Session 6:
The Economic Regulation of Networks: Setting Price Controls in the UK Water Industry

Outline

- The Water Industry in the UK
- Economic Regulation
- The history of the privatised water industry
- Presentation on Shleifer on Yardstick Competition
- Presentation on Europe Economics study UK water
- 1999 Periodic Review of Water and Sewerage Charges
- Conclusions
The Water Industry in the UK

- Water services
- Sewerage services
- Related water quality issues
- Operating Expenditure
- Capital Expenditure
  - Capital Maintenance
  - Capital Expenditure
- Multiple Regulators

Economic Features of the Water Industry

- Classic distribution Network
  - Vertically Integrated local monopolies
  - Large local economies of scale and scope due to high capital costs
  - Limited scope for efficient competition
- High potential for profit and tax raising for related environmental expenditure on rivers and beaches.
- Under-investment in public sector, need for further investment following EU directives.
- Potential for innovation exists in technology of service provision.
- Mergers between companies in same and related distribution networks may yield efficiency savings.
- Substantial scope for overseas expansion in water asset management and ownership.
The functions of the regulator (Water Act 1989)

1. Ensure proper activity occurs.
2. Ensure financial viability of companies.
3. Protect customers, especially in rural areas, pensioners and disabled.
4. Ensure quality of supply.
5. Promote efficiency and economy of companies and facilitate effective competition.

The Powers of the Regulator

- Licensing of companies
- Setting of regulated price controls (RPI-X)
- Setting of quality targets and payments
- Acquisition of information
- Investigation of anti-competitive practices
- Referral to the Competition Commission
The price setting process

- Identify comparator group of firms
- Identify range of efficiency measurements
- Identify inputs, outputs and environmental variables
- Collect data on consistent basis
- Conduct analysis
- Generate efficiency differences
- Generate efficient cost predictions for each firm
- Set X from difference between actual and efficient costs

Allowed Revenue and X factor
Key Factors in Process

- Regulatory Asset Base (RAB)
  - Establishing initial value difficult
- Weighted Average Cost of Capital (WACC)
  - Depends on risk factor and gearing ratio
- Operating expenditure (OPEX)
  - May be subject to CAPEX trade-off
- Capital expenditure (CAPEX)
  - Requires carefully auditing if separately regulated
- We will look at an example of a price control process.

History of the Water Industry

<table>
<thead>
<tr>
<th>Water Act 1973</th>
<th>Build up to privatisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 10 Water Authorities created.</td>
<td>• Underinvestment during the 1980s.</td>
</tr>
<tr>
<td>• Regulatory and utility functions.</td>
<td>• Part of a wider government policy.</td>
</tr>
<tr>
<td>• Integrated river-basin management.</td>
<td>• Large future investment - use of private sector capital.</td>
</tr>
<tr>
<td>• Replaced local authorities and water boards - consolidation.</td>
<td>• 1986 White Paper - privatisation without restructuring (retention of regulation function).</td>
</tr>
<tr>
<td>• 29 private water-only companies.</td>
<td>• Report by Stephen Littlechild on economic regulation: RPI - X.</td>
</tr>
<tr>
<td>• Water authorities targets: investment, borrowing and opex.</td>
<td></td>
</tr>
</tbody>
</table>
The newly privatised structure

**Companies**
- 10 WASCs
- 29 water-only companies

**Regulators**
- Secretary of State
- OFWAT
- MMC
- NRA
- DWI

**Economic regulation**

**Quality regulation**

- 1989 Water Act and 1991 Water Industry Act
- Quality regulation removed from companies - function performed by NRA and DWI.
- Economic regulation separate from quality regulation - potential inefficiency.
- OFWAT set up as principal economic regulator - independent
- MMC covers mergers and disputes between companies and OFWAT over prices.

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Competition vs regulation

**The need for regulation**
- Water as a natural monopoly
  - Decreasing costs
  - Large sunk costs
- Could competition play a role?
  - Franchising.
  - Contracting out.
  - Capital market.
  - Product market.
  - Yardstick.
- Four types of product market competition: inset; cross-border; common-carriage; new connections.

