

Executive Summary

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A New Perspective: Investment and Efficiency under Incentive Regulation

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Following the liberalisation of the electricity industry since the early 1990s, many sector regulators have recognised the potential for cost efficiency improvement in the networks through incentive regulation aided by efficiency benchmarking and productivity analysis. Incentive regulation and benchmarking have generally resulted in efficiency improvement in the networks though mainly in operating costs. However, in recent years, new issues such as smart grids, renewable integration, electric vehicles and demand side management have emerged that give rise to the issue of network investments.

The main challenge is whether a system of regulation can be designed that provides the right incentives for delivery of cost effective services while deters any systematic under- or over-investment. Achieving a balance between the cost and risk of underinvestment against the cost of overinvestment requires understanding of the nature of the relationship between investment and efficiency in the networks.

In this study we analyse the relationship between cost efficiency and investment behaviour of electricity distribution networks under ex-post regulatory treatment of investments using the case of Norway. Despite the important role of regulatory treatment of capital expenditures, using total costs benchmarking, for investment behaviour and efficiency improvement in the networks, the topic has not been formally examined in the empirical literature.

The contribution of this paper is two-folded. Firstly, we introduce the concept of “no impact efficiency” as the revenue-neutral measure of the efficiency effect of investment under cost benchmarking that makes the firm “investment efficient” and thus immune from cost disallowance in benchmarking process. Secondly, we estimate the observed efficiency effect of investments in order to compare this with no impact efficiency and discuss the implications of cost benchmarking for investment behaviour of distribution companies. The dataset used for analysis comprised an unbalanced panel of 129 Norwegian distribution network companies observed from 2004 to 2010.

The results show that the weighted average efficiency gain of the networks from investments is 10% indicating that more investment generally has resulted in higher cost efficiency. The findings suggest that networks that fall short of the no impact efficiency need to reduce their capital expenditures in order to improve their cost efficiency following investment. On the other hand, firms that outperform the no impact efficiency may wish to increase their investment levels in order to gain from the efficiency they achieved. Overall, the new

reallocation of investments will increase the total investment of the sector, as a whole, but without lowering the average efficiency gain of the sector.

At the same time, there are significant variations in efficiency gain following investments among the individual companies. In addition, firms with an average investment to total cost ratio have gained more efficiency through their investments relative to those with higher or lower than average. Moreover, the efficiency loss following investments is mainly related to smaller networks which had lower investment to total cost ratios. An implication of this for regulatory framework can be that cost reducing incentives have adversely affected the smaller networks leading to lower level of investments and higher operating costs and consequently efficiency loss in these firms. Given that average investment levels have been more productive indicates that the regulatory incentives should prevent the network utilities from going below or beyond certain levels of capital expenditures.

The results of the study also indicate that the relationship between investment and efficiency under incentive regulation is not straightforward. The effectiveness of ex-post regulatory treatment of investments relies on the reliability of benchmarking methods and results which are potentially vulnerable to certain trends and behaviours such as harmonised over- and under-investments. Despite these issues, under ex-post regulatory treatment of investments, consumers are more likely to be exposed to efficient level of costs compared with an ex-ante model. At the same time, networks bear a higher investment risk under the ex-post model. Thus, the regulatory treatment of investment always involves an element of risk sharing trade-off between the firms and their consumers.

The concept of no impact efficiency introduced in this paper improves our understanding of investment behaviour of firms under ex-post regulatory treatment of investment. The incentive to invest in cost reducing assets and measures which is perceived to be the direct consequence of incentive regulation can be explained through no impact efficiency concept. Additionally, no impact efficiency provides a benchmark for the sector regulators to examine the firms' investment efficiency and design more effective schemes to address the issue of investment under regulation. Finally, the measure of no impact efficiency can also be used by regulated firms to adjust their investment level accordingly.