The Role of Benchmarking in Incentive Regulation: Lessons from electricity distribution

Michael Pollitt

EPRG

UNIVERSITY OF CAMBRIDGE
Judge Business School

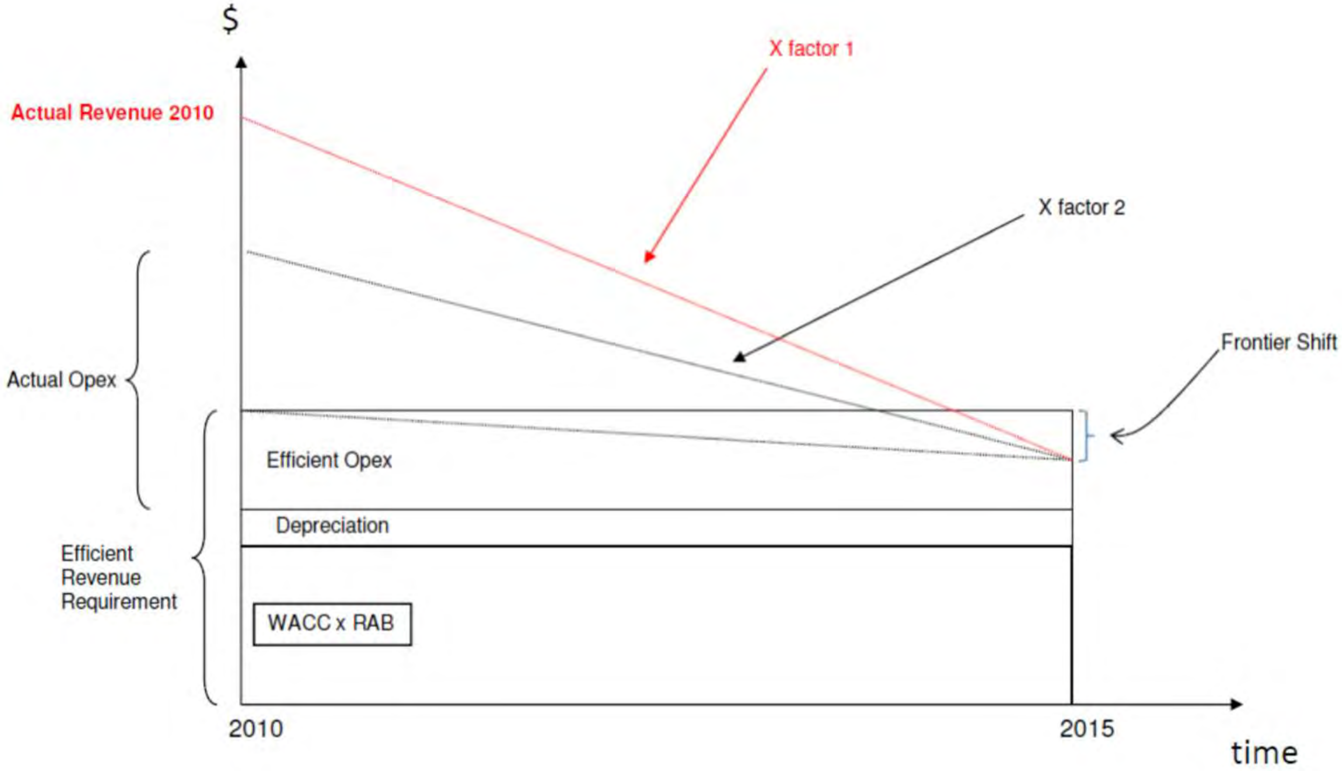
Outline

- Benchmarking and incentive regulation
- Options for comparative benchmarking
- Efficiency benchmarking approaches
- Implementing a chosen efficiency technique
- Experiences in GB, Netherlands, Germany
- Future of benchmarking
- Conclusions for regulators

Benchmarking & Incentive Regulation

- Littlechild, 1983 (also Shleifer, 85, Baumol 82, Kendrick 75)
- Littlechild in 1993 and DCPR1 at Offer
- RPI-X to RIIO
- Ex ante incentives
- Negotiation role for benchmarking: with firms and suppliers
- Two functions:
  - Establishing starting points for target revenue at the beginning of a regulatory control period.
  - Establishing the trend level of productivity growth for a sector and set a general target level of efficiency improvement.
- Littlechild on ‘rivalrous discovery process’ (2014)

Example of regulatory of revenue profile over a 5-year price control from 2010-15



Energy Policy
Research Group
UNIVERSITY OF CAMBRIDGE
Judge Business School

Alternative Incentive Models
(in the spirit of Stephen's learning from US)

- Performance-based rate making in US set a real revenue cap per customer with a revenue sharing mechanism.
  - Southern California Edison by the California Public Utilities Commission for 5 years from 1996, with annual X factors of 0-1.6%, with revenue sharing around a target rate of return. For +/-50 basis points of rate of return, shareholder receives 100% of reward/risk; +/-50 bps to +/- 300 bps sharing between customer and shareholder of 25-100%; +/- 300 bps to +/-600 bps, 100% to shareholder; and above +/-600 bps the 'rates' are reopened by the regulator (Jamasb and Pollitt, 2001).
- Another simple mechanism that could be implemented as part of CPI-X regulation is an average productivity X factor.
  - This was suggested by Uri (2002) for US telecoms. If the X factor is specific to the industry being regulated and the industry starts off at a normal level of profitability, then can set the X factor equal to the average productivity level will maintain reduce prices in line with costs and maintain profitability.

