

Comparing welfare effects of different regulation schemes: an application to the electricity distribution industry

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1 Introduction

It is generally known that fully informed regulators do not exist in reality. In most of the cases the regulated firm has more information about its costs and other factors and accordingly, the regulated firm may use its information advantage strategically in the regulatory process to increase its profits or to pursue other managerial goals, to the disadvantage of consumers. Many regulatory agencies have put lot of effort to reduce this information asymmetry. Theoretical research on regulation (especially incentive regulation) has also evolved and it has provided new information to regulators (see e.g. Laffont 1994, Laffont and Tirole 1986 and 1993, Armstrong et al. 1994, Armstrong and Sappington 2004). Because the regulator has less information than the firms the regulated firms have strategic advantage. Generally any firm would like to convince the regulator that it is a “higher cost” firm than it actually is. By behaving like this the firm believes that the regulator sets higher prices (which increases firms’ profits and removes welfare from consumers to the regulated firms).

When a social welfare maximizing regulator tries to distinguish between firms with high cost endowments and firms with low cost endowments it faces an adverse selection problem. One possible solution to this problem is to use firm’s ex post realized costs to set regulated prices. This means that the regulator uses some form of “cost of service” (or rate of return) regulation. However, when the regulator in this way solves the adverse selection problem it leads to another problem, namely to the moral hazard problem. This is because the loss of the opportunity for the firm to earn extra profits reduces managerial effort and consequently less managerial effort increases the firm’s realized costs. This leads to the situation where regulation actually increases the costs above their efficient levels.

The moral hazard problem may be solved by some form of incentive regulation (e.g. price cap regulation, revenue cap regulation or yardstick competition), but then full costs of adverse selection problem are incurred. The regulator is thus in a complicated situation. One problem connected to the price cap regulation is also the fact that price cap regulation is very weak at rent extraction for the benefit of consumers and society and it potentially leaves a lot of rent to the firm. This raises the question whether we could find a regulatory mechanism which will lie somewhere between these two extremes. The task of the regulator is hence to find such a mechanism that takes the social costs of adverse selection and moral hazard into account. One of these kinds of methods is menu of contracts regulation, where for each firm a menu of cost contingent contracts is offered and the firm can choose a contract which it prefers among the menu (see Laffont and Tirole 1986).

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2 Objectives of the research

In this research, we compared the welfare effects of different regulation schemes in electricity distribution utilities. In our calculations we utilized the benchmarking information of firm specific costs. The firm specific cost information of Finnish electricity distribution utilities was obtained by using various Stochastic Frontier models. The four regulation schemes which we compared were price cap regulation, cost of service regulation, menu of cost-contingent contracts and simple menus of contracts. In our calculations we utilized the benchmarking information of firm specific costs. The firm specific cost information was obtained by using various models of Stochastic Frontier Analysis.

3 Results

Our basic result is that total welfare can be improved if we move from the cost of service regulation scheme to the menu of contracts regulation, simple menu on contracts or to the price cap regulation. There is however, a significant difference among regulation regimes on how this improved welfare is distributed to consumers and producers.

3.1 Statistics of inefficiency scores

In Table 1 we present statistics of inefficiency scores obtained by using four variations of Stochastic Frontier Models. These model variations are called RE, REH, TRE and TFE. The scores represent the percentage deviation from a minimum level that would have been incurred if the company had operated as best-practice (or cost efficient) based on our data.

Table 1 Statistics of inefficiency scores using Stochastic Frontier Models

	RE	REH	TRE	TFE
Minimum	.972-01	.419-01	.117-01	.575-01
Maximum	.782	.481	.450	.142
Mean	.327	.141	.737-01	.775-01
Std.Dev. of $E[u_i]$.130	.738-01	.470-01	.948-02
(v)	.068	.067	.032	.165
(u)	.353	.150	.096	.101

These basic statistics clearly show that the models REH, TRE and TFE capture the firm specific heterogeneity into the cost frontier allowing the inefficiency distribution move to the left and become more concise. Also the distribution of the frontier in randomized specifications is more concise.

Results 2

The effects of the changes in regulation schemes with respect to the welfare are calculated by using the empirical cost inefficiency information.

