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Capital Efficiency and Infrastructure Regulation: Editorial Introduction

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I Introduction

A conference was held on the topic of capital efficiency and infrastructure regulation at the London Business School in June 2005. This was a follow-up to an earlier conference in 2004 on the role of efficiency estimates in UK regulatory price reviews, the papers from which have previously been published in a special issue of *Utilities Policy*¹. The 2004 conference concentrated on efficiency measurement as it affected *operating costs* whereas the 2005 conference featured the much less explored topic of efficiency measurement of *capital costs*.

The title of the 2005 follow-up conference was: ‘Capital Efficiency, its Measurement and its Role in Regulatory Reviews of Utility Industries’. The theme of the conference was the topic of capital efficiency, the techniques for measuring it and their implications. The conference was sponsored by the Commission for Aviation Regulation (CAR), Eire,

In view of the key role of capital efficiency for measurement in regulatory reviews for airports and related services, several presentations were made on that topic. However, analytic work on efficiency measurement is most developed for the water and sewerage industries and for electricity distribution. This resulted in a conference format where presentations were given which set out current best practice for those industries both in the UK and in other countries (developed and developing). This was followed by presentations on capital efficiency issues for airports and airport related services.

The special issue to which this note provides an introduction presents papers based on a selection of the presentations given at the 2005 conference. In what follows, I provide a brief introduction to the papers with some personal observations - with which the authors of the papers may or may not agree.

II Lessons for Airport Regulation from Other Industries and Countries

The first two papers cover the England & Wales water and sewerage industry for which economic regulation is carried out by the Office of Water Services (Ofwat)².

The first paper, by Gordon Allan, Engineering Adviser Ofwat, provides a description of the methods used by Ofwat for assessing capital efficiency in the industry and how they are used in

¹ Five papers and an Introductory Editorial Note were published in a Special Issue of *Utilities Policy*, Volume 13, December 2005.

² Within the UK, there are three different industry structures and regulatory regimes for water and sewerage. The England & Wales water industry has been privatised and is regulated by Ofwat. The water and sewerage industry in Scotland has not been privatised but it has its own regulator, the Water Industry Commission for Scotland. Northern Ireland has yet to corporatise its water industry or to establish a water regulatory agency.

regulatory reviews. In particular, he discusses how these methods were used in the 2004 Third Periodic Review which covers the period 2005-10.

Ofwat has been developing its methods in this area since 1989. Like their assessments of operating efficiency, they are primarily based on comparisons between the companies (10 water and sewerage companies and 12 water only companies) with ‘yardstick’ comparisons relative to an efficiency benchmark based on engineering assessments commissioned by Ofwat. Since 1989, Ofwat has built up an extensive data base of engineering, accounting and other data to provide a sizeable amount of cost information that is designed to be comparable across the companies.

Ofwat’s capital efficiency comparisons are based (a) on unit capital cost comparisons and (b) econometric estimates. The former are used both for assessing capital enhancement and capital maintenance whereas the latter are only used for assessing capital maintenance. The methods used for these comparisons have developed considerably since 1989 and Allan’s paper provides an excellent description of their current procedures and how they were used in the latest Periodic Review within the context of forward looking, price cap regulation.

The key point to emerge from Allan’s paper – at least to my mind - is that the Ofwat procedures for capital efficiency are very much ‘bottom-up’ and also quite prescriptive. Companies can choose how much investment they need to make relative to the Ofwat guidelines but the guidelines (Allan uses the term “Ofwat assumptions”) are laid down centrally as Ofwat’s best estimate of what the companies are likely to be invest to meet the various targets for output and quality standards. In consequence, Ofwat’s methods of water regulation look much more like traditional US-style regulatory processes than what Stephen Littlechild envisaged in his 1986 proposals for UK water regulation let alone his classic 1983 paper on telecom regulation³. Maybe Ofwat takes this approach because of the nature of the industry where competition between alternative providers plays only a tiny role so that there is very little reliable market outcome information. We will return to this question later below.

The second paper is by Tony Ballance Director of Regulation and Competition Severn Trent Water – a company regulated by Ofwat. Ballance provides a critique of the Ofwat approach to regulating capital efficiency. He describes this as “... one of trying to “get prices right” often by “nailing down” each component of company costs through an approach that considers and estimates different cost components in isolation through the building block type approach”⁴. Balance is critical of this and argues for a more market based – presumably top-down – approach, e.g based more on regulated companies’ plans and other information.

