Do network industries plan to eliminate inefficiencies in response to regulatory pressure? The case of railways in Great Britain

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ABSTRACT

This paper outlines an econometric analysis of business planning data examining the scope for efficiency improvements of regulated firms in regulatory price reviews. Historical data may not fully reflect current industry cost structures, whereas forecast data offers evidence on cost evolution. Business Plans can provide useful information on planned elimination of inefficiencies in response to regulatory pressure. Network Rail submitted such data to the British railway regulator at the last Periodic Review (2013). Using a cost frontier model, the organisation's business units are analysed to determine the extent of their plans to eliminate internal inefficiencies and response to regulatory incentives.

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1. Introduction

The elimination of cost inefficiency is important to ensure that network industries deliver services in a socially optimal manner. However, given the market failure of natural monopoly which afflicts most network industries, direct competition in the market is not optimal from the cost perspective. As such, economic regulation is required and price-cap regulation (Beesley and Littlechild, 1988) is the now standard means to achieve a cost efficient outcome. A key component of economic regulation is the establishment of the efficient cost level for the regulated firm(s). This requires data on the costs, outputs, quality and input prices to separate out the factors outside of the firm's control versus the residual inefficiency. Such data can often be difficult to collect in a form which is consistent across firms (or business units comprising a firm) and across time. In addition, in cases where an industry has recently undergone large capital investment or is expected to start large investments, historical data may be an inappropriate characterisation of the expected future costs of firms.

Importantly, and the subject of this paper, many regulatory review processes involve regulated firms outlining proposals for cost- and/or price-caps based on business planning data. This paper outlines an econometric analysis of such business planning data and discusses how this analysis can be a useful complement to the evidence base on the likely scope for efficiency improvements of regulated firms in regulatory price reviews. The approach could involve an individual network organisation submitting data on internal business units (e.g. British railway infrastructure), or it could involve multiple geographically separate firms submitting evidence on their operations (e.g. regional water companies and electricity distribution companies). Whilst this paper utilises an example from Britain, price-cap regulation is widely practiced across Europe and the wider world, so the approach to analysing business planning data by econometric methods as part of the regulatory process is equally applicable.

Our empirical illustration is the railway infrastructure manager in Great Britain, Network Rail, which has been set an ambitious revenue reduction profile of 18% for Control Period 5 from 2013/14 to 2018/19 (Network Rail, 2013a). This was based on a set of benchmarking evidence, both top down evidence from international comparators and bottom-up evidence (ORR, 2013). A control period is typically five years long and reflects Network Rail's time horizon for financial and operational planning under the regulation of the Office of Rail and Road (ORR). While international comparators were used to inform some of the scope for savings, a substantial body of evidence pointed to savings possible through dissemination of internal leading practice

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within Network Rail – see, for example, ARUP (2012).

The analysis in this paper seeks to determine if the regulated firm is planning for elimination of these inefficiencies. A frontier efficiency model is estimated, using zonal business planning data produced by Network Rail, which examines the implied evolution of inefficiency within the subsequent Control Period. Failure to find convergence may indicate scope for further savings, whilst finding convergence indicates that the regulated firm is responding to incentives from regulators. Some evidence is found that Network Rail is responding to regulatory incentives and planning to reduce the degree of internal inefficiency in its business.

More generally, our approach illustrates the potential role of analysis of business planning data via econometric approaches in regulatory reviews. In particular we can identify several potential benefits of utilising this data rather than, or in complement to, actual cost and output data:

1) Historical data may not be fully reflective of the current structure of the industry, particularly in times where the industry has been responding to substantial cost or technology shock.

2) Business planning data should be consistently defined across firms or across zones within a company as it is being requested directly by a regulator at a given point in time. It will also typically comprise a panel dataset (in our empirical example, six years) as data will be requested for a set number of periods into the future. This can contrast with collections of either cross-sectional data or a short panel of actual data, given the difficulty in ensuring consistency of data and zonal structure over time. In the example of Network Rail, the zonal structure has changed at least once over the five-year period to the last Periodic Review in 2013. In contrast, the Business Plan data should have consistent definitions of costs across zones comprising Network Rail and across time.

3) The data is provided by the regulated company as the basis for a proposal to be evaluated by the regulator. Thus, analysis of this data provides a useful high level evaluation of a submission to reveal the implicit assumptions being made by the firm about its cost structure and efficiency variation over time.

