NERA
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Approaches to Measuring the Efficiency of Postal Operators

Final Report for Ofcom

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Executive Summary

Under the regulatory framework that it introduced in 2012, Ofcom is monitoring Royal Mail's quality of service, efficiency and affordability. While it is not intending to set specific efficiency targets, Ofcom's monitoring of Royal Mail will need to be informed by a view of what might represent a reasonable rate of improvement. If its monitoring identifies potential concerns about the rate of efficiency improvement achieved, or it has to review the need for intervention in relation to end-to-end competition, Ofcom might need to carry out a more detailed assessment of the scope for Royal Mail to improve its efficiency. And in some cases, for example if Ofcom decides to re-regulate Royal Mail or to establish a universal service compensation fund, it might need to carry out a very detailed assessment. NERA and Consult Sirius were commissioned by Ofcom to review potential methodologies for assessing the efficiency of postal operators in these different situations.[1]

We reviewed how regulators in postal industries and other UK regulated industries have assessed efficiency in recent price control reviews, drawing on published sources and interviews with a number of postal regulators.[2] In industries (such as water and electricity) where regulators set price caps for a number of similar firms, they have made extensive use of econometric and statistical benchmarking to set efficiency targets. Other regulators have used several methods in combination, including both:

- "top-down" reviews of most or all of a firm's costs, typically based on evidence from UK or foreign firms in the same industry, firms in other regulated industries, and competitive sectors of the economy; and
- "bottom-up" reviews of the efficiency of specific activities. These are typically based on comparisons with either firms in the same industry (especially those that are thought to demonstrate best practice), or other similar-sized companies (for functions such as HR and IT), and can identify specific changes that could be made to improve efficiency.

Many methods provide evidence primarily on the size of the "efficiency gap" (the difference between the firm and best practice). But some top down methods provide direct information about the rate of efficiency improvement over time.

Drawing on this review, we considered the methods that might be most useful to Ofcom in different situations. To help inform Ofcom's view of what might represent a reasonable rate of efficiency improvement, the most suitable methods are likely to be those that do not require significant initial work:

- Royal Mail's business plan provides information on the rate of efficiency improvement that Royal Mail views as achievable, but regulated firms' business plans are often conservative and, in the event of poor performance, may be revised in the light of outturns and no longer reflect the rate of improvement that *could* be achieved;

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1 In this report, we define efficiency as the extent to which a firm produces output at minimum cost.

2 We carried out this research in March and April 2013, focussing especially on the most recently completed (or substantially completed) price cap review in each industry.

- evidence from other UK regulated industries provides a high-level indicator of efficiency improvements following some combination of regulation, liberalisation, market restructuring and/or privatisation, but it may be more difficult for Royal Mail to achieve similar results in an industry experiencing volume declines (for example if there are rigidities in the labour force);
- two further methods, previous improvements achieved by Royal Mail and assessment of total factor productivity trends in competitive sectors, could be viewed as providing a lower bound on the rates of improvement that Royal Mail should be able to achieve; and
- internal benchmarking, using Royal Mail's productivity measure to control for differences in volumes and product mix, can provide Ofcom with information on the relative efficiency of different units within Royal Mail, and there may be some advantages from monitoring how productivity differences change over time.

If Ofcom has concerns about whether Royal Mail's efficiency is improving at a reasonable rate, it may decide to carry out further analysis to consider whether its initial expectations were too optimistic or whether Royal Mail really has underperformed. It may also need to carry out a more detailed assessment for a review of the need for intervention in relation to end-to-end competition, which may need to consider (among other things) whether Royal Mail might be able to improve efficiency at a faster rate than its current performance. This assessment might be more resource-intensive than Ofcom's initial analysis, but will still be less detailed than the analysis generally carried out to determine the efficiency target required for a comprehensive price control. The most suitable methods are likely to be those that are focused on Royal Mail's specific situation, and which provide information about the rate of improvement that should be achievable in the short to medium term:

- an expert review of Royal Mail's business plan could shed valuable light on questions such as whether the original plan was sufficiently challenging, and the specific reasons for any significant difference between business plan projections and outturns;
- qualitative international comparisons with the modernisation (or similar improvement) programmes implemented by other EU postal operators could also help to indicate whether Royal Mail is making sufficiently rapid progress in implementing specific measures to improve efficiency;
- if further evidence was needed, internal, process or function benchmarking could be used, but would require a greater amount of additional work:
  - internal benchmarking, using either econometric methods or Royal Mail's "workload" metric to control for external factors, can provide useful information on efficiency differences between individual mail centres or delivery offices;
  - process benchmarking can be used to assess the efficiency of particular operational processes in comparison with other operators, and can be used to identify specific improvements that could be made by Royal Mail; and
  - function benchmarking can used to assess the efficiency of specific corporate functions, such as IT, property management or HR, compared with the costs incurred by similar sized companies.

In the event that Ofcom needs to carry out a comprehensive price control review (or calculate the net cost of the universal service obligation), there is a strong argument for using evidence

from a wide range of different sources, in line with the practice of other regulators. All methods listed above would be suitable for this more detailed assessment,[3] and using a range of different sources should provide Ofcom with sufficient information to make an informed and defensible judgement.

[3] There are several other methods that have been used by regulators in other industries, but would not be suitable for Ofcom's review of Royal Mail. These include international cross-section benchmarking, which has problems including the lack of a suitable dataset and the severe difficulty of adjusting for external factors between countries, and domestic benchmarking which is ruled out because of the lack of suitable comparators to Royal Mail.

1. Introduction

This report, by NERA and Consult Sirius for Ofcom, reviews potential methodologies for assessing the efficiency of postal operators. Royal Mail's level of efficiency and the rate at which it is improving are both important to Ofcom, as it is required by the Postal Services Act 2011 to have regard to the provision of the universal postal service becoming efficient before the end of a reasonable period, and continuing to be efficient at all subsequent times.

Under the regulatory framework that was introduced last year[4] Ofcom is, among other things, monitoring Royal Mail's quality of service, affordability of universal services and the rate of efficiency improvement. On efficiency, Ofcom's monitoring will be focused on the level of costs.[5] It expects Royal Mail to improve efficiency levels and sustain these improvements thereafter. While Ofcom is not intending to set specific efficiency targets, its monitoring of Royal Mail's performance will need to be informed by a view of what represents a reasonable rate of efficiency improvement. And it could carry out further analysis of what a "good" outcome for operating performance might look like if the monitoring regime identifies potential concerns about operating efficiency.

An understanding of Royal Mail's current and potential efficiency will also be important in any future review of the need for intervention in relation to end-to-end competition, under the circumstances set out in Ofcom's March 2013 guidance.[6] In the event of a review, Ofcom would need to reach a view on the expected financial position of Royal Mail, taking account of expected future efficiency savings. It would assess Royal Mail's potential commercial response to end-to-end competition, including the impact of stronger incentives to improve efficiency. And it would also consider the extent to which any poor financial performance was the result of factors within Royal Mail's control, including an assessment of whether Royal Mail had achieved and was planning to achieve a reasonable rate of efficiency improvement.

This study covers the main approaches to efficiency assessment that have been used by regulators in the postal industry and in other UK regulated industries, including both top-down and bottom-up methodologies. We consider the practical experience of using these methods, including how they have been applied, any difficulties or limitations raised by regulators or others, the way the results have been used and reaction from the industry.

We then assess the potential for each of these methods to help inform Ofcom's view of what might represent a reasonable rate of efficiency improvement, and its potential contribution to any more detailed analysis of Royal Mail's efficiency (whether in response to concerns arising from Ofcom's monitoring or for a review of end-to-end competition). Among others, we consider:

- the relevance of different methods to the specific circumstances of Royal Mail;

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4 Ofcom (2012), "Securing the universal postal service – decision on the new regulatory framework", March 2012.

5 *Ibid.*, paragraph 1.35.

6 Ofcom (2013), "End-to-end competition in the postal sector – Final guidance on Ofcom's approach to assessing the impact on the universal postal service", March 2013, paragraph 5.45.

- any risk that a methodology may either under or overstate Royal Mail's efficiency or potential rate of improvement; and
- whether the suitability of different methods depends on the particular circumstances of Ofcom's review, such as whether it is part of Ofcom's monitoring regime or a review of end-to-end competition, including a consideration of time and resource requirements.

The remainder of the report is structured as follows:

- Section 2 provides some background on the UK postal industry, describes how efficiency is defined in this report, and provides an overview of Royal Mail's recent efficiency performance;
- in Section 3 we describe how each methodology has been used in practice and its suitability for use in postal industries, drawing on reviews of experience in postal and other regulated industries;
- Section 4 sets out the advantages and disadvantages of each methodology for Ofcom, both to inform its initial view of a reasonable rate of efficiency improvement and as part of a fuller efficiency review. We also discuss possible approaches to monitoring and suitable metrics; and
- Appendix A and Appendix B describe how efficiency methodologies have been applied in postal and other regulated industries respectively

2. Background

2.1. UK Postal Industry

Royal Mail is the designated provider of universal postal services in the UK. Under its universal service obligation, covering all letters and packets weighing less than 20 kilograms, Royal Mail must:

- deliver letters every Monday to Saturday to every address in the UK (Monday to Friday for packets);
- maintain a network of access points at a prescribed density, and make at least one collection of letters every Monday to Saturday (Monday to Friday for packets);
- meet a number of quality targets, including to deliver at least 93 per cent of First Class mail by the next working day, and 98.5 per cent of Second Class mail within three working days; and
- provide services at an affordable, uniform tariff.