Table 2 Change in welfare (TS = PS + CS), Cost of service regulation as benchmark, million €

SFA model	Price cap			Menu of contracts			Simple menu of contracts		
	Δ TS	Δ PS	Δ CS	Δ TS	Δ PS	Δ CS	Δ TS	Δ PS	Δ CS
RE	177,8	240,9	-63,1	194,4	150,0	44,4	144,43	70,6	73,9
REH	49,6	234,2	-184,5	61,5	184,1	-122,6	25,9	10,4	15,6
TRE	5,6	239,7	-234,1	25,8	163,6	-137,8	6,4	4,5	1,9
TFE	8,3	235,5	-227,2	14,7	207,4	-192,7	3,6	1,4	2,2

Changing the regulation scheme from cost of service to whatever other regulation regime presented above results in a significant welfare improvement. However, there is a clear difference how different regulation schemes divide welfare to producers and consumers.

4 Relevance of the research

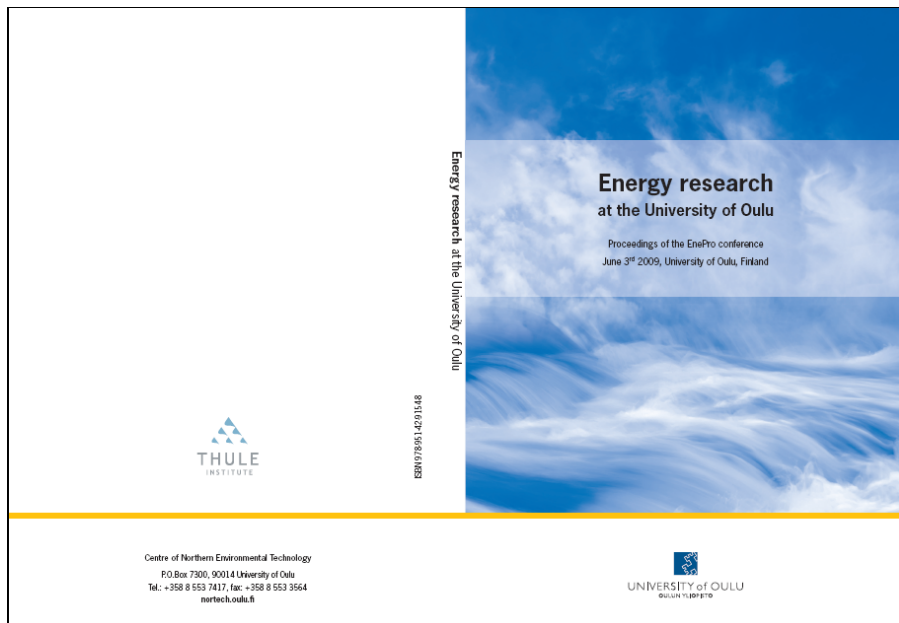
The purpose of this study was to analyse whether it is possible to improve social welfare by changing the regulation scheme of electricity distribution. A great deal of theoretical research has been conducted concerning different regulation methods but the connections of the regulation theory to the real regulatory processes have been seen problematic. In this research, we combined the theory of different regulation schemes to the firm specific cost information of electricity distribution utilities obtained by using various Stochastic Frontier models. According to our results – consistently with the theory – price cap regulation solves the problem of moral hazard and welfare improves if we move from cost of service regulation to the price cap regulation. However, in price cap regulation the problem of adverse selection remains unsolved. According to the theory, the menu of contracts regulation should solve both the moral hazard and adverse selection problems. Our empirical results support this. Welfare can be significantly improved by removing from the pure cost based regulation to the menu of contracts regulation. Notable is that welfare increases in all model specifications. However there are significant differences among regulation schemes on how improved welfare is distributed to consumers and producers.

References

- Armstrong, M., Cowan, S. and Vickers, J. (1994). *Regulatory Reform: Economic Analysis and British Experience*, Cambridge, MA: MIT Press.
- Armstrong, M. and Sappington, D.E.M. (2004). Toward a Synthesis of Models of Regulatory Policy Design with Limited Information, *Journal of Regulatory Economics*, 26 (1), 5–21.
- Laffont, J-J and Tirole, J. (1986). Using Cost Observation to Regulate Firms, *The Journal of Political Economy*, Vol. 94, No. 3, pp. 614–641.
- Laffont, J-J and Tirole, J. (1993). *A Theory of Incentives in Regulation and Procurement*, Cambridge, MA: MIT Press.
- Laffont, J-J (1994). The New Economics of Regulation Ten Years After. *Econometrica*, Vol. 62, No. 3, pp. 507–537.

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