Cost Proxy Models and Telecommunications Policy
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reviewed by Eric Kodjo Ralph

Introduction
This slim volume-less than 190 pages of main text-manages the astonishing feat of dragging the largely theoretical principal/agent literature, as applied to regulation, into the domain of robust practicability. A clear implication for the authors is that cost proxy models need to become an essential tool of regulatory policy. However, this book does more than merely introduce and convey the value of cost proxy modelling to regulatory economists. It single-handedly provides a roadmap for the practical development of a decade’s worth of regulatory technology. The authors’ over-riding vision of making theory work in practice, a quality often missing in the academic literature, is a tribute to them. Despite covering a huge range of very complex material, the book is clearly written and presented. As an added bonus, the data and cost models used are provided on a CD so readers can extend the authors’ results or verify them through repetition and sensitivity tests.

Cost proxy models
Traditional econometric studies of regulated industries based on time-series data-too often with the sample being largely confined to a regulated monopoly-simply cannot generate the kind of data necessary to consider out-of-sample industry structures. Consequently, they cannot even answer such basic questions as whether, for example, in telecommunications, there are economies of scope between public switched services and private line services, or what are efficient forward-looking costs. In contrast, proxy cost models can address such questions, as the authors demonstrate, for example, in their examination of economies of scope between switched and private access lines.

The more central concern of the authors is that regulation effects firms’ willingness to reveal and reduce their costs, which hinges “on very detailed properties of the cost function of a representative firm... For example, ... on the detailed relationship of derivatives of the cost function with respect to the technology and effort variables” (177). The use of cost proxy models provides a framework in which such effects can be modelled.

While the authors argue that cost proxy models have a long tradition in economics (15-16), they were unable to cite any models that were sufficiently sophisticated to undertake analysis on a par with that provided in this book. Unlike earlier cost proxy models which merely mimic observed processes, LECOM, developed by Gabel and Kennet (1991) and described in the second chapter of the book, is an engineering model that engages in several layers of optimisation to establish a least-cost telecommunications network architecture. Input prices and outputs, including location of customers, demand for access lines and traffic, and types of traffic (switched or private line) are inputs to the model.

The model’s outputs are a network architecture and its cost. Thus by holding input prices fixed and varying outputs a cost function is generated, though not one that is fully analytically representable. Such a cost function is sufficient to develop the first result of the book.

Chapter 3, based on Gabel and Kennet, 1994, provides the simplest demonstration of the value of the proxy model approach over time-series based econometric approaches.

Incentive regulation: monopoly and duopoly

The analysis of scope is interesting, and helps convince the reader of the value of LECOM and cost proxy models more generally, but as already suggested, the ability to better analyse the implications of incentive regulation is the real game in the eyes of the authors. For this kind of analysis, however, much more is needed than the cost function outlined. In particular, analytically tractable cost, demand and disutility of effort functions are called for, as well as a means of characterising regulatory ignorance and a measure of the cost of government funds.

Chapter 4 of the book provides a brilliant, concise, cohesive and relatively accessible summary of all the major forms of regulation in thirteen pages. The book is worth purchasing for this summary alone.

The second exercise of Chapter 5 addresses the question of more realistic entry, but shifts its focus to customers (access lines). Unregulated duopoly outperforms unregulated monopoly despite interconnection costs, loss of economies of scale and, for the uniform entry case, loss of economies of density. Regulation improves economic efficiency in all cases. More interestingly, targeted entry with yardstick competition outperforms the Laffont and Tirole regulated monopolist when the cost of government funds
is low and is equal in performance to the regulated monopoly for a high cost of funds; and
- yardstick regulated uniform entry is dominated by both regulated targeted entry and regulated monopoly reflecting the importance of economies in production.

**Incentive regulation: Monopoly**

The book also seeks to address some practical implementation issues of incentive regulation (Chapter 6). It demonstrates, for the simple characterisation of efficiency and effort chosen by the authors, that Laffont and Tirole regulation of a monopolist can be substantially simplified.

Not surprisingly, these results do not hold for more general characterisations of effort, in particular if effort is not independent of output (109-111), as one would expect, for example, when network expansion is called for. Consequently, while the chapter seeks to address issues of implementation, it ultimately does not have any direct practical application.

Chapter 7 compares a wide range of monopoly regulatory mechanisms. The results in terms of economic efficiency are not surprising. The Laffont and Tirole mechanism outperforms all others, but interestingly is followed by Baron and Myerson optimal regulation which assumes the regulator not only cannot observe effort, but also cannot assume the regulator not only cannot observe effort, but also cannot

- if the Laffont and Tirole mechanism is generalised to allow for different weights being applied to producer surplus, then, as less weight is given to producer welfare, leading to regulatory solutions that favour consumers, increasing amounts of producer surplus must be foregone to gain an additional increment of consumer surplus (127-129). (An argument also appears to be made for “constitutionally imposing” a price cap with transfers, being that if firms and consumers fought over what weight should be assigned to producer welfare, with firms having a 25% influence and consumers 75%, then the expected outcome would be Pareto inferior to a price cap with transfers. It is, however, not clear as to what political forces would come into play to produce this outcome (129).)

These results are again reasonably robust to parameter value changes, at least in the case of the cost of government funds and minutes-of-use demand elasticity.

An important caveat to these comparisons of monopoly regulation, which the authors only briefly raise, is that the analysis is quite static (132). Regulators announce the rules, subject to various constraints, such as the kinds of transfers allowed and whether cost can be observed ex post, and then firms optimise. End of game. This raises questions about whether the authors’ reported results are likely to follow in a dynamic environment. For example, under the Laffont and Tirole mechanism, costs, but not effort, are observed after supply and a transfer is made. At this point, the regulator can also back out the firm’s actual cost structure, though this is of no value to it in a one-shot game. However, if the game is repeated, firms in general would want to disguise their cost-type, otherwise they would face tougher regulation in subsequent periods. The question then is, how one ex ante commits to transfers based on costs without creating the obvious incentives to game.