**Yardstick competition**
- Key method of assessing scope for service and cost improvements.
- Yardstick importance in merger decisions by MMC/Competition Commission.
- Severn Trent and South West Water merger blocked (1996).
Emerging regulatory issues

Initial structure at vesting

- RPI +K; K = Q - X; 10 year controls.
- Large scale investment. Regulatory role to ensure financing of functions
- Major uncertainties:
  - environmental legislation
  - scope for savings
- Criteria for interim determinations set.
- Government (NRA; DWI) to set environmental standards - OFWAT sets prices in response.


- Original K factors soon undermined.
  - Lower costs (recession in construction industry).
  - Higher costs (environmental requirements).
- Overall, bills and profits rising; and social issues (e.g. disconnections).
- Regulator announced 1994 Periodic Review.
  - Active role in the level of quality spending.
  - Co-operation with quality regulators

The 1999 Periodic Review: Milestones

- Last price review in 1994. 1999 review to set prices from 1 April 2000.

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1996</td>
<td>Announcement of review</td>
</tr>
<tr>
<td>February 1997</td>
<td>Statement of review objectives and principles</td>
</tr>
<tr>
<td>June 1997</td>
<td>Consultation on framework &amp; business planning process</td>
</tr>
<tr>
<td>February 1998</td>
<td>Regulator response to consultation</td>
</tr>
<tr>
<td>October 1998</td>
<td>Prospect for prices: consultation</td>
</tr>
<tr>
<td>April 1999</td>
<td>Companies submit business plans</td>
</tr>
<tr>
<td>July 1999</td>
<td>Regulator draft conclusions</td>
</tr>
<tr>
<td>November 1999</td>
<td>Regulator final conclusions</td>
</tr>
<tr>
<td>January 2000</td>
<td>Deadline for references to CC</td>
</tr>
</tbody>
</table>
The 1999 Periodic Review: efficiency savings

• Future cost savings depend on:
  – Extent to which industry as a whole can improve efficiency (shift in efficiency frontier).
  – Inefficient firms catch up (movement towards the frontier).

• Efficiency studies carried out in Periodic review:
  – Econometric comparison of operating costs (OFWAT/Stewart)
  – Capital cost benchmarking (Babtie Group)
  – TFP approach (other industries) - (Europe Economics)

Presentations on:

Shleifer (1985)

Europe Economics (1998)

National Audit Office (2002)
## The 1999 Periodic Review (1)

<table>
<thead>
<tr>
<th>Review objectives and principles</th>
<th>Consultation exercises (June 1997)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Periodic review announced in October 1996: (3 years before final conclusions).</td>
<td>• OFWAT proposals for consultation:</td>
</tr>
<tr>
<td>• Key objectives and principles:</td>
<td>– Five year control period</td>
</tr>
<tr>
<td>– Prices to fall in real terms</td>
<td>– P₀ for out-performance (capital and opex).</td>
</tr>
<tr>
<td>– Continue with RPI+K</td>
<td>– Voluntary benefit-sharing</td>
</tr>
<tr>
<td>– P₀ to reflect past over-performance</td>
<td>– Prices not to rise in real terms: customers to be consulted</td>
</tr>
<tr>
<td>– K = f(P₀ + Q + S + V - X)</td>
<td>– Use of comparative analysis</td>
</tr>
<tr>
<td>• S= enhanced service exp</td>
<td>– Penalties to ensure neutrality for not meeting environmental programmes</td>
</tr>
<tr>
<td>• V= supply/demand balance exp</td>
<td>– Price increases for quality only once work is completed</td>
</tr>
<tr>
<td>– Four year control period</td>
<td>• Also proposed process timetable and information requirements.</td>
</tr>
<tr>
<td>• Outlines process</td>
<td></td>
</tr>
<tr>
<td>– Co-operation with quality regulators</td>
<td></td>
</tr>
<tr>
<td>– Business planning process</td>
<td></td>
</tr>
<tr>
<td>– Consultations</td>
<td></td>
</tr>
</tbody>
</table>