The structure of this paper is as follows. Following this introduction section 2 outlines the precedent for using business planning data in regulatory reviews and why the approach is useful in the railway infrastructure context. Section 3 outlines the efficiency analysis methodology and section 4 outlines the data sources. Section 5 reports the results, focusing on the plausibility of the estimated frontier, the estimated frontier shift over time and the trends on efficiency. Section 6 concludes.

2. Regulatory context

The use of business planning data in regulatory reviews is not without precedent although our understanding is that this has not been systematically reported in the academic literature. Ofgem, the British regulator of electricity and gas transmission and distribution, has considered the suitability of comparing total cost efficiency based on future plans/costs and historic costs in price control reviews. Analysis based on future plans was recommended for electricity and gas distribution, although gas distribution was thought to be more appropriate with supporting analysis of historic costs (Frontier Economics, 2010). Two subsequent reports have investigated how total cost benchmarking for price control reviews may be undertaken in practice (Frontier Economics, 2013a: 2013b). The key motivation for the use of future plans by Ofgem is consistent with the benefit of utilising business planning data, namely that Ofgem argued that the need for substantial capital

investment meant that historical cost data would be of limited relevance with any changes in underlying network or cost structures considered to weaken the effectiveness of historical cost analysis. Subsequently Ofgem adopted statistical analysis of electricity distribution company's business plans as part of the evidence for the initial assessment of the proposals (UK Power Networks, 2014).

In railways in Britain, historical cost data is less useful for benchmarking Network Rail today given the large cost shock which affected the industry. Across the whole British railway sector, unit cost (cost per passenger km) measures of railway industry (Network Rail; passenger and freight operators; rolling stock leasing companies) efficiency has fluctuated since privatisation (McNulty, 2011). In the years 1996/97–1999/00, unit costs were declining before the Hatfield and Ladbroke Grove train incidents led to increases in costs owing to safety improvements and temporary speed restrictions. Unit costs rose to a peak in 2003/04 at approximately 35% higher than in 1996/97. However, to 2009/10 there has been an almost continual downward trend with unit costs returning to approximately 1996/97 levels. Accompanying this has been a 62% increase in passenger kilometres travelled.

Absolute industry costs were estimated in McNulty as 30% (£2.5–3.5bn) above the efficient level as of 2008/09. International comparisons against France, Holland, Sweden and Switzerland revealed that this efficiency gap could potentially be as great as 40%. This gap remains despite 30% cost reductions during Control Period 3 (CP3: 2004/05 to 2008/09). Drawing on evidence from the previous 2008 Periodic Review (ORR, 2008), a significant proportion of the gap is attributed to Network Rail, which has a maintenance and renewals efficiency gap of 34% (Fig. 1) in comparison to international benchmarks, although passenger operators and rolling stock leasing companies are also attributed responsibility.

Finally, with respect to changes in the British rail industry that make historical data problematic for analysis is safety. The British railway system has become far safer since the 2000 Hatfield accident; it is now one of the safest railways in Europe. For example, in its 2015 Safety benchmarking report the ORR (2015a, p6) finds that the UK was the best performing EU member state (of 28) in 2013 (with 0.16 accidents per million train kilometres) and was second best over a four-year average (2010–2013). Whilst the industry is still trying to make gains in safety, the big challenges arising from an incomplete asset register and asset renewals backlog have been cleared. This should make projected cost data more comparable (the data used in this paper), but presents challenges with utilising historical data as this will clearly contain an element of catch-up expenditure. Given that the safety situation for Network Rail has stabilised we do not include measures of safety in our model for each zone. This is of course also pragmatic given the lack of projected data, which would have a large degree of uncertainty associated if it were available.

In terms of how Network Rail is regulated, revenue profiles (funding profiles), as opposed to purely price profiles, are set by the regulator at each review period since Network Rail receives a substantial amount of funding, through a lump sum transfer from Government and from other borrowing. This is in addition to prices charged to train operators, which are also subject to the reduction profile in the usual price-cap profile. Further Network Rail is free to retain the profit (for reinvestment) of any over performance on the cost side within the control period. As such the regulation of Network Rail is more akin to price cap regulation than rate of return regulation.

Given that price-cap regulation incentivises the regulated firm to outperform the price cap target, using business planning data could be deemed to be 'micro-managing' the firm rather than allowing it discretion to outperform the target set by the