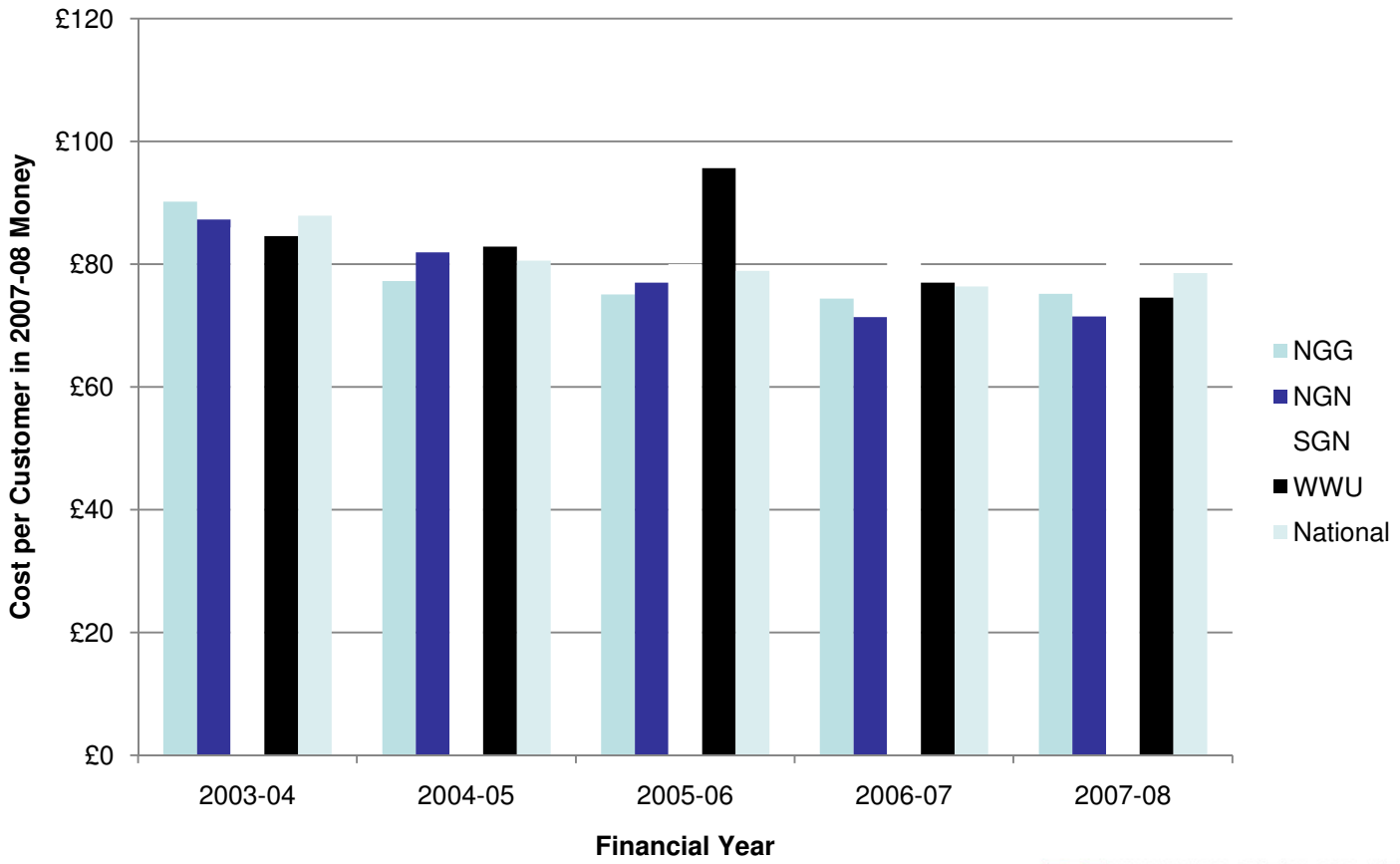
Other sectors: Gas distribution

Figure 5.1.1: Mean controllable operational expenditure per connection for Gas Distribution Firms in Great Britain



Other sectors: Gas Distribution

Figure 5.1.2: Mean total annual cost per connection for Gas Distribution Firms in Great Britain



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Other sectors: gas distribution

- Controversial at the time (Seris, 2006; Oxera, 2003).
- Benefits from separate price controls, might be realisable without separation.
- However benefits look significant and accompanied by substantial increase in investment.

Other sectors: Electricity supply

- Newbery and Pollitt (1997) on breakup of CEGB: +ve SCBA.
- Pollitt (2008) on EU ownership unbundling of transmission: +ve theory and evidence.
- Kwoka and Pollitt (2010) on US electricity distribution mergers: -ve for efficiency.
- Triebs et al. (2010) on US electricity divestitures: overall positive SCBA.

Evidence from water reforms

- South East Queensland:
- Prior to 2008 local councils ran water and sewerage
- Now:
- Bulk water: Q Bulk Water Supply Authority
- Desalination & recycled water: Q Manufactured W Authority
- Transport: Q Bulk Water Transport Authority
- Grid Manager manages contracts.
- Three separate distributor-retailers

- Total connections: 1.2m.

Evidence from water reforms

- Melbourne Water divested in 1994
- Now upstream water and sewerage only.
- 3 new companies do reticulation, distribution and retail.
- This has enabled benchmarking.
- 2008 review by hostile state Premier showed positive results and no suggestion of return.
- Separation of retail and distribution to be reconsidered in future.

Evidence from water reforms

- Munich local utility SWM reorganised in 2004.
- Wholesale water only; distribution of electricity, gas and water company; retail E, G and W company.

- Cost cutting has resulted.
- Potential scope gains via multi-utility.
- Note this does separate retail from rest.

Conclusions

- Ideal unbundling would stimulate competition, improve regulation, reduce governance costs and stimulate dynamic efficiency.

- Much current econometric evidence on water and sewerage industries does not form basis for reliable policy advice on separation.

- Need to look at experience of actual reform in other countries and industries.

Select References

For full references see:

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