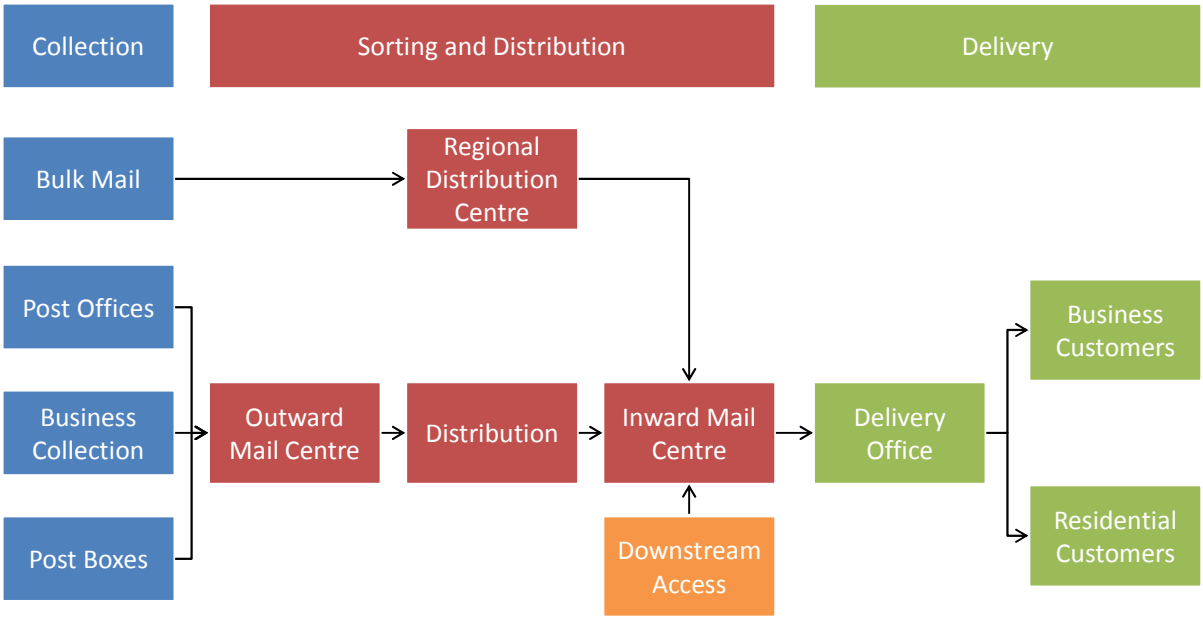
Figure 2.1 provides an overview of Royal Mail's operation. Royal Mail collects from each of the UK's 115,000 post boxes and 11,800 post office outlets, and from around 90,000 business addresses, and takes the mail to one of its 48 mail centres.[7] At the outward mail centre,[8] an initial phase of processing known as "outward sort" segregates mail by class and by format (e.g. letter or packet), and sorts it according to its destination mail centre.[9] The outward sort is mainly automated with a degree of manual sorting, mostly for packets.

[7] Ofcom (2013), "The availability of communications services in the UK", May 2013, paragraph 4.53.

[8] Mail centres operate as outward mail sorting centres at some times of day, and inward mail centres at others.

[9] At this stage, Royal Mail also undertakes revenue protection activities, and cancels postage stamps.

Figure 2.1
The Postal Value Chain



Source: Adapted from Hooper et al. (2008)[10]

After the outward sort, mail is distributed as necessary to other mail centres according to the destination address. Mail centres also accept mail from access operators (as described below) and bulk mail from regional distribution centres at this stage.[11] The inward mail centre sorts the mail to individual local delivery offices, and typically to individual routes (the "inward sort"). As with the outward sort, the inward sort is mainly automated with a degree of manual sorting, mostly for packets.

Following the inward sort, mail is sequenced according to the order of addresses on each route (known as walk-sequencing). Historically, walk-sequencing has been conducted manually at delivery offices, but it has become increasingly automated following the installation of walk-sequencing machines in mail centres and delivery offices.[12]

Mail is distributed via a local delivery network to Royal Mail's 1,400 delivery offices, from where it is delivered to both residential and business customers.

The UK postal market is fully liberalised. At present, Royal Mail faces competition primarily in its collection, inward sorting and distribution activities. "Access operators" collect mail in

[10] Hooper, R, D Hutton and I Smith (2008) "Modernise or decline: Policies to maintain the universal postal service in the United Kingdom", p28.

[11] Businesses with significant bulk mailings can receive a discount in exchange for sorting the mail to meet Royal Mail's requirements.

[12] As of May 2013, 79 per cent of letters were automatically walk-sequenced. See Royal Mail (2013), "Preliminary Results for the year ended 31 March 2013", May 2013, p3.

bulk from businesses, sort (where necessary) and transport it, and then present mail at the relevant inward mail centre for delivery by Royal Mail.

Access mail volumes have grown strongly in recent years, from 10 per cent of total volumes in 2006 to 46 per cent in 2012.[13] As a result of the high proportion of costs in delivery, however, Royal Mail retains 85 to 90 per cent of the revenue generated by access mail.[14]

While other operators are also permitted to deliver mail, Royal Mail faces only limited competition from firms that provide a full service from collection through to delivery (known as end-to-end competition).[15] TNT Post began a trial of delivery operations in West and Central London in April 2012, and in June 2013 expanded this into South West London.[16] It has stated that it intends to expand its delivery of business mail to other areas in the UK.[17]

2.2. Comparison with Other Regulated Industries

While there are similarities between post and other regulated industries, there are also a number of significant differences, including declining demand, the form and extent of competition and the high labour intensity of the postal industry. These are important to take into account when considering the potential suitability of methods that have been used to assess efficiency in other regulated industries.

Following a long period of rising volumes, the UK mail industry has been subject to declining demand since the mid-2000s, in part at least because of e-substitution.[18] And due to the increase in access competition over the same period, Royal Mail's end-to-end volumes have fallen faster than the market as a whole. In contrast, demand is typically more stable in many other UK regulated industries, including water, electricity and gas distribution.[19]

There are economies of scale and density in providing mail services, which means that unit costs typically fall when volumes increase, and rise when volumes fall, even if underlying efficiency is unchanged (see Section 2.3). The combination of scale economies and falling volumes could lead to increases in Royal Mail's unit costs, offsetting the impact of efficiency improvements, whereas rising demand in other regulated industries will have reinforced the beneficial impact of efficiency improvements on unit costs. There is also evidence that, in the postal industry, costs are less responsive to volumes when demand is falling than when it

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[13] Ofcom (2013), "Communications Market Report 2013", August 2013, paragraph 6.1.1.

[14] Ofcom (2012), "Annual monitoring update on the postal market – financial year 2011-12", November 2012, paragraph 5.12.

[15] In 2011, Royal Mail delivered over 99 per cent of all mail in the UK.

[16] "TNT Post creates 500 new jobs in South West London", TNT press release, 19 June 2013, http://www.tntpost.co.uk/aboutus/news/entryid/3.

[17] "TNT Post steps up rival delivery service to Royal Mail", Reuters 13 June 2013, www.reuters.com/article/2013/06/13/uk-britain-tntuk-idUKBRE95C0HU20130613.

[18] In the 2011/12 financial year, mail volumes were 80 per cent of their level in 2005/06. See Royal Mail Regulatory Financial Statements 2003/04-2011/12

[19] While demand in some of these industries, such as gas distribution, can be subject to year-to-year fluctuations, there are no other examples of sustained significant decline.

is rising, at least in the short term.[20] These cost asymmetries affect how efficiency performance in post might be compared to other regulated industries.

Another key difference between post and other UK regulated industries is the form and extent of competition. As noted in Section 2.1, Royal Mail faces extensive competition in its collection, sorting and distribution activities, but only limited end-to-end competition at present. This means that there are no domestic firms directly comparable to Royal Mail, in contrast to the water industry, or electricity and gas distribution networks, where regulators can compare the efficiency of similar firms within the same industry.[21] And where Royal Mail does face competition, it may be from firms with newly established (or expanded) networks and without the legacy costs or universal service obligations (though also economies of scale) that apply to Royal Mail.

Furthermore, unlike many other network industries, in which production is capital intensive, Royal Mail's business is labour intensive, with labour accounting for more than 60 per cent of its costs in 2012.[22] While there is scope for further automation of certain activities (such as sorting), collection and outdoor delivery activities are always likely to require a high proportion of labour inputs. The degree of labour intensity may also increase the influence of trade unions, which could make it more difficult to implement efficiency improvements that require changes to working practices or reductions in staffing levels (especially if falling volumes are already reducing labour inputs).[23] And it may be easier to observe the processes that underlie the provision of postal services (and therefore assess some aspects of efficiency) than in a capital intensive industry.

2.3. Defining Efficiency

Understanding different forms of efficiency and the ways firms can improve efficiency is important in considering the suitability of different methodologies. For this report, we define efficiency as the extent to which a firm produces output at minimum cost. A similar definition can also be applied to individual activities within a firm (such as collection, transport or delivery) and for individual units (such as mail centres or delivery offices).

