



Incentive regulation, productivity growth and environmental effects: the case of electricity networks in Great Britain

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The electricity industry is facing an increasing pressure from environmental and customer engagement targets as regulators are employing incentive schemes to reduce customer interruptions, emissions and leakages. The incentive regulation provides the network companies with an incentive to promote cost saving, service quality, resource use efficiency and investment in low carbon technologies. These actions by regulators to manage carbon footprint and broader environmental impact may have beneficial impacts on environmental outcomes, but ambiguous impacts on conventional measures of total factor productivity (TFP), which should be adjusted to reflect improvements in quality. The increased emphasis on quality of service for multiple stakeholders (under the regulatory regime known as RIIO) leading to rising stakeholder satisfaction and engagement are also impacting measured TFP in regulated network sectors.

Our paper examines the productivity growth of electricity transmission and distribution networks in Great Britain over the period 1990/91 – 2018/19 and how changes in incentive mechanism have influenced the measured TFP. In doing so we extend the analysis to examine the effects of quality of service and environmental targets on measured productivity growth. It is vitally important that productivity measures adjust for the increasing regulatory pressure to reduce the wider societal impacts of the electricity sector and improve quality of service. We argue that failure to do so may



mean that productivity growth may look slower than it actually is. We employ a DEA technique which considers the underlying data without a stochastic element to compute productivity growth.

Our findings show that productivity growth is consistently low for over the sample period, of the order of 1% p.a. For both electricity transmission and electricity distribution we try to monetise a wider range of quality and emissions variables in order to show the difference their inclusion makes to measured productivity growth. We show that it can make a difference both positively and negatively, though often this difference is small. While the inclusion of the monetised quality variables makes a significant difference to the measured productivity growth, the monetised emissions variables do not make much difference. Although, the productivity gains arising from the improvements in quality of service are relatively small in transmission network but appear to be significantly larger in distribution network. Furthermore, we observe a stronger improvement in productivity growth in recent years, when a wider range of variables are available. This is quite notable in the current RIIO-ED1 price control period. Given the emphasis in RIIO on a wider range of outputs and incentives it would have been good to include more of these variables directly in our analysis, if data had been available for earlier years. However, it is still early days in terms of the new measures that have been incentivized, especially on customer satisfaction and promotion of distributed generation.

Overall, our study suggests that incentive regulation can be effective in achieving its intended objectives of reducing the wider societal impacts of the electricity sector and improving quality of service. However, how the regulators implement incentive schemes and what they really incentivize are important. Measurement of productivity growth should also reflect *what regulatory incentives are targeting*. This is because we want to measure how worthwhile such targets are and because we do not want to miss genuine increases in productivity growth which conventional measures of productivity are missing.

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