Particular issues to which Ballance draws attention are:

- (i) *Problems of data comparability* - particularly on detailed cost data – and the absence of panel data; (Both of these issues also arose in the discussion of electricity distribution and they seem to be general problems in regulatory information availability.); and

³ See Littlechild (1986) *The Economic Regulation of Privatised Water Authorities*

⁴ See Balance, this journal, p. XX.

- (ii) *The problem that by considering opex and capex separately, Ofwat fails to take into account the trade-offs between them. (The same criticism can be made of other UK utility industry regulators – it seems to be a generic regulatory problem.) Ballance suggests that this may create some perverse incentives for the regulated water and sewerage companies.*

In general, Ballance argues for a less prescriptive approach by Ofwat using incentive compatibility techniques and - in the absence of market information from competition – greater use of cost-benefit analysis.

The following paper by Martin Crouch (Director, Electricity Distribution, Ofgem) is important in this context. Ofgem has recently adopted a new approach to electricity distribution capex which is deliberately based on incentive compatibility. Instead of prescriptive requirements, it offers electricity distribution companies a ‘menu’ of risk-reward choices by which to meet target standards. Crouch’s paper sets out this approach and explains why it was adopted.

As Crouch emphasises, utility regulators have to deal with difficult issues, firstly, of asymmetric information – the companies have the knowledge which regulators need them to reveal; secondly, the potential and incentives for gaming and strategic behaviour by the companies; and, thirdly, genuine uncertainty. The classic economic theory answer to this provided by Laffont and Tirole is to offer companies *a menu of incentive compatible contracts*⁵.

Crouch summarises this approach as: “ ... allow(ing) companies to choose between getting:

- a lower capex allowance, but with a "higher-powered incentive" that allows them to retain significant benefits if they can deliver the required outputs more efficiently, and
- a higher capex allowance, but with a "lower-powered incentive" that gives relatively smaller reward for underspending the higher allowance.

Companies who believe that they need to spend a lower amount of capex will find it more beneficial to choose the lower allowance, whilst companies who believe that they need to spend relatively more will find it more beneficial to choose the higher allowance”. (Crouch op cit, p.XX.)

The new Ofgem menu-based approach to regulating electricity distribution company capex is clearly a major new development and one that has generated a great deal of interest - and also of praise. Economists have found it of particular interest for its explicit adoption of ideas taken from regulatory theory. It remains to be seen whether and how far it meets the hopes of its designers. Like many others, I look forward to the evaluation of the outcomes of the scheme - and hope that it is successful and can provide a model for use in other infrastructure industries.

This allows us to consider the question of whether Ofwat could adopt such an approach for England & Wales water regulation, as essentially advocated by Ballance in his critique of the current Ofwat approach set out in the paper by Gordon Allan.

⁵ See Crouch this issue, p. XX and the papers (a) by Laffont and Tirole and (b) by Joskow that he cites.

This question was put to Philip Fletcher, Director General of Ofwat, at a public meeting in March 2006. His answer was that Ofwat felt that they could not follow this approach at the 2004 Periodic Review since there were European Union and UK government legal obligations on delivering environmental and other output targets for which the water companies' investments were planned. He felt that, at least in the current state of knowledge, a menu-based approach raised the risks of failing to achieve the EU targets, in which case, there could be widespread and potentially serious legal consequences. However, he did not rule out the approach and maybe Ofwat and other regulatory agencies will adopt it in the future if its use by Ofgem does not result in significant capex under or over spends relative to expert appraisals.

Philip Fletcher did, however, strongly support the greater use of cost-benefit analysis in this area by the water companies and Ofwat – as advocated in the Ballance paper. However, as is well-known, the answers resulting from ex ante cost benefit appraisals can differ significantly depending on who carries them out and why. They can be important, particularly when there are major issues of social costs and environmental and other externalities, but they do not have the theoretical attractions or basic simplicity of market outcome data or companies' choices from a risk-reward menu.

Ian Alexander's paper provides a very useful overview of the range of regulatory approaches used with regard to utility industry capex across a range of countries and to the key choices that regulators have to make in this area. However, perhaps the most interesting part of his paper is the discussion of contracting out approaches. As we have seen, much of the problem with water regulation is the absence of market-based information on costs for companies with local or regional monopoly franchises.

Contracting out of investment (e.g. on a BOT – Build Operate & Transfer basis), at least in principle, allows the introduction of market based competition for investment that has previously been agreed to be required. What it offers is a market test of the efficiency of investment construction and the costs of that. In practice, problems can readily arise as the market for contractors may be very small and there can also be problems over repeat contracts – although this must be set against the similar issues that arise with the market for engineering consultants advising regulators and companies. A particular issue is that, if the main utility stops being active in the area, it can lose its ability and skill base with which to be an intelligent and informed purchaser.