Efficient firms operate on the "efficiency frontier", which is defined by the minimum cost required to produce different levels (and mixes) of output. For firms that are inefficient and therefore not on the efficiency frontier, the distance from the frontier is often described as the

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[20] These cost asymmetries might arise from difficulties in shedding labour in the short term, or universal service obligations to maintain delivery and collection a minimum number of days per week. See, for example, Bradley, M, J Colvin and M Perkins (2012) "Do volume increases and decreases have the same effect on labor hours?" In: Crew, M and P Kleindorfer eds *Multi-modal Competition and the Future of Mail.*

[21] In the energy and water industries, these comparators exist due to the creation of separate companies during privatisation, and not market entrants growing to a comparable size.

[22] Calculated based on Royal Mail Annual Report 2012, p41. Partly as a result of modernisation, Royal Mail has recently reduced the share of labour in total costs. See Ofcom (2012), "Annual monitoring update on the postal market, financial year 2011-12", paragraph 2.11.

[23] See Holder, S and H Smith (2012), "Privatization: could the benefits seen in other network industries be realized in postal industries?", in: Crew, M. and P. Kleindorfer eds *Multi-modal Competition and the Future of Mail.*

"efficiency gap". In regulatory economics, it is common to distinguish between two ways that a firm can become more efficient:

- catch-up improvements can be realised by a firm that is currently inefficient. These improvements reduce the size of the efficiency gap and move the firm closer to the efficiency frontier; and
- frontier shift improvements can be realised by firms that are already efficient, operating on the efficiency frontier. These reflect movements over time in the efficiency frontier itself, for example because of technological progress.

Over time, an inefficient firm might be expected to realise both catch-up and frontier shift improvements.

There are a number of reasons why a firm may be inefficient (and thus potentially able to achieve catch-up as well as frontier shift improvements). These include:

- using more inputs than necessary to produce a given level of output;[24]
- not using the optimal mix of inputs given prices of labour, capital and other inputs;[25] or
- paying labour more than the market wage.

Information about the causes of a firm's inefficiency, as well as the overall size of the efficiency gap, could help regulators reach a view on the proportion of the gap that might reasonably be eliminated over the relevant time period (e.g. the length of the next price control period). It may not be reasonable to expect a firm to close the efficiency gap completely, particularly in the short-term. For example, it may be difficult to address inefficiency due to high wages in the short-term, or to reduce the proportion of labour used, especially in a highly unionised industry.[26] Even in the long-term, firms may have legacy costs and constraints that make it difficult to achieve the same level of efficiency as a firm on the efficiency frontier (which may have greater freedom in the way it structures its business).

A slightly different concept is productivity, which measures the relationship between outputs and the inputs used to produce them. Productivity can be estimated using measures (such as total factor productivity) that take account of all inputs and outputs, or it can be expressed using simple or proxy measures of particular inputs (such as operating expenses or labour hours) and simple measures of outputs (such as the number of mail items).

Productivity can increase or decrease even if there is no change in a firm's underlying efficiency, as represented by its distance from the efficiency frontier. For example, if there are economies of scale, so that the average cost (per unit of output) for an efficient firm falls

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[24] This is known in the economic literature as technical inefficiency.

[25] This is known in the economic literature as allocative inefficiency.

[26] These constraints may be reflected in short-term cost asymmetries as discussed in Bradley, M, J Colvin and M Perkins (2012) "Do volume increases and decreases have the same effect on labor hours?" In: Crew, M. and P. Kleindorfer eds *Multi-modal Competition and the Future of Mail.*

as output increases,[27] then a reduction in demand will lead to a decrease in productivity even though underlying efficiency may be unchanged.

"Partial" productivity measures, which record only some inputs (such as labour costs or operating expenses), may also diverge from efficiency measures because of substitution between inputs. For example the replacement of labour inputs with capital inputs will often be carried out in order to improve efficiency. But the improvement will be overstated by a measure which records labour (or other non-capital) inputs only. And if outputs are measured incompletely, for example because the measure fails to reflect important differences between types of output or changes in service quality, then this may also lead to divergence between productivity measures and changes in underlying efficiency.

These differences between productivity and efficiency are important in the case of Royal Mail. Its volumes have been decreasing as a result of both e-substitution and competition within the industry. Economies of scale are therefore likely to lead to increases in unit costs and other productivity measures, which should not be confused with a reduction in efficiency. And changes in the mix of mail (such as the increasing proportion of parcels) will lead to cost increases, and this will be recorded as a deterioration in most productivity measures even if underlying efficiency is unchanged.

2.4. Royal Mail's Efficiency Performance

Improving efficiency has been a key objective for Royal Mail under its previous price controls, as well as under the current regulatory framework. Between 2002 and 2006, Royal Mail removed between £460 million and £600 million of costs from its business.[28] It outperformed the efficiency targets that underpinned Postcomm's first price cap, without incurring the capital or one-off costs that were initially thought to be required. However, the implementation of Royal Mail's Renewal Plan, a collection of initiatives intended to meet Postcomm's targets, was not as successful as planned, and most of the efficiency improvement was achieved through other initiatives.[29]

Despite having outperformed its regulatory settlement, Royal Mail indicated in its 2006-07 accounts that it was 40 per cent less efficient than its competitors. The Hooper report describes five reasons for this efficiency gap:

- Royal Mail's network of mail centres and delivery offices was largely unchanged, whereas other European postal operators restructured in the early 1990s;
- the level of automation at Royal Mail, particularly for walk-sequencing, was much lower than other European postal operators;

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[27] Sometimes in network industries a distinction is drawn between economies of scale (which relate to changes in both output volumes and network size) and economies of density (which relate to volume changes within an unchanged network). A number of studies have found evidence of economies of density in postal deliveries. For simplicity, in this report we use "economies of scale" to refer to economies of scale and density.

[28] Hooper (2008), "Modernise or decline: policies to maintain the universal postal service in the United Kingdom"

[29] LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", p76

- working practices restricted Royal Mail's efficiency, including early finishes of postal workers and the payment of overtime to workers covering for absence (even when within paid hours);
- pay significantly above market average rates; and
- ongoing pension contributions for a defined benefit pension scheme with contributions significantly higher than average.

In 2006, Postcomm set a further price control for the period from 2006/07 to 2009/10.[30] During this period, Royal Mail found it increasingly difficult to meet its efficiency targets.[31] It continued to miss both its own and Postcomm's targets for the rate of efficiency improvement.[32] However, Royal Mail has introduced a programme of modernisation aimed at improving efficiency. For example, it has increased the level of automation,[33] rationalised its network of mail centres[34] and closed its defined pension scheme to new members.[35]

Based on Royal Mail's performance under the previous regulatory regime, Ofcom judged that the price control approach to regulation had failed. It noted that, given Royal Mail's financial circumstances and the regulator's primary duty in relation to the universal service, "there are serious weaknesses associated with a price control formula in providing credible incentives to Royal Mail to become efficient in the near term".[36]

Under the current regulatory regime, Ofcom has removed the majority of price controls and is monitoring the rate of improvement of Royal Mail's efficiency, as well as quality of service and affordability of universal services. Ofcom published its first annual monitoring report in November 2012, which forms a baseline position for future monitoring. On efficiency, the report includes a summary of key performance measures that might be useful in considering Royal Mail's efficiency overall. But Ofcom also noted that it intended to undertake work to determine "how to assess what constitutes a reasonable rate of efficiency improvement by Royal Mail".[37]

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30 Postcomm subsequently extended the price control for two additional one year periods (with some changes in each case).

31 Postcomm (2009), "Royal Mail's price control from April 2010 (Tariff 2010) – decision and notice of proposed licence modifications", p8

32 Ofcom (2011), "Securing the universal postal service – proposal for the future framework for economic regulation", October 2011, paragraph 1.23

33 By 2012, 79 per cent of mail was automatically walk sequenced. See Royal Mail Group (2013), "Preliminary results for the year ended 31 March 2013", May 2013, p3.

34 Royal Mail closed nine mail centres in 2012. It has now closed a total of 25 mail centres, while four have been opened since the start of modernisation, representing a 30 per cent net reduction. See Royal Mail Group (2013), "Preliminary results for the year ended 31 March 2013", May 2013, p3.

35 See Royal Mail Holdings (2010), "Annual report and financial statements year ended 28 March 2010", p15. In 2012, Royal Mail transferred its pension assets and liabilities to a new Government pension scheme to address its historic pension deficit. See Royal Mail Group (2013), "Preliminary results for the year ended 31 March 2013", May 2013, p32-35.

36 *Ibid*., paragraph 1.26

37 Ofcom (2012), "Annual monitoring update on the postal market: Financial year 2011-12", paragraph 3.5.

3. Methodologies for Assessing Efficiency

In this section, we outline a number of approaches to efficiency assessment that have been used by regulators, and comment on their usefulness for postal industries. The methodologies fit into one of three classifications:

- cross-section studies provide a top-down assessment of a firm's efficiency relative to a set of similar firms, in order to determine the overall scope for efficiency improvements;[38]
- time series analyses examine historical trends in efficiency measures, either for the firm itself or for a set of comparators, in order to decide upon a reasonable rate of future efficiency improvements; and
- expert review involves a detailed assessment of aspects of a firm's plans or activities, making use of specific industry or operational knowledge, in order to identify (and quantify) opportunities to improve efficiency.