Comparative Benchmarking Options

- Activity/Process
  - e.g. DPCR1
- Matching
  - e.g. Small island KPIs (Cross et al., 2017)
- Model-based
  - e.g. Brazil, Sweden
- Frontier efficiency
  - i.e. DEA, COLS, SFA, StoNED
- Multi-factor Total Factor Productivity Analysis (MTFP)
  - e.g. Economic Insights for ACM.

International Experience of Benchmarking

Table 1.1: Use of different benchmarking techniques across 43 electricity regulators (Haney and Pollitt, 2009).

D= Distribution **T= Transmission**	**Rank**	**Frequency**
Process/Activity	1	10 (D); 8 (T)
DEA	2	8 (D); 8 (T)
COLS	3	3 (D); 3 (T)
SFA	4	2 (D); 1 (T)

Frontier Efficiency Techniques

- Data Envelopment Analysis (DEA)
  - e.g. Germany, Austria, Portugal
- Stochastic Frontier Analysis (SFA)
  - e.g. Germany, Portugal
- Corrected Ordinary Least Squares (COLS) or Modified Ordinary Least Squares (MOLS)
  - e.g. GB, Austria, Portugal
- Stochastic Non-parametric Envelopment of Data (StoNED)
  - e.g. Finland
- Andor and Hesse (2014) compare DEA, SFA and StoNED.

Best practice in implementation (Lovell, 2006)

- large / high quality dataset
- panel data
- consistency with engineering
- well behaved functional forms
- use of bootstrapping / confidence interval analysis
- checking for consistency with non-frontier methods
- inclusion of quality / environmental / input price variables
- clear value added

Key Implementation Choices

- The peer group
  - size categories, international, outliers
- The outputs, input and environmental variables used
  - included effects, calculation of CSV
- Which costs are comparable
  - opex, capex, totex, passthrough elements
- Cost adjustments to improve comparability
  - local labour costs, cost normalisation
- Translating efficiency scores into X-factors
  - minimum scores, time to catchup, maximum Xs

Case Study: Great Britain

- 14 DNOs
- Activity and COLS focus, with lots of data cleaning
- Current 5-year price control period 2023-28:
- Ofgem made use of four models – three based on a composite scale variable (CSV) COLS approach and one based on disaggregated activity benchmarking. The included actual data from 2016-21 (5 years) and simulated data from 2022-28 (6 years). Two of the CSV models use actual plus simulated data, the third only uses the simulated data. The weighting placed on the results was 16.67% on the first three and 50% on the latter. The simulated data incorporates expected take-up rates of EVs and heat pumps.
- Declining role for benchmarking of actual costs.

Case Study: Netherlands

- 6 firms, of which 3 large
- Early DEA use abandoned after period 1, now in period 8
- Lots of legal challenges, including to latest X factor
- Current 5-year price control period 2022-26
- Yardstick approach, single X factor for all.
- Composite output index includes measures of connections, transportation service and feed-in service (e.g. distributed generation). The first two include 40 different measures. This provides the baseline regulated totex revenue per composite unit. X factor is adjustment to average composite revenue plus the expected frontier shift in the industry (based on comparative industries).
- Big regulatory cost falls until 2017, WACC/investments rising.

Case Study: Germany

- 865 electricity DSOs
- Use of DEA and SFA, over 4 periods from 2009
- Involvement of Per Agrell and Peter Bogetoft
- Detailed law on benchmarking, overturned by ECJ in 2021
- Current 5-year price control 2024-28.
- Four methods used for comparison are DEA (assuming CRS) and an SFA approach each calculated with using two different measures of Totex (opex + capex) - the nominal value of capex or a standardised measure.
- Smaller distribution companies (less than 30k customers) can opt out of the benchmarking exercise and be given the average efficiency score of the included companies, under a simplified procedure.

Future Challenges

- Is repeated benchmarking harder to justify over time?

- Does comparative efficiency benchmarking as good as a single yardstick in Shleifer (1985)?

- Are underlying cost function more difficult to model as both the outputs and inputs of the firms proliferate and differentiate?

- RIIO process downgraded the role of benchmarking by suggesting that negotiated regulatory settlements, procurement auctions, private wires networks (see Pollitt 2010).

Energy Policy Research Group
UNIVERSITY OF CAMBRIDGE
Judge Business School

Future Challenges

- Is benchmarking consistent with a responsive and adaptive 'learning regulator' (Pollitt et al., 2024)?

