Electricity Distributor Productivity in an Evolving Electricity Landscape

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Overview

Ontario electricity distributors have been under incentive regulation for about 25 years. The regulator (the Ontario Energy Board) uses data-driven methods to evaluate their performance and to set rates. However, the energy transition has complicated the data analysis process as the roles and responsibilities of distributors have evolved. This paper uses multiple methodologies to analyse an extensive dataset on Ontario distributors for the period 2002-2022. The analyses demonstrate that there is considerable variation in the measured efficiency of electricity distributors. The paper proposes alternatives for the next generation of incentive regulation in Ontario.

Methods

We use four methods to analyse productivity: total cost benchmarking (TCB), total factor productivity (TFP), data envelopment analysis (DEA) and stochastic frontier analysis (SFA). The TCB implementation incorporates up to four output variables (number of customers, distribution capacity, electricity deliveries and network line length). Input variables include factor prices (OM&A and capital) and utility specific factors (such as customer density, age of assets, underground v. overhead wires). The TFP implementation does not account for covariates. It follows the usual approach of comparing aggregate output and input indexes. Various versions of DEA are implemented, the main variables being outputs and inputs. SFA employs similar variables to those used for DEA but the model also includes an explicit productivity trend term and utility specific factors.

Results

Consistent with previous analyses of Ontario data covering earlier periods, most of our modelling estimates find *negative* measured productivity growth. However, the productivity growth is less negative during the latter part of the dataset (2013-2022). This suggests that the incentive regulation scheme which the OEB implemented in 2013 has had a beneficial effect. It should be emphasized that negative values may be a consequence of modelling limitations arising from the absence of data on the changing roles and responsibilities of utilities.

Conclusions

These results underscore the need for a more nuanced approach to incentive regulation. A one-size-fits-all model may no longer suffice as distributors face evolving challenges, including managing distributed energy resources, modernizing equipment, installing and maintaining expanding electric vehicle charging infrastructure and adapting to changes in consumption patterns. Estimation of productivity and efficiency using multiple methodologies can allow the OEB to better identify and decompose the sources of productivity change and incorporate these within more finely tuned distributor rates. As has been noted by many observers, the evolving energy transition will continue to lead to changes in the roles and responsibilities of electricity distributors.

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