## The 1999 Periodic Review (2)

<table>
<thead>
<tr>
<th>Response to consultation (Feb 98)</th>
<th>Prospects for prices (Oct 1998)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Two significant changes.</td>
<td>• Preliminary quantification of future costs and implications for bills.</td>
</tr>
<tr>
<td>• Abandon approach of linking bills to delivery of environmental projects:</td>
<td>• Based on assumptions about future investment programmes (for quality) and efficiency savings.</td>
</tr>
<tr>
<td>– Increased risk and higher WACC</td>
<td></td>
</tr>
<tr>
<td>– Other ways (monitoring) to ensure timely project delivery</td>
<td></td>
</tr>
<tr>
<td>• Companies allowed to keep capital efficiencies for a (rolling) five years.</td>
<td>• Suggests P₀ of £40-£50 off average bill (15-20%); then bills to rise, but remain lower than in 1999/00 by 2% - 12%.</td>
</tr>
<tr>
<td>• No specific penalty for not meeting quality targets - linked to overall service performance.</td>
<td>• Issued raised:</td>
</tr>
<tr>
<td>• Raises prospect of rising bills overall.</td>
<td>– Profiling of charges (P₀ versus X)</td>
</tr>
<tr>
<td></td>
<td>– Incentives to outperform (treatment at next review).</td>
</tr>
</tbody>
</table>
The 1999 Periodic Review (3)

Draft Conclusions (July 1999)
- Companies allowed to keep savings for rolling 5 years: applies to opex as well as capex
- Careful review of capital programme to improve efficiency and change phasing.
- WACC of 4.75% post-tax real.

Final Conclusions (November 1999)
- Additional quality enhancements allowed to reflect ministerial guidance.
- New risks recognised: metering take-up; bad debt levels; vulnerable customer groups (to be addressed through interim determinations if required).

Impact on bills

<table>
<thead>
<tr>
<th></th>
<th>Draft</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_0$</td>
<td>-13.7%</td>
<td>-12.3%</td>
</tr>
<tr>
<td>$K$ (average)</td>
<td>0%</td>
<td>0.6%</td>
</tr>
</tbody>
</table>

The 1999 Periodic Review: Setting K

- $K = f(P_0 + Q + S + V - X)$
- Past over-achievement on opex and capex costs clawed back through $P_0$ or adjustment to the RCV respectively (RCV=RAB or regulatory capital value)
- Though impact delayed to allow savings to be retained for 5 years.
- Capital charges include depreciation on capital enhancement and capital maintenance.
The 1999 Periodic Review: methods (1)

**Econometric approach**

- Evaluation of operating costs:
  - Analysis separates efficiency differences from exogenous factors
  - Suggests up to 30% gap between most and least efficient
  - Econometric models published and reviewed by Warwick University

**Babtie Group**

- Study in widescale adoption of lower cost new technologies.
  - Comparative capital unit cost method.
    - Comparison of range of standardised capital projects - standard costs
    - High standard costs relative to peers higher scope for savings.
  - Based on specific technologies and practices where take up by the industry as a whole is less than complete.
  - Minimum improvement in capital efficiencies of 1% to 2% per annum

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**Econometric techniques**

\[
\begin{align*}
\text{EFF}_{\text{OLS}} &= \frac{DG}{BG} \\
\text{EFF}_{\text{COLS}} &= \frac{FG}{BG} \\
\text{EFF}_{\text{SFA}} &= \frac{EG}{BG}
\end{align*}
\]

[Graph showing cost and output relationships with various efficiency measures labeled]

* = Regulated firm
The 1999 Periodic Review: methods (2)

Europe Economics

• Focus on real unit operating expenditure.

• Breaks down value chain into activities and then finds comparator industries:
  – Extraction
  – Refining
  – Network
  – Construction
  – Manufacturing
  – Finance/business services
  – Chemicals

• Builds composite TFP index - found scope for savings of 2.5% to 3% p.a.

The 1999 Periodic Review: results

• Efficiencies (or X factors) in final conclusions:
  – Opex: 7% to 22% over 5 years
  – Capex maintenance: 3% to 15% over 5 years
  – Capex enhancements: 7% to 24% over 5 years

Figures for individual companies reflect catching up of their own efficiency relative to the leading companies and expected productivity growth for all companies.
Figure 3: Capital investment 1981–2005

Source: OFWAT (1999)

Figure 4: Comparison of actual and projected total operating expenditure

Source: OFWAT (1999)
Figure 5: Comparison of actual and projected capital charges

- Capital charges on base service assets – actuals
- Capital charges on base service assets – Director’s projections
- Total capital charges – actuals
- Companies’ submitted total capital charges
- Total capital charges – Director’s projections

*To illustrate the period of new price limits, the first year of projections is shown as the year ending 31 March 2001.