For each methodology we describe how it has been used in practice, and its suitability for use in postal industries. We draw on an extensive review of recent experience in other UK regulated industries, and a review of experience in a selection of postal industries where regulators have carried out some form of efficiency analysis.[39] These reviews covered how the methodologies have been applied, any difficulties or limitations raised by regulators, the use of the results and reaction from the industry. Full descriptions of these reviews can be found in Appendix A for postal industries and Appendix B for other UK regulated industries.

Methodologies are also often classified as top-down or bottom-up. Top-down studies examine the efficiency of the firm as a whole (or at least a substantial part of it). Cross-section top-down analyses often use econometric or statistical techniques, whereas time series analyses often track changes in one or more metrics such as those listed in Box 3.1. In contrast, bottom-up studies examine particular operational processes or initiatives, often using industry-specific knowledge.

[38] While some of the methodologies that we classify as cross-sectional sometimes use data that also have a time dimension (panel data), we retain this classification where the data are used primarily to compare levels of efficiency rather changes over time.

[39] In most cases we have reviewed experience from the most recently completed (or substantially completed) price control review in each industry as at March 2013, and have not necessarily covered past reviews.

Box 3.1
Efficiency Assessment Metrics

Real unit operating expenditure (RUOE) adjusts operating expenditure to remove the effects of inflation, and then divides by a measure of output to generate a unit cost – for example, real operating expenditure per letter delivered. In some studies, RUOE is also adjusted to account for factors such as volume effects or changes in product mix. There are three main components of RUOE:

- total operating expenditure, which is often taken from companies' regulatory accounts (and therefore already complies with any accounting requirements specified by the relevant regulator). In some studies, expenditure is adjusted at this stage to remove the impact of economies of scale, and any exceptional items (or other non-recurring costs) should also be excluded;
- a measure of output, which can be used to calculate unit (rather than total) operating expenditure. In some industries, there is an obvious simple measure (such as the volume of water, gas or electricity carried over a network), whereas in others there may be several possible measures (such as passengers or length of track), or a composite measure may need to be constructed (for example, combining calls and data, or airline passengers and cargo);
- a price deflator to convert from nominal to real expenditure. Previous studies have used a general price index such as the "all items" Retail Prices Index (RPI).

Real unit operating cost (RUOC) is conceptually similar to RUOE, but contains capital expenditure or depreciation along with operating expenditure.

Partial Factor Productivity metrics divide a measure of outputs by a single input, e.g. mail volume per employee.

Total Factor Productivity (TFP) divides a measure of outputs by an aggregate measure of inputs, and is often used as a measure of overall productivity. It is usually calculated in one of two ways: value added TFP, which measures the productivity of labour and capital, while gross production TFP measures the productivity of labour, capital *and* intermediate inputs.

In order to examine these metrics over time on a consistent basis, regulators have often made adjustments to remove the effects of changing volumes or product mix. For example, a study for ORR adjusted RUOE for volume effects using estimates of cost elasticities.[40]

[40] See Appendix B.4.2.3 for further details of this adjustment.

3.1. Cross-section

3.1.1. Overview

Cross-section analysis can be used to assess a firm's current level of efficiency. It gives a static 'snapshot' estimate of the efficiency gap, and is therefore informative about the overall scope for catch-up efficiency improvements. Knowing the size of efficiency gap does not, however, provide information about how fast these improvements can be achieved. Neither does it shed light on the scope for an already efficient firm to become even more efficient over time (i.e. frontier shift improvements).

Cross-section analyses often use a dataset of similar firms, operating either domestically or in other countries, as the basis of the assessment. However, where separate costs can be identified for similar units (e.g. regions, routes, offices) within a single firm, cross-section analysis can also be used to estimate the size of any internal efficiency gap.

Comparisons can be made using a variety of methods, which differ in their technical complexity, data requirements and reliability of results. For instance, firms could be compared against each other on the basis of simple performance metrics (such as unit costs or productivity ratios), or using more detailed econometric analyses (to cover all inputs and outputs and to attempt to adjust for differences in operating environments, given sufficiently detailed and comparable data).[41] An overview of the main econometric and statistical methodologies is provided in Box 3.2.

[41] Alternatively, analyses might make focused qualitative comparisons against similar firms to provide a view of whether there is scope for an operator to make specific efficiency improvements. We discuss such comparisons in Section 3.3.4.

Box 3.2
Cross-section Assessment Methodologies

There are a number of quantitative techniques that assess relative efficiency by first estimating an efficiency frontier from data on costs and cost drivers.[42] This frontier is a mathematical relationship that gives the minimum cost of producing a given level of output for any set of cost drivers. The inefficiency of a firm (or operational unit) is given by its distance from this frontier.

Econometric deterministic frontier analysis (DFA) is a class of econometric techniques used to estimate an efficiency frontier, and attributes all of the difference between a firm and this frontier to inefficiency.

Stochastic frontier analysis (SFA) also estimates an efficiency frontier using econometric techniques, but only assigns part of the distance of a firm from this frontier to inefficiency, recognising that at least some of the difference will be due to statistical error.

Data envelopment analysis (DEA) uses linear programming to estimate an efficiency frontier, and so is not an econometric approach. It wraps a boundary around observations in input space, and so represents the minimum observed use of inputs to produce a given level of output. DEA is particularly sensitive to data error and outliers, and often produces relatively large estimates of inefficiency.

A difficulty with cross-sectional efficiency assessment is the need for detailed data, consistently collected for all comparison units. The dataset might need to be very comprehensive to control for heterogeneity that would otherwise be confused with inefficiency, for example if potential comparators face very different operating environments. However, even with very detailed data, it might still be difficult to separate inefficiency from all other sources of cost differences.

3.1.2. International comparators

3.1.2.1. Description

International cross-section analysis can be used to assess a firm's level of efficiency by making quantitative comparisons with similar firms in other countries. In making international comparisons, the problems associated with different operating characteristics and the need for consistent data require particular attention.

3.1.2.2. Practical experience

In UK regulated industries, international comparisons have been used to assess efficiency during price control reviews in rail, air traffic control and telecoms. These are all industries for which no domestic comparators are available. In addition to the analyses conducted for

[42] For example, a study of Royal Mail's efficiency for Postcomm used data on total costs, outputs (such as mail volume) and other environmental factors (such as the density of the delivery network). See Appendix A.6.2.2 for further details.

price controls, the Office of Rail Regulation (ORR) has published follow-up work to monitor Network Rail (and to develop its methodology ahead of the next price control review).[43]

The studies conducted for UK regulators have used a range of techniques. While ORR and Ofcom used SFA, the Civil Aviation Authority (CAA) made comparisons on the basis of partial productivity measures (for example, total air traffic control costs per flight hour). In post, the use of international comparisons has primarily been limited to high-level indicators, such as prices, with a limited number of econometric applications that have not been considered to yield reliable results.

The need for detailed and consistent data across all firms is a particularly acute problem when making international comparisons. The studies conducted for ORR and the CAA used existing, curated datasets of international comparators. As the data had been validated it meant that, to the greatest extent possible, they could be considered to be consistent. ORR's consultants explicitly commented that the SFA analysis, which was very data-intensive, would not have been feasible without access to the ready-made, comparable dataset.[44] Furthermore, even with access to consistent data, studies have often had to make further adjustments to data to improve comparability.[45]

Others have considered constructing bespoke datasets, for example by obtaining data through surveys. For instance, the CAA's consultants attempted to collect data for additional comparators (beyond the European Air Navigation Service Providers (ANSPs) contained in their existing, curated dataset) through survey responses. However, the data were not as comparable as those contained in a centrally managed and validated dataset, and as such the subsequent analysis was not considered to provide robust estimates of the efficiency gap. Similarly, the Australian Competition and Consumer Commission (ACCC) reviewed a study, commissioned by Australia Post, that used data from survey responses to undertake international benchmarking, which it did not consider to be robust due to data comparability problems (along with the difficulty of controlling for differences in operating environments). It did not rely on the analysis in making its decision.[46]

Even with access to detailed data, it is difficult to obtain a reliable estimate of inefficiency as international comparators often face very different operating conditions. Some studies, such as that commissioned for the CAA, have simply made high-level comparisons against other firms that are considered to face similar conditions. Other analyses, such as the studies commissioned by ORR and Ofcom, attempt to account for this heterogeneity by controlling for observable differences between operating environments within an econometric model. However, regulators have often found distinguishing inefficiency from these other differences to be very difficult in practice, particularly because both inefficiency and other

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43 ORR (2010), "International cost efficiency benchmarking of Network Rail", September 2010.

44 Smith, A, P Wheat and G Smith (2010), "The role of international benchmarking in developing rail infrastructure efficiency estimates", *Utilities Policy*, Vol 18, Issue 2 (June), p86-93.

45 For example, ORR made adjustments to Network Rail's cost figures to account for the Hatfield derailment.

46 See Section A.1.2.1 for further details.

external factors that cause cost differences between countries may not vary much (or at all) over time.[47] This has reduced the reliability of the resulting estimates.[48]

Of all regulators that have considered international cross-sectional analysis, ORR has placed the most weight on the results, adopting them as the basis of the efficiency target in the last price control.[49] However, an important consideration in ORR's use of the results is likely to have been the fact that a number of other studies, applying different methodologies, indicated a similar degree of inefficiency.[50] Both the CAA and Ofcom placed less weight on the results of their international benchmarking,[51] while postal regulators have also not relied upon international cross-section work.