Perhaps this is less problematic than it first seems, but it would have been valuable to hear the authors’ views on the question. My reasoning is as follows. The effectiveness of a price cap is known to depend on the extent that the regulator can credibly commit to an exogenously determined cap (that is, at what ceiling and/or floor rates-of-return is the regulator likely to abandon the cap); and the length of the regulatory commitment. Thus the price cap’s capacity to induce effort in the authors’ static models can be extended to a dynamic model where a credible commitment to an exogenous cap can be made over a period of years. While it is true that the dynamics of mechanisms such as those of Laffont and Tirole, and Baron and Myerson are less well-known, similar though more complex commitments to those necessary for effective price caps are presumably possible. In particular, the promised transfers and pricing rules in these more complex cases would be based on ex ante knowledge and would be fixed over the period of the regulatory contract, including the specification of exogenous indices for adjustment of cost-bases, transfer amounts and pricing rules.

**Incentive regulation: cross-subsidies and entry**

Another issue that regulators face is the problem of entry into more lucrative urban areas which undermines the capacity of an incumbent to cross-subsidise rural services. Chapter 8 compares targeted urban-only entry with uniform entry across low and high cost areas (as in Argentina). Targeted urban-only entry is intended to approximate market outcomes in countries such as the US and Australia. Under the targeted entry scenario, urban prices are set by competition to cost-covering lev-
els and these prices are imposed on the incumbent in rural markets. As a result, the incumbent faces a deficit which either is covered directly from the budget or by a telecommunications-sector tax. Under uniform (Argentine) entry two geographical monopolists are yardstick regulated to set cost-covering uniform prices imposed over both low and high cost areas with the implied cross-subsidies.

The authors’ read their results as suggesting that the urban-only approach, especially with external funding, may be superior to Argentine entry where the cost of government funds is reasonably low. In my view, no strong conclusion can be drawn about the relative efficiency of these two approaches on the evidence given, though it does lean toward the authors’ position.

Another issue that entry raises and which is covered in Chapter 9 is whether an incumbent, operating as a monopoly in a regulated segment of the overall market, might behave in ways that would harm entrants in more competitive market segments. However, while appearing to suggest that such actions might have anticompetitive intent, the chapter is more concerned with the possibility that optimisation may incidentally result in preventing entry or harming an entrant.

The chapter begins by demonstrating that if cost-plus regulation is applied to one segment of the market then the incumbent has strong incentives to seek cost allocations that push as much shared costs as possible to the regulated sector (154-156). As is well-known, the evidence given, though it does lean toward the authors’ position.

More interesting is the possibility that optimisation of the firm’s unobserved effort might also harm entry (156 ff). In the first example, an accounting rule is fixed and the incumbent and an entrant are equally efficient (one interpretation of which is that the entrant relies on the incumbent’s infrastructure for certain inputs at an effectively regulated price) (158-160). It turns out entry could be blocked if, through optimising effort applied in the monopolised and competitive market segments, the incumbent ends up setting an effort level in the competitive segment that exceeds that which is worthwhile to the entrant. In effect, the regulated firm’s choices of effort levels across its production processes shifts observed costs toward the regulated sector.

Despite this, there is no anticompetitive intent here. The firm’s goal is not exclusion of the entrant, but merely an attempt to maximise profit. Nor is it clear what the actual market equilibrium would be, since exit would likely change the regulatory parameters. However, there is no doubt the authors’ example raises a problem: under certain parameterisations, if the incumbent were not to act strategically then entry would be excluded. Moreover, it goes without saying that the regulator would not want to be in a position where strategic action on the part of the regulated firm is necessary to maintain the presence of an entrant.

Because the results just described rely on the authors’ effort functions, a second example is considered which fixes firm effort. Similar results are observed: the incumbent, by optimally responding to the regulatory restraints it faces, may prevent entry. Grounding this possibility in a situation where both switched and private lines are supplied, the likelihood of entry prevention is increased as the degree to which the incumbent is reimbursed for its costs in the regulated sector rises (since this increases the gain from shifting costs), and to the extent the entrant’s operations are small compared with the incumbent’s. As before, the implications of this are less that such exclusion would be undertaken for anticompetitive intent or even occur, but that, under certain parameterisations, regulation could have awkward unintended consequences.

**Minor quibbles and conclusion**

Despite overall being well-written and organised, with excellent internal cross-referencing, I had some minor organisational quibbles with the book. While endnotes used to cross-reference material elsewhere in the text were very helpful, other endnotes could have profitably been left in the text, most especially given the unfortunate decision to use endnotes rather than footnotes. It was also the case that some repetition was possibly unnecessary, but in a book this complex the authors erred correctly in leaning towards too much recapping rather than too little. However, I think the material on calibrating the model at pages 96-98 should have replaced the earlier calibration description at pages 80-81.

In conclusion, this book was a pleasure to read despite its difficult subject matter. It demonstrates that recent regulatory theory can be practicable, and provides a platform on which a modern regulatory practice can be built. To my mind that is an important, much needed and even astonishing achievement.

**Endnote**

1 Un-referenced numbers in brackets refer to pages of the reviewed book.
References


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Rating

Rating Criteria Rating

Theoretical Approach / Methodology +++++
Structure +++
Depth of the Analysis +++
Contribution of new Knowledge ++++
Applicability +++++
Clarity and Style of Writing +++

Rating Points: excellent: +++++ poor: +

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