Source: OFWAT (1999)

Figure 6: Total capital maintenance expenditure

Source: OFWAT (1999)
Figure 2: Components of the average household bill 1991–2004

Source: OFWAT (1999)

Example of bill for Thames Water customer

<table>
<thead>
<tr>
<th>Director’s assessment of expenditure needs underlying the determination</th>
<th>2000-01 to 2004-05 (£/property/annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Total operating expenditure — annual average</td>
<td>102</td>
</tr>
<tr>
<td>2 Total capital maintenance expenditure — annual average</td>
<td>47</td>
</tr>
<tr>
<td>3 Total capital enhancement expenditure — annual average</td>
<td>53</td>
</tr>
</tbody>
</table>

Director’s assessment of the post-tax cost of capital needed by the company: 4.75%

<table>
<thead>
<tr>
<th>Director’s assessment of what is driving the changes in bills</th>
<th>£</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average household bill in 1999-2000</td>
<td>206</td>
</tr>
<tr>
<td>Less</td>
<td></td>
</tr>
<tr>
<td>(1) passing on past efficiency savings and outperformance</td>
<td>-28</td>
</tr>
<tr>
<td>(2) assumptions on future efficiency improvements</td>
<td>-11</td>
</tr>
<tr>
<td>Plus</td>
<td></td>
</tr>
<tr>
<td>(3) improvements in drinking water &amp; environmental quality</td>
<td>12</td>
</tr>
<tr>
<td>(4) improvements in service performance</td>
<td>&lt;1</td>
</tr>
<tr>
<td>(5) maintaining the balance between supply &amp; demand</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Average household bill in 2004–05</td>
<td>180</td>
</tr>
</tbody>
</table>

Source: OFWAT (1999)
The 1999 Periodic Review: incentives

**Innovation, technology and efficiency**
- Strong incentives to innovate to generate savings in opex and capex:
  - Keep savings for 5 years.
  - Yardstick competition.
- Technology a key driver of savings:
  - Trenchless (no dig) technologies
  - Metering and leakage control
  - Network monitoring technologies
  - Sequencing batch reactors (sewage treatment).
  - Improved procurement practices.
- Companies forming partnerships in search for innovation.

**Quality**
- Failure to meet environmental standards may result in enforcement action from the Environment Agency of the DWI.
- Plus adjustment to the RCV for investment not carried out as planned - projects monitored (milestones).
- And $P_0 +/- 0.5\%$ adjustment to reflect overall measure of service to consumers (includes environmental and service factors).

Conclusions on Water Regulation

- Privatisation resulted in cost cutting and raising of capital for new investment.
- Price regulation is sometimes necessary to ensure fair prices.
- Price regulation benefited from a specialist regulatory body (or co-ordinated group of bodies).
- Companies will attempt to game any regulatory system that they work under.
Conclusions on Water Regulation

- RPI-X regulation good for incentives, however quality is a big issue with price regulation.
- Regulation is costly and time consuming and works best when technology not changing too quickly.
- Taxes to cover related and external effects can be included in regulated prices.
- Incentivisation of capital investment difficult to handle but not impossible.

Lessons for Napster

- Trade-off between adequate return to incumbents for developing/maintaining network and fair prices lies at the heart of public policy towards distribution networks (including music distribution).
- Regulatory bodies can and do regulate prices on the basis of cost and rate of return. Any regulatory system must maintain pressure on incumbents to reduce costs, innovate or yield market share to innovators.
- Comparators (such as Napster) play an important demonstration effect and have value to society for that reason. Caution should be exercised in letting incumbents takeover new entrants (or each other) and hence the number of comparators.
- Levies can be added to the price of monopoly services to support innovation, e.g. to support artists if we think they are being damaged by Napster.