However, the real question is whether or not the empirical results support contracting out. On this, Alexander produces impressive evidence that contracting out of infrastructure investments can induce significant cost savings relative to benchmark costs. Evidence from Latin American electricity transmission provides evidence of 30-40% savings from contracting out via BOTs. This is not just a developing country tool. Alexander reports that, in Scotland, nine water BOT's have been commissioned – and the model is also being widely considered for water treatment and sewage plants in China, Northern Ireland and elsewhere. Arguably, the French water concession model operates as a contracting out process.

Nevertheless, as Alexander points out it is only useful for large, discrete projects such as: the construction of new power stations (or major rehabilitations), investment in major new electricity transmission lines, major stand-alone water works and similar. It cannot, for instance handle the capital efficiency issues faced by regulators in electricity distribution. But, as Alexander shows, regulators are now experimenting with various other techniques to foster efficient utility

investment in those circumstances. One particularly interesting example is Ofgem's use in the UK of an 'error correction mechanism' for National Grid with respect to electricity transmission investment.

The papers by Ian Alexander and Martin Crouch demonstrate well how new information-revealing and more decentralised, market-based approaches are being developed and used by utility regulators. They are being used both as a way of determining the need for new investment (and the required amount) as well as for containing the costs of utility investments in network and related monopoly facilities. This has to be good news and we should look forward to seeing evaluations of the results of the new Ofgem 'menu' approach and for further developments.

III Capital Efficiency in Airports and Airport Related Services

The Special Issue contains two papers on this topic. The first paper (by Derek Holt, Alan Horncastle and Jonathan Phillips of Oxera) provides a discussion of all the main issues both for airports and airport related services (primarily air traffic control services). The second paper (by David Starkie of Economics-Plus Ltd) concentrates on the question as to whether price-cap regulated airports have an incentive to under-invest or over-invest.

In the UK, the three main London airports (Heathrow, Gatwick and Stansted) are privately owned – but, by a single company BAA plc (previously, the British Airways Authority). Until recently, the CAA (Civil Aviation Authority), their regulator, regulated the three airports together; but, since 2002, the CAA regulates them on a stand-alone basis.

BAA also owns most of the main Scottish airports (Aberdeen, Edinburgh and Glasgow) as well as Southampton Airport. The CAA provides economic regulation for the three London airports as well as for Manchester Airport⁶. However, neither BAA's Scottish airports nor Southampton nor the other (privately or municipally owned) regional airports are subject to *economic* regulation. CAA is also responsible for economic regulation of NATS (National Air Traffic Services Ltd) a majority privately owned company.

It is clear that the consideration of capital efficiency for airports is very important but also extremely difficult. The major investments are hugely lumpy with capacity utilisation building up relatively slowly over time. The paper by Holt et al takes the water industry as a comparator since, like water, airports are highly capital intensive with large and very long-lived investment projects. In addition, regulatory practice for capital efficiency is most developed for water and sewerage. Hence, it is no surprise that airport and water regulators have (at least in the UK) tended to use the same methods for assessing capital efficiency - most notably unit cost comparisons.

Holt et al mention the possibility of formal benchmarking (including econometric analysis) but there do not seem to be any examples as yet of examples of UK or other airport regulators using such techniques. A major likely reason for this is that the number of regulated airports per country is very small so that any data set for econometric or similar analysis must use examples

⁶ Strictly speaking, this should be specified as the Competition Commission and the CAA. For historical reasons, the Competition Commission acts as the initial airport regulator rather than the CAA. This is the opposite process to that for the economic regulation of all the other UK regulated utilities.

from other countries. That raises serious questions about comparability of data, exchange rate conversion issues, etc. Those problems are made worse when many potential comparator airports remain publicly rather than privately owned.

Besides these issues, Holt et al mention the following issues as making capital efficiency studies for airport and airport related services particularly difficult:

- heterogeneous investment programmes;
- variation in both outputs and the input mix;
- lumpy, cyclical investment and non-synchronous investment cycles⁷.

The extremely lumpy nature of much airport and related investment means that efficient management of investment projects is crucial. In consequence, *process benchmarking* has been adopted as a tool by the CAA in the UK. This enables comparison of what has been achieved and allows for feasibility testing for major new projects (e.g. new terminals, runways, air traffic control computer systems and similar).