3.1.2.3. Suitability for postal industries

Given the lack of appropriate domestic comparators for the postal incumbent in many countries, international cross-section analysis could be useful if data were available and external differences could be controlled for. However, the lack of an established, high quality dataset for postal operators means that this method is unlikely to be suitable for postal industries. And even if such data were available, it would still be a major challenge to identify cost differences that are due to inefficiency rather than other environmental differences. During the 2005-06 price review, Postcomm's consultants commented that "The generic issues that influence international comparability are particularly acute within the postal sector as each operator faces significantly different environments. These differences include the geography and topography of the delivery network, quality and service obligations, strength of labour unions and the market status (i.e. existence of competition, degree of regulation, etc.). These in turn drive both the way in which postal services are provided and the level and structure of costs".[52]

In the longer term, for this method to yield robust results, a considerable amount of work would be required to collect a wide range of postal industry data on a consistent basis across several countries. However, even if such a dataset were developed, the challenge of controlling for cost differences caused by external factors rather than inefficiency could be insurmountable.

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47 When this is the case, even econometric models using detailed data cannot reliably distinguish between inefficiency and cost differences due to other external factors.

48 For example, Ofcom did not take direct account of evidence from econometric international cross-section studies (that it had commissioned previously) in recent price controls for BT Openreach as they had not adequately controlled for international differences in operating conditions. See: Ofcom (2012), "Charge control review for LLU and WLR services", Annexes, paragraph A3.58.

49 ORR noted that cost benchmarking against comparable firms is common regulatory practice and, as Network Rail is a national monopoly, conducting similar analysis is only possible with international comparators.

50 Network Rail challenged the analysis on the grounds of poor data quality, the need for further adjustments, and erroneous functional form in the econometric specification. But ORR did not accept these criticisms, and its academic advisor considered the work to be robust and that ORR had addressed all of Network Rail's criticisms.

51 The CAA considered along with a range of other evidence (and the results did not identify general efficiency savings anyway), and Ofcom did not rely on any of the international cross-section work, which it did not consider to be robust.

52 LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", paragraph 2.9.

3.1.3. Other UK comparators

3.1.3.1. Description

Where there are multiple domestic firms operating within an industry, they can be compared against each other to assess their relative efficiency. Using domestic comparators has a number of advantages over international analysis. Firstly, data are more likely to be available on a consistent basis, especially as the regulator can impose common reporting requirements on firms in the industry. Furthermore, differences in firms' operating environments are likely to be smaller than in an international cross-section (although any remaining differences will still need to be controlled for).

3.1.3.2. Practical experience

Domestic cross-section analysis has not been used in postal industries due to the lack of sufficiently comparable firms. It has, however, been used in the UK by Ofwat and Ofgem in the context of price control reviews. Ofwat had previously conducted cross-sectional analysis for monitoring as well, but this has not continued beyond the 2009 price control.

Both Ofgem and Ofwat have used econometric analysis to carry out domestic comparisons, based on data submitted by the regulated companies. In its most recent price control review of gas distribution networks, Ofgem examined total expenditure (totex) as this captures any efficiency gains achieved by substituting between labour and capital; examining operating expenditure separately from capital expenditure does not capture these improvements in allocative efficiency.[53] It also considered regressions run at the level of separate activities (such as work management and repairs).[54] Ofwat will also use totex regressions for its next price review.

However, while firms in the same country are likely to be more comparable than a sample of firms from different countries, there are still likely to be external differences between comparators that could be difficult to distinguish from differences in efficiency. Ofgem recognised that its econometric methodology could not fully distinguish inefficiency from other factors affecting cost, and so interpreted the results conservatively.[55] Both Ofgem and Ofwat also made a number of "offline" adjustments to costs in recognition of this, for example to reflect the London wage premium or to adjust for atypical costs.

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[53] Ofgem defined totex as the sum of controllable operating expenditure, capital expenditure (smoothed using a seven-year moving average), mains replacement expenditure and shrinkage (gas consumed within, or lost from, a gas transporter's system).

[54] For both totex and activity-based models, it used panel regressions using two datasets: (i) four years of historical data and (ii) two years of forecast data.

[55] In particular, it only required firms to eradicate 75 per cent of the estimated inefficiency over the course of the price control, with the frontier set at the upper quartile firm (rather than the most efficient).

3.1.3.3. Suitability for postal industries

Despite an increase in competition over recent years, in most postal industries there are few, if any, companies of a comparable size to the universal service provider.[56] While in theory there may be domestic comparators for elements of Royal Mail's operation, such as upstream competitors that provide collection and distribution services (as well as some limited sorting services) or parcel operators, the conclusions that could be drawn from such comparisons would be limited as:[57]

- it may be difficult to adjust for differences in scale, and to control for constraints on Royal Mail that affect its business model, in particular those arising from the universal service obligation;
- economies of scope, reflected in costs that are common to a number of Royal Mail's activities, may lead to cost allocation problems that make it difficult to compare only part of Royal Mail's operations;
- such comparisons will provide only a partial picture of relative efficiency, and it might be difficult to extend conclusions to Royal Mail's business as a whole; and
- even if efficiency differences can be identified, it may be impractical for Royal Mail to implement the changes that would be necessary to eliminate these differences in the short to medium term.

Even if, in the longer term, a substantial increase in end-to-end competition leads to a market structure that, in theory, could support meaningful domestic comparisons, there are still likely to be significant differences between the incumbent universal service provider and newer entrants. These might include differences in scale and coverage. And incumbent operators may well have legacy costs and constraints which, though they might arguably be viewed as inefficiencies, do not necessarily give rise to efficiency improvements that could reasonably be expected in the short to medium term.

3.1.4. Internal benchmarking

3.1.4.1. Description

Internal benchmarking examines the relative efficiency of different operating units within a firm, for example mail centres and delivery offices in postal operators. This can give an estimate of the scope for efficiency improvements available to the firm from simply applying its own best practice consistently throughout its operation.

Making internal comparisons means that data consistency is likely to be less of an issue than for other cross-sectional analysis, as accounting should be consistent throughout a firm.[58]

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[56] In the energy and water industries, domestic cross-section analysis has been possible due to the creation of separate companies during privatisation (and not market entrants growing to a comparable size).

[57] While these problems affect top-down quantitative comparisons between firms, there may still be scope for process benchmarking as described in Section 3.3.4.

[58] There is a risk, however, that disaggregated data for individual units may be less reliable than more aggregated (and perhaps audited) firm-wide data.

Also, while there may be some differences in operating environment between units, and it will still be important to control for these, they are likely to be less significant than between the regulated firm and other comparators. The analysis can use econometric techniques such as those set out in Section 3.1.1 to attempt to control for such differences. Alternatively, comparisons can be made on the basis of physical productivity measures (such as labour productivity) or measures designed to capture a more detailed engineering relationship between output and inputs.

Internal benchmarking does not provide information on whether observed internal best practice is efficient in itself, as there may be systemic inefficiencies that apply to all units which will not be detected by the analysis. For this reason, internal benchmarking is likely to provide a conservative estimate of the scope for catch-up efficiency improvements.

3.1.4.2. Practical experience

Internal benchmarking has been used by postal regulators in the US and UK, as well as in a number of academic studies outside the regulatory environment.

The USPS Office of Inspector General has used internal benchmarking of labour productivity to estimate the scope for efficiency savings.[59] For instance, one of its studies estimated the scope for efficiency savings in city delivery operations by comparing productivity between districts, while another assessed mail processing operations by drawing comparisons between similarly sized processing facilities.

LECG's 2005 report to Postcomm conducted internal benchmarking of Royal Mail, based on one year of labour cost data from Royal Mail's 70 mail centres and 1377 delivery offices. The study used a variety of econometric techniques, including stochastic and deterministic frontier analyses, in addition to DEA.[60] The size of the estimated inefficiency depended on the technique used, and ranged from £220 million to £330 million.[61] However, as the analysis only takes account of existing Royal Mail best practice, the study presented the results as conservative estimates. Royal Mail supported the use of internal benchmarking and bottom-up analysis in preference to less sector-specific and less detailed top-down analysis, though it disputed some of the details of the econometric analysis and provided its own alternative estimates.[62]

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[59] The labour productivity for each comparator was calculated by comparing actual labour hours to standard hours (based on mail volumes and the number of delivery points). See USPS Office of Inspector General (2011), "National assessment of city delivery efficiency 2011 - Office performance: Management advisory report"

[60] The study also considered simply comparing performance ratios, such as labour cost per item, but concluded that it would be too difficult to control for differences between units.

[61] In line with expectations, the largest estimate came from DEA while the smallest was from SFA.

[62] For instance, it claimed that a translog functional form would have been more appropriate than the more restricted Cobb-Douglas, and that a different assumption should have been made about the distribution of inefficiency in the SFA regressions. See Oxera (2006) "Issues arising in assessing the relative efficiency of delivery offices and mail centres", or Moriarty et al. (2006), "Econometric analysis of the efficiency of Royal Mail units and the implications for regulatory policy", in: Crew, M and P Kleindorfer eds *Liberalization of the Postal and Delivery Sector*.

