Scott W. Cunningham, Jeroen De Joode

FIRM BEHAVIOR UNDER INCENTIVE REGULATION: THE INEFFICIENCIES OF BENCHMARKING

S. W. Cunningham: Faculty of Technology, Policy and Management, Delft University of Technology, Jaffalaan 5, 2628 BX Delft, The Netherlands
Phone: +31 (0)15-278 87187, Fax: +31(0)15-278 6439, E-mail: s.w.cunningham@tbm.tudelft.nl
J. de Joode: Faculty of Technology, Policy and Management, Delft University of Technology, Jaffalaan 5, 2628 BX Delft, The Netherlands
& Policy Studies Unit, Energy research Centre of the Netherlands (ECN), The Netherlands

Overview

With the liberalization of energy markets and the vertical disintegration of its encompassing elements it was generally acknowledged that the transmission and distribution of energy were to be considered a natural (regional) monopoly. In order to improve the efficiency of operations and extract monopoly rents, its activities were regulated. This paper examines one specific type of regulation, namely incentive regulation through regulatory benchmarking. This is the better-known CPI-X rule applied on an individual firm basis. Periodically, prices are only allowed to increase with inflation minus an efficiency-factor. The latter can be a penalty or a bonus, dependent on the firm's performance relative to the sector's average. Traditional incentive regulation literature assumes that ex ante X-factors are generally sufficient in incentivising utilities to remove inefficiencies. We show, using a model of incentive regulation based on benchmarking and data envelopment analysis (DEA) that, under certain conditions, energy distribution system operators (DSOs) will not have sufficient incentives to move forward to the industry's efficiency frontier.[1]

Method

We review incentive regulation in literature and practice (the Netherlands) and discuss the techniques used for the determination of efficiency improvements and X factors. We construct an incentive regulation model based on benchmarking following the framework of Takayama (1969). The specific technique adopted in the benchmarking analysis is data envelopment analysis (DEA). We model a set of homogeneous DSOs subjected to benchmark regulation. The DSO is profit maximizing, but is subjected to a potentially non-binding regulation that limits its rate of return. Decision variables for the DSO are its use of capital inputs, and it's delivered units of electricity.

Results

While the benchmark regulation embodied by techniques such as DEA potentially afford a wide range of contracts to the DSO, only a limited set of possible contracts will be accepted at equilibrium by a population of DSOs. The comparative static case in our analysis shows that when assigned a contract by a regulator, a DSO shows a mixed Averch-Johnson effect (Averch and Johnson, 1962) causing a potential over and under-investment in capital expenditures. In the case where benchmark competition is introduced and DSOs are allowed to choose their contract, an equally limited set of contracts will be chosen. Furthermore these contracts will be subject to the same allocation distortions as observed in the comparative static case.

[1] Doubts concerning the effect of incentive regulation on utilities' efficiency performance are also raised by Giulietti and Waddams Price (2005).

Conclusions

Using a framework provided by Takayama (1969) we show that incentive regulation based on benchmarking analysis -- under certain conditions -- does not provide DSOs with sufficient incentives to move to the industry's efficiency frontier. This is dependent on the DSO's position with regard to their (i) input variables (operational versus capital units), (ii) their relative efficiency position compared to the efficiency frontier and, (iii) the 'regulatory penalty' DSOs are faced with.

References

Averch, H. and L.L. Johnson (1962), "Behavior of the DSO under Regulatory Constraint", American Economic Review 52, pp. 1053-1069.

Giulietti, M. and C. Waddams Price (2005), "Incentive Regulation and Efficient Pricing", Annals of Public & Cooperative Economics, Vol. 76, Issue 1, pp. 149, 2005

Takayama, A. (1969), "Behavior of the DSO under Regulatory Constraint", American Economic Review, Vol. 59, pp. 255-260.