It is clear from the paper by Holt et al that capital efficiency studies have, as yet, made less of a contribution to economic regulation in general and to regulatory decision making for airports than for water and sewerage or for electricity networks. However, some progress has been made and both conceptual frameworks and initial data bases have been established.

To my mind, a particularly interesting features of the Holt et al paper was the discussion of regulatory incentives and the role of capex (and opex) efficiency measurement within a consistent incentive framework where there are major (and multi-dimensional) risks and uncertainties. This discussion is in Section 5 of their paper and echoes discussions in previous papers. In particular, the discussion appears to adopt a similar line of thought to that set out in the Alexander paper.

The Starkie paper deals with a particular issue, namely whether or not airport regulation (as practised in the UK with 5-year price caps) encourages over or under-investment. Early commentators (such as Helm and Thompson in 1991) suggested a bias towards under-investment. Starkie argues that the way that the system has operated has “probably inclined towards over-investment, rather than under-investment”⁸.

It is well-known that rate of return regulation has a bias towards over-investment and ‘gold-plating’. Price cap regulation in the UK does not seem to have avoided this. Starkie argues that this is because of a combination of factors, including bundling of BAA’s main London airports for regulatory purposes and the nature of competition between regulated and unregulated airports. In particular, there is the issue of competition between regulated Stansted and unregulated Luton and regulated Manchester and the unregulated⁹ Liverpool airport.

An important general point arises in the Conclusions section of Starkie’s paper. He points out that, for the 2008-13 regulatory period, CAA is promoting direct negotiation between BAA and the airports over capex needs, pricing, etc rather than CAA ‘doing’ the regulation in the way that

⁷ See Holt et al this issue, p. XX.

⁸ See Starkie, this issue, p. XX

⁹ Unregulated in terms of *economic* regulation. Of course, all airports have stringent levels of health and safety and other regulation – also carried out by the CAA.

Ofwat does for the water industry. In many parts of the world, airports are primarily regulated by contract, typically concession contracts. It is also the case that the direct customers for airport and related services are large, well-informed customers - the airlines. Further, the airlines can reasonably be expected to act effectively in the interests of their passengers. However, airlines have very different needs and attitudes towards airport service provision as shown in the differences between ‘flag-carrying’ airlines such as BA, United or Air France and budget airlines such as Ryanair and Easy Jet.

It remains to be seen whether or not the CAA proposed model works in practice or whether CAA will be forced into a sufficient amount of dispute resolution and arbitration to mean that it is effectively determining the regulatory outcome rather than endorsing a deal made by the separate parties. Attempts at similar decentralisation (e.g. on encouraging the parties involved to determine telecom interconnect charges) have had very mixed success and, in the UK, Oftel (the telecom regulator from 1984- 2004 initially had to make the interconnection determinations because the parties could not agree. In later years, it felt obliged to signal clearly to the parties what would or would not be acceptable to it as a way of constraining the negotiations and enabling the parties to reach their own solution.

Whether or not it succeeds, the key point is that this move by the CAA is another example of regulators trying to move towards decentralised, market-based capex decision-making and away from determining capex by decisions based on expert engineering, economic, etc judgements. As several of the papers in this Special Issue show, this appears to be the way in which UK utility regulators are trying to move on capital and investment issues.

IV Concluding Comments

It seems that capital efficiency and investment planning for infrastructure industry is a topic where a lot is happening.

Traditional regulator-led “bottom-up” approaches as used in the UK by Ofwat are achieving more sophistication e.g. through the use of econometric and other formal statistical methods. However, it is particularly interesting to find growing interest in (and the practical application of) new methods where the responsibility is placed much more on the companies with the regulators try to pull back from being benevolent (semi) dictators, setting – or at least recommending - standardised investment requirements based on expert advice.

In this context, the Ofgem use of ‘menu’ regulation based on incentive-compatible contracts is a major breakthrough. Other regulatory agencies, many regulatory economists and others are watching with great interest to see whether and how far the approach can avoid some of the dilemmas of reconciling central standard setting and targets with genuinely incentive-based regulation.

The following papers in this Special Issue present a variety of perspectives on this topic and well reflects the current state of the debate.

References

Helm, D. and D. Thompson (1991) 'Privatised Infrastructure and Incentives to Invest', *Journal of Transport Economics and Policy*, XXV, 3, 231-246

Littlechild, S. 'Economic Regulation of Privatised Water Authorities', HMSO, London

(All other references are to the other papers published in this Special Issue for which I do not have page numbers.)