Following the 2006 Postcomm price control review, a number of studies examined the approach to internal benchmarking.[63] These studies find that inefficiency and economies of scale are particularly difficult to distinguish with only one period of data, and that such analysis will consequently overstate true inefficiency. However, the precision of inefficiency estimates can be improved by making use of panel data, with observations on the same units in different time periods.[64]

3.1.4.3. Suitability for postal industries

Internal benchmarking is particularly well-suited to postal industries because of the presence of a large number of comparable units (such as mail centres and delivery offices) within postal operators. As long as the relevant data are collected and are sufficiently reliable, they could provide a large and consistent dataset, which would be very suitable for internal benchmarking. And while external differences may be less problematic than under international benchmarking (see Section 3.1.2), it will still be important to adjust for environmental differences that may affect costs (such as volumes and product mix, service quality, the nature of the area covered, the extent of automation, etc.).

3.1.5. Function benchmarking

3.1.5.1. Description

Function benchmarking is used to assess the efficiency of specific overhead functions, such as IT, employment costs or HR, by making focused comparisons against similar companies. Such analyses can be useful in understanding the size of the efficiency gap, even though the assessment is focused on particular categories of overhead and management costs. Function benchmarking can be used to investigate potential specific sources of inefficiency and provide supporting evidence to a more comprehensive analysis.

3.1.5.2. Practical experience

Function benchmarking has been used frequently in price control reviews for UK regulated industries, with studies used by Ofgem, ORR, Ofcom and the CAA, as well as by Postcomm and the Guernsey Competition and Regulatory Authority (GCRA) in postal industries. These regulators have conducted studies to benchmark a number of different overhead cost categories, including finance, facilities management, IT and employment costs.

As these functions are carried out within many firms, there is a potentially large set of comparators. Often, studies have made use of large, curated datasets of costs incurred by comparator firms for specific functions. For instance, the studies commissioned by the CAA to assess BAA's corporate overheads compared its finance costs to 400 comparators in the

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[63] For instance, Harman et al. (2010), "The effect of falling volumes on traditional efficiency analysis", in: Crew, M and P Kleindorfer eds *Heightening Competition in the Postal and Delivery Sector* and Cazals, et al. (2012), "A panel data analysis of inefficiency and heterogeneity in the postal sector", in: Crew, M and P Kleindorfer eds *Multi-modal Competition and the Future of Mail.*

[64] Harman et al. (2010) argue that it is difficult to disentangle economies of scale from underlying inefficiency without panel data. Cazals et al. (2012) use six years data for Royal Mail delivery offices and a variety of SFA specifications.

US and Europe, and compared its facilities management costs to 40,000 properties in the UK (operated by 50 occupiers), both using pre-existing datasets.

Analyses for regulators have tried to ensure that comparators are sufficiently similar. For example, Ofgem restricted its attention to firms of a comparable size to UK energy companies in making its comparisons. The CAA's consultants noted the difficulty in identifying comparators for air traffic control officers' (ATCO) wages as the job requires a unique skill set, and eventually chose to use higher-skilled rail network controllers or ATCOs in other countries.

Studies have often made comparisons on the basis of simple productivity measures, for example comparing total finance cost as a proportion of net revenue, or total occupancy cost per square metre to different points in the distribution of the comparator dataset. The choice of which metrics to examine can affect the results. For example, the CAA's consultants found NATS En Route plc's (NERL's) finance function to be efficient as a whole, but some metrics based on sub-processes indicated inefficiency.[65]

Where costs are higher than the benchmark, this is taken as evidence of inefficiency. Studies have often taken the implied savings that would be made from reaching the benchmark as scope for efficiency improvement, but in other cases it has been recognised that these savings may not be achievable in practice. For example, the CAA's consultants found NERL's facilities function to be inefficient against the benchmark, but this was often due to restrictions outside of management's control (for example security restrictions preventing subletting to third parties).

3.1.5.3. Suitability for postal industries

Function benchmarking is suitable for application in postal industries, and there are no significant advantages or disadvantages relative to the use of this methodology in other regulated industries. During the review of Royal Mail's 2006 price control, Postcomm's consultants benchmarked a number of aspects of staff costs (including pay levels, absence and attrition rates), along with other overhead categories such as finance, legal, marketing and human resources.[66]

3.2. Time Series

3.2.1. Overview

Studying historical efficiency improvements, either in the regulated firm itself or in comparable industries, can give an indication of a reasonable rate at which efficiency improvements might be made in future.

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[65] NERL is the provider of en route air traffic services in the UK.

[66] Further details of the function benchmarking carried out for Postcomm during the 2006 price control review are contained in Appendix A.6.2.3.

The results could either reflect the scope for frontier shift or total (i.e. catch-up and frontier shift) efficiency improvements, depending on which industries are considered. For example, examining historical efficiency improvements in competitive industries gives an indication of only frontier shift improvements, as competitive firms are likely to be operating on or close to the efficiency frontier. Studying trends in regulated industries following privatisation will reflect the combined effect of frontier shift and catch-up, if commercial or regulatory pressures have incentivised regulated firms to improve efficiency and move closer to the efficiency frontier.

A limitation of time series analysis is that the historical experience in certain industries, or even of the regulated firm itself, might not provide a realistic picture of what should be expected in the future. It is crucial to take account of, and if necessary adjust for, the specific circumstances facing the regulated firm, and understand the ways in which these differ from the comparator firms or time periods. For example:

- a firm may have experienced rapid catch-up efficiency improvements as a result of specific initiatives that cannot be reproduced in future;[67]
- a firm may have incurred certain additional costs (or enjoyed savings) that are unrelated to efficiency and are not expected to occur again;[68] and
- for a firm with economies of scale, unadjusted changes in productivity may not provide a realistic benchmark for efficiency.

Time series studies could examine one or more of a number of metrics, although two of the most widely used are real unit operating expenditure (RUOE) and total factor productivity (TFP), as described in Box 3.1 above.

3.2.2. International comparators

3.2.2.1. Description

Time series analysis can provide top-down quantitative evidence about previous efficiency improvements achieved by international firms in the same industry. In theory, this could be useful when there are no relevant domestic comparators, though any analysis would need to give careful consideration to differences in operating environments, such as whether the comparator firms are at the same stage of modernisation, whether differences in the regulatory environment create different incentives to improve efficiency, or industrial relations issues.

[67] For example, Australia Post argued during its 2008 price notification that it had moved from a period of technical advancement to a phase of sustained process improvement, making future efficiency gains more difficult to obtain than those achieved in the past. See Section A.1.3 for further information.

[68] For example, Ofcom made adjustments to BT Openreach's past performance to account for certain historical cost savings that would not occur in the future (see Section B.5.2.3), while ORR adjusted Network Rail's historical performance to account for additional costs following the Hatfield derailment (Section B.4.2.3).

3.2.2.2. Practical experience

Time series efficiency analysis using international comparators has not been used in the most recent price control reviews by UK regulators, and was only briefly considered by a study for Postcomm during the 2006 price control review. This study considered historical annual changes in RUOE in a selection of European countries over the period 1998-2003, and noted an average decline in unit costs of 1.8 per cent over the period. However, after adjusting for volume effects found an annual increase of 0.8 per cent, indicating that the results are sensitive to economies of scale adjustments. There was also little commonality in the evidence between countries, with volume adjusted RUOE changes ranging from -7 per cent a year to +7 per cent a year. Eight countries recorded real reductions and eleven countries recorded increases. Postcomm's consultants concluded that the results were difficult to interpret due to differences in operating circumstances between Royal Mail and its European comparators.

3.2.2.3. Suitability for postal industries

The limitations that are likely to have discouraged regulators from using international time series analysis in recent reviews apply equally, if not more so, in postal industries. Different stages of modernisation and liberalisation between countries may make it more difficult to compare efficiency gains quantitatively, and it may be especially important to control for economies of scale and changes in product mix, as well as labour relations issues that may contribute to cost asymmetries.

3.2.3. Other UK regulated industries

3.2.3.1. Description

Historical rates of efficiency improvement achieved by companies in other UK regulated industries could provide useful information on a reasonable rate of efficiency improvement for Royal Mail. This is based on a view that, across a number of previously state-owned industries in the UK, a relatively similar set of efficiency improvements might be achieved following industry reform (typically including some or all of market restructuring, economic regulation, privatisation and liberalisation). Studies carried out for other regulators have looked at the rates of productivity growth achieved, and also how these have varied, for example depending on the time since privatisation.

3.2.3.2. Practical experience

Historical efficiency improvements realised in UK regulated industries have been examined in very similar studies for Postcomm and ORR.[69] The study for Postcomm considered time series of operating expenditure in other UK regulated industries in order to provide a high-level indication of the scale of potential future efficiency savings. It examined both historical average RUOE efficiency gains in UK regulated industries along with the corresponding efficiency targets over the same time period, finding that regulated firms have outperformed

[69] A number of similar studies were commissioned by other UK regulators, including Ofwat, Ofgem and the CAA, in previous reviews.

their savings target on average. ORR considered a very similar analysis during Network Rail's most recent price control, which examined historical RUOE reductions in other privatised, price regulated UK utilities.