- All regulators struggling with rising inflation, rising investment and falling productivity, which make benchmarking and projecting revenue more difficult.

- Any regulatory benchmarking method is subject to a Lucas (1976) critique, and hence needs to be retired at some point?

Conclusions

- Benchmarking still valuable and arguably lower cost to do.
- Use of multiple methods recommended.
- Raw data needs careful adjustment.
- Direct translation of frontier efficiency scores into allowed revenue difficult to justify.
- Benchmarking works best with firms of similar size, opportunities, and/or where firms are free to merge.
- Role varies over time:
  - Important in 1993
  - Marginal in 2026?
- Attention to incentive properties rather than exact results.

References

- Agrell, P. and Bogetoft, P. (2014), *Review of Six Years of Energy Network Benchmarking*, Conference on benchmarking methods for incentive regulation in the energy sector: evaluating and improving the German approach, Bonn, 27/05/2014.
- Andor, M. and Hesse, F. (2014), ‘The StoNED age: the departure into a new era of efficiency analysis? a Monte Carlo comparison of StoNED and the “oldies”(SFA and DEA)’, *Journal of Productivity Analysis*, 41(1): 85–109.
- Baumol, W.J. (1982), ‘Productivity Adjustment Clauses and Rate Adjustment for Inflation’, *Public Utilities Fortnightly*, July 22: 11-18.
- Cross, S., Padfield, D., Ant-Wuorinen, R., King, P. and Syri, S. (2017), ‘Benchmarking island power systems: Results, challenges, and solutions for long term sustainability’, *Renewable and Sustainable Energy Reviews*, 80: 1269-1291.
- Cunningham, M., Lawrence, D. and Fallon, J. (2020), *Frontier Shift for Dutch Gas and Electricity TSOs,* Report prepared for Netherlands Authority for Consumers and Markets 1 May 2020, Economic Insights Pty Ltd.
- Haney, A. and Pollitt, M.G. (2009), ‘Efficiency analysis of energy networks: An international survey of regulators’, *Energy Policy*, 37: 5814-5830.
- Jamasb, T. and Pollitt, M. (2001), 'Benchmarking and Regulation of Electric Utilities: Lessons from International Experience'*, Utilities Policy,* Vol.9, No.3, pp.107-130.
- Kendrick, J.W. (1975), ‘Efficiency Incentives and Cost Factors in Public Utility Automatic Revenue Adjustment Clauses’, *Bell Journal of Economics*, 6(1): 299-313.
- Littlechild, S. (2014), ‘RPI-X, competition as a rivalrous discovery process, and customer engagement – Paper presented at the Conference The British Utility Regulation Model: Beyond Competition and Incentive Regulation?’, *Utilities Policy*, 31: 152-161.
- Littlechild, S.C. (1983), *Regulation of British Telecommunications’ Profitability*, London: HMSO.

References

- Lovell, K. (2006). *Frontier Analysis: Recent Advances and Future Challenges*. Keynote Address, North American Productivity Workshop, Stern School of Business, New York University, New York.
- Lucas, R.E. (1976), 'Econometric Policy Evaluation: A Critique' In Brunner, K.; Meltzer, A. (eds.). The Phillips Curve and Labor Markets. Carnegie-Rochester Conference Series on Public Policy. Vol. 1. New York: American Elsevier. pp. 19–46.
- Montfoort van, F., Dijkstra, P.T. and Mulder, M. (2024), 'The impact of energy transition on distribution network costs and effectiveness of yardstick competition: an empirical analysis for the Netherlands', *Journal of Regulatory Economics*, 65: 85–107.
- Ofgem (2022), *RIIO ED2 Draft Determinations Core Methodology Document, 19 June 2022,* London: Ofgem.
- Pollitt, M.G., Covatariu, A. and Duma, D. (2024), *Towards a more Dynamic Regulation of Energy Networks*, Brussels: Centre on Regulation in Europe. https://cerre.eu/publications/towards-a-more-dynamic-regulation-for-energy-networks/
- Pollitt, M. (2010), 'Does Electricity (and Heat) Network Regulation have anything to learn from Fixed Line Telecoms Regulation?', *Energy Policy*, Vol.38 (3), pp.1360-1371.
- Shleifer, A. (1985), 'A Theory of Yardstick Competition', *The RAND Journal of Economics*, *16*(3): 319–327.
- Trinkner, U. (2024), *Benchmarking of German Electricity DSOs: Experiences and Lessons Learned from RP2 to RP4.* BNetzA scientific dialogue, 24th September 2024, Presentation. Swiss Economics.
- Uri, N.D. (2002), 'A Note on Measuring the Productivity Offset for Regulatory Purposes', *Journal of Productivity Analysis* 17: 201–211. https://doi.org/10.1023/A:1015055904013

Energy Policy Research Group

UNIVERSITY OF CAMBRIDGE Judge Business School