Postcomm's study noted the need to consider the extent to which its findings could be applied to Royal Mail, which included deciding on the extent to which it was likely to experience efficiency improvements due to the 'privatisation effect'. It noted that Royal Mail was at an early stage in the liberalisation process, and therefore that "significant catch-up gains should still be available".[70] ORR used a similar approach to account for the privatisation effect, in particular treating the effects of the Hatfield derailment and the ensuing higher expenditure as having 'reset' Network Rail to pre-privatisation levels of efficiency.

ORR did not rely heavily on the results of this analysis, but instead used them as evidence in support of its overall efficiency targets. In the case of Postcomm, while its consultants drew on a range of different methods, their conclusions from the top-down analysis were in line with the rates of improvements achieved by other regulated firms, and their overall conclusions from the study as a whole were consistent with the bottom of this range.[71]

3.2.3.3. Suitability for postal industries

Time series analysis of other regulated firms can provide an estimate of the potential rate of efficiency improvement of postal operators. This method may be particularly useful now that many other regulated industries have been through earlier processes of privatisation, liberalisation and regulation, which provides a source of easily available data.

There is a similar need for care in applying the results of this method to postal industries as for other time series methods. Royal Mail's case is also unusual in that it has not (yet) been privatised, though it has faced competition as well as pressure from falling overall demand. The timing and order of reforms (including privatisation, liberalisation and the introduction of regulation) affect how the evidence might be relevant to the postal industry.[72]

3.2.4. Regulated firm

3.2.4.1. Description

Examining the historical efficiency improvements made by the regulated firm itself might provide a further source of information on a reasonable rate for future improvements. Indeed, some commentators have argued that price caps should be set mainly on the basis of long-

[70] LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", paragraph 21.30.

[71] *Ibid*., paragraphs 21.30 to 21.35, and 26.35 to 26.40.

[72] For a fuller discussion, see Holder, S and H Smith (2012), "Privatization: could the benefits seen in other network industries be realized in postal industries?", in: Crew, M and P Kleindorfer eds *Multi-modal Competition and the Future of Mail.*

term industry-wide trends.[73] But others (including regulators in Europe and Australasia) have adopted a more pragmatic approach, often taking information from a wide range of sources, including many sources specific to individual regulated firms.

3.2.4.2. Practical experience

Several postal regulators have examined the previous efficiency performance of the regulated firm in setting price controls, and Ofcom has examined similar evidence in determining BT's regulated charges for certain services.[74] Most studies have focused on RUOE as a measure of efficiency, although other metrics (such as headcount, overtime levels or mail volumes per employee) have also been used. Studies have also frequently adjusted the relevant metrics for economies of scale and changes in product mix.

An example of the application of this method in postal industries is a study carried out for Postcomm in its 2006 price control review. Postcomm's consultants examined changes in Royal Mail's RUOE over the period 2002/03 to 2005/06. The study noted the importance of ensuring that the historical cost data are consistent over time, and made adjustments to exclude certain expenditures (such as one-off costs), as well as to account for volume effects. LECG considered the results to be a lower bound for future efficiency improvements, on the basis that it expected Royal Mail to face stronger competitive pressures in future than it had previously.

Similarly, ANACOM, the Portuguese postal regulator, has examined Correios de Portugal's historical RUOE, along with a number of metrics such as unit labour cost and revenue per item, adjusted for changes in product mix and volume. The ACCC has also examined historical efficiency improvements.[75]

Ofcom placed significant weight on BT's previous efficiency performance (along with its business plans) in LLU/WLR and leased line charge controls, on the basis that BT-specific data are more reliable and applicable than other data sources.[76] Similar to Postcomm's approach, it examined average cost reductions, having excluded certain one-off costs.[77]

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[73] A well-known paper by Bernstein and Sappington ("Setting the X Factor in Price-Cap Regulation Plans", *Journal of Regulatory Economics*, 1999) suggests that the X factor should reflect differences in TFP growth and input price inflation between the firms in the relevant industry and firms in the rest of the economy. However, they also acknowledge that an additional "customer productivity dividend" or stretch factor might be appropriate when structural change (such as a switch from rate-of-return to price cap regulation or a significant increase in competition) are expected to motivate a firm to improve its realised productivity growth rate. They give the example of the US Federal Communications Commission, which included a customer productivity dividend of 0.5% per year in its price cap plan for AT&T.

[74] It used this evidence in both the LLU/WLR and leased lines price control reviews.

[75] We note, however, that the ACCCs' role is to consider requests for price changes. So its approach is often determined by the nature of the evidence submitted by Australia Post in its original application.

[76] Ofcom used a measure that included capital as well as operating costs. The 2009 LLU/WLR charge control resulted in an appeal to the Competition Commission, which stated that both historical analysis of Openreach efficiency and the Openreach budget provide useful indicators of the scope for future efficiency reductions.

[77] While Ofcom did not consider that a cost being one-off in nature is a sufficient reason to exclude it in general, it concluded that certain exclusions were justified in these charge controls.

3.2.4.3. Suitability for postal industries

While time series analysis of previous efficiency gains achieved by the regulated firm can be applied to postal operators, it requires careful application, for example to take account of the impact of changes in volumes and product mix. Given falling volumes in postal industries, the economies of scale adjustment may also need to take account of possible cost asymmetries, particularly if postal operators experience difficulties in shedding labour. It will also be important to take account of different stages of modernisation, and changes in the regulatory and competitive environment.

3.2.5. TFP growth – comparator sectors

3.2.5.1. Description

Long term historical trends in total factor productivity (TFP) in representative sectors of the UK economy (chosen to match the nature of activities undertaken by the regulated firm) are often used to provide an estimate of potential efficiency improvements.[78] In most cases, long term trends have been calculated for largely competitive sectors of the economy, so that the TFP analysis provides an estimate of potential frontier shift efficiency improvements.

3.2.5.2. Practical experience

TFP trends across sectors have been examined by a number of regulators, both in other UK regulated industries and in postal industries internationally, in the context of price control reviews. While in principle, TFP is defined as the ratio of composite measures of outputs to inputs, in practice studies have generally used TFP estimates from the widely-used EU KLEMS dataset.[79]

Many regulators, including Ofgem, ORR and Postcomm, have followed a similar approach, constructing a TFP index for the regulated firm by identifying sectors of the economy that are similar in nature to the activities it carries out.[80] Postcomm's consultants, for example, first identified the main aspects of Royal Mail's operations, such as mail centres, vehicles and property, and matched these to the manufacturing, transport and construction sectors respectively. The overall TFP measure for Royal Mail was a weighted average of the long term growth rates (adjusted for volume effects) for TFP in each of these sectors, with weights based on the share of Royal Mail's overall cost base.[81] In order to compare this with the

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[78] By examining TFP over a sufficiently long period of time, and using aggregate sector-level data, any productivity improvements are unlikely to reflect catch-up efficiency gains but instead give an estimate of how the efficiency frontier has shifted over time.

[79] The EU KLEMS project, financially supported by the EC, "aims to create a database on measures of economic growth, productivity, employment creation, capital formation and technological change at the industry level for all European Union member states from 1970 onwards." See www.euklems.net

[80] Royal Mail responded to analysis carried out for Postcomm by stating that total factor productivity analysis involves a degree of subjectivity.

[81] The study considered two indices, which assigned different sectors to each of Royal Mail's components. It used these to suggest a range of reasonable future improvements.

results from other top-down approaches, Postcomm's consultants also calculated an equivalent rate of change in RUOE.[82]

If, as is usual, the comparison is based on mainly competitive sectors of the economy, then analysis of TFP growth will indicate the scope for frontier shift efficiency improvements only. Ofgem therefore added the estimated TFP improvements to separate estimates of potential catch-up efficiency to arrive at total efficiency targets.[83] ORR did not treat its TFP in this way, instead simply interpreting its TFP conclusions as supportive of its overall efficiency conclusions.

3.2.5.3. Suitability for postal industries

Analysis of TFP growth in comparator industries is as suitable for postal industries as for other regulated industries, and can be applied by following a similar approach to selecting appropriate comparator sectors of the economy (although this may require an element of judgement). For example, during the 2006 price review, Postcomm's consultants matched Royal Mail's activities to two different sets of comparator sectors, and used the results from both scenarios to suggest a range of potential improvements, reflecting uncertainty over the most appropriate comparators.[84] Postcomm's consultants stated that, because of the approximate nature of the estimate, it was important that it was used as only one of a range of indicators of potential rates of efficiency improvement.[85]

3.3. Expert Review

3.3.1. Overview

An expert efficiency review involves making detailed assessments of aspects of a firm's activities, drawing on specific industry or operational knowledge. This could involve reviewing the firm's business plan, to assess whether its content is sufficiently challenging and well-justified, or a more structured assessment of the regulated firm's working practices and processes, perhaps including benchmarking of individual processes. In practice, the approaches are closely related and often used in conjunction with each other.

Expert review has the potential to provide an efficiency assessment that is tailored to the specific circumstances of an individual firm, and can provide more detailed information than top-down studies about where any efficiency savings might be made. In most cases, we would expect the savings identified by such reviews to be largely or wholly catch-up savings.

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82 This involved adjusting for long-term capital substitution and changes in input prices. See Section A.6.2.7 for further details.

83 NGGD challenged this approach, as it argued that TFP estimates already contain some catch-up improvements which Ofgem resultantly double counted. But Ofgem rejected this argument, as it did not believe that there will be systematic catch-up over sufficiently long time periods.

84 Further details of this analysis are contained in Appendix A.6.2.7.

85 LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, section 24; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Top-down final conclusions", 23 January 2006, section 3.

3.3.2. Business plan

3.3.2.1. Description

The regulated firm's business plan can provide information on the rate of future efficiency improvement that the firm believes is achievable (and is willing to reveal to the regulator and other parties). Industry or operational experts might undertake a detailed review of the business plan, in order to verify that the targeted efficiency assumptions are sufficiently challenging and perhaps also to identify any additional initiatives that could provide further improvements. Alternatively, especially if they are carrying out other types of analysis to assess potential future efficiency gains, regulators might simply take the savings implied by the plan as a useful indication of the firm's own view of the efficiency improvements it can reasonably make.

3.3.2.2. Practical experience

Business plans have often been used by regulators in price control reviews, having been used both as a source of information in setting baseline costs (for instance by Ofwat and Ofgem) and to inform the regulator's view on a reasonable rate of efficiency improvement (such as in a number of postal industries, including in the UK).

Across several industries, regulators have noted the risk of bias in regulatory business plans, as regulated companies have incentives to understate the scope for efficiency savings. Regulators have taken a number of different approaches to address this issue, including:

- using a business plan prepared for internal purposes, not regulatory submission. For instance, Ofcom has used BT's Medium Term Plan (a document prepared by BT for internal planning) during charge controls, as it reasoned that it would be less likely to understate potential efficiency savings than a regulatory business plan;
- providing incentives for truthful revelation in business plans. Both Ofgem and Ofwat have designed mechanisms to reward companies for submitting truthful business plans (whereby firms are awarded a bonus for submitting high-quality and well-justified plans);[86] and
- undertaking a detailed business plan review using operational expertise, making adjustments where it is considered to be insufficiently challenging or justified. For instance, ORR and a number of postal regulators (including Postcomm) have carried out detailed reviews of the regulated firms' business plans, efficiency assumptions and the supporting evidence.

[86] Energy companies submitted business plans to Ofgem during price controls, and Ofgem had the option to fast-track and/or financially reward those firms whose plans it considered to be well-justified. Ofwat used a similar incentive scheme in determining capital expenditure efficiency, whereby firms were financially rewarded if their capital expenditure proposals were demonstrated to be both necessary and accurately costed.

3.3.2.3. Suitability for postal industries

There are a number of examples of review of the regulated firm's business plan in postal industries, as described above and in more detail in Appendix A. The fact that, for some postal operators, important improvements in efficiency are likely to be achieved through specific, easily observable modernisation projects may mean that an independent review of the firm's business plan may be particularly useful.[87] However, the specific and perhaps unique nature of each operator's circumstances (such as the initial level of efficiency and the nature of the constraints faced when trying to modernise) mean that it might be difficult for external reviewers to challenge the firm's assessment of how fast particular improvements can be implemented, or the eventual cost savings that will result, simply on the basis of a review of the business plan. More detailed analysis, as described in the following sections, may therefore be required.

3.3.3. Regulated firm activities

3.3.3.1. Description

Industry or operational experts might undertake a general review of the regulated firm's activities (either at the level of the whole firm or individual processes) in order to assess overall efficiency, and identify any specific initiatives that might lead to improvements. The assessment might involve experts making site visits in order to review processes, or could be based on information provided by the regulated firm.

Falling between the business plan review described above and process benchmarking as described below, this method involves a review that draws on more information than just the firm's business plan, but falls short of a formal comparison with the processes adopted by individual operators thought to exemplify best practice.

3.3.3.2. Practical experience

Expert reviews of the regulated firm's operations have been used by a number of postal regulators as well as to a lesser extent in Ofgem's price control reviews. The reviews have varied in their scope and focus, ranging from broad review of processes and best practices to a more focused examination of the efficient costs for particular activities.

Expert review has been applied most broadly in post. Efficiency reviews for the small postal operators in Jersey and Guernsey involved assessment of general operations based upon site visits and information requests, and identified specific opportunities for efficiency improvement. Postcomm's consultants conducted a less comprehensive assessment for Royal Mail for the 2006 price control review to supplement its review of Royal Mail's Strategic Plan. This review identified a number of initiatives that could generate efficiency savings, such as delivery route optimisation and scaling back weekend operations, based on visits to a small number of Royal Mail sites,[88] meetings with management and information

[87] These include initiatives such as extending automation in mail centres and delivery offices, and introducing more flexible labour practices (such as increasing the proportion of part-time labour).

[88] The consultants visited four delivery offices, four mail centres and the National Distribution Centre.

requests. Ofgem carried out a smaller scale expert review, based on a small number of cost areas (such as street works), to supplement its cross-sectional analysis.

3.3.3.3. Suitability for postal industries

In principle, an expert review of the regulated firm's activities is well suited to postal operations, given the labour-intensive (i.e. not asset-based) and observable nature of many processes, and the discrete nature of some potential improvements (e.g. different types of automation). In practice, however, if something more than a general review of the firm's business plan is required, then process benchmarking (as described in the next section) might provide a more appropriate next step, especially for large postal operators, rather than a general review that simply relies on the general knowledge and experience of those undertaking the task.

3.3.4. Process benchmarking

3.3.4.1. Description

Process benchmarking involves making a specific assessment of the way the regulated firm carries out particular processes compared with other operators (which may be selected because they are thought to represent best practice). These comparisons can be based on specific indicators (such as automation levels) for a group of comparable firms, or more detailed qualitative comparisons with individual firms that are believed to be applying best practice.

As with other cross-sectional efficiency methods, process benchmarking is used to identify catch-up rather than frontier shift efficiency improvements. Reviewers will also need to consider carefully whether best practice techniques used elsewhere are suitable for the operator in question, taking account of differences in operating environments and other constraints (including labour relations issues).

3.3.4.2. Practical experience

Process benchmarking has been used in post and other regulated industries. Postcomm used surveys and case studies of international operators to identify best-practices for a number of specific processes during the 2006 price control review. For example, it compared Royal Mail's proposal to implement collection route optimisation software and concluded that, if implemented, it would be ahead of best practice.[89]

ACCC has used benchmarking in a similar way to assess Australia Post's modernisation plans. It noted that the proposed deployment of automated walk sequencing appeared slow and small-scale compared to what had been achieved by other national mail operators (including USPS, Deutsche Post and Royal Mail).[90]

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[89] See Appendix A.6.2.10 for further details.

[90] See Appendix A.1.2.5 for further details.

The CAA also used process benchmarking during BAA's most recent price control review, having commissioned a study to examine the relative efficiency of specific operating activities and processes (such as security screening and baggage management) at BAA airports. The analysis involved quantitative benchmarking against 14 comparator airports, using a different set of comparator airports for each process, with the aim of ensuring comparability in terms of cost drivers relevant to the process in question.[91] It made comparisons on the basis of both physical and financial simple productivity measures, combined with a more qualitative assessment of good practices observed in other airports that might be applicable in BAA.

3.3.4.3. Suitability for postal industries

Process benchmarking could be considered to be particularly well-suited to postal industries, and there are examples of its application, as described in section 3.3.4. The higher proportion of labour (rather than capital inputs) used in postal industries, together with the nature of the processes (such as labour practices and utilisation rates), means that efficiency may be more readily observable than in asset intensive industries, making process benchmarking easier and more effective. Nevertheless it will be important for reviewers to take account of factors, such as labour relations or differences in operating environments, that may affect an operator's ability to implement improvements or the cost savings that are likely to result from them.

3.4. How Methodologies Have Been Used Together

All regulators have combined a number of different approaches to efficiency assessment in the context of price control reviews, with the number of methods used varying between industries. In cases (such as electricity, gas and water) where there are a number of comparable domestic firms, cross-sectional efficiency assessments based on econometric analysis have played a major role in recent price reviews (even though the regulators' conclusions may also have been significantly affected by judgements, for example about what level of relative performance to use as the benchmark or the speed with which any efficiency gap can be closed). This has been supplemented by additional analyses conducted to address specific questions. For example, Ofgem used expert review of certain activities that had been excluded from the main econometric analysis, and function benchmarking of business support costs (for which it made separate allowances).

In industries where such comparisons are not possible, regulators have typically commissioned a range of different studies to assess the scope for efficiency improvements, and the overall efficiency target has been based on a judgement that reflects both the findings across all of the studies and the perceived robustness of individual pieces of evidence. For example, the CAA, ORR and Postcomm all considered the findings from a wide range of

[91] For example, in constructing a comparator dataset for central search security screening, it selected airports with a similar passenger profile, scale and statutory requirements.

studies in the most recent price control reviews.[92] While ORR made direct use of the numerical estimates from international benchmarking, this was justified by the results being consistent with the findings from other studies.

Many regulators have commissioned a mixture of top-down and bottom-up studies. This is an attractive combination, as the top-down studies provide a high-level view of the overall efficiency improvements that might be available, though not necessarily based on detailed investigation or even information that is specific to the firm itself. Bottom-up studies can then provide specific examples of how these improvements might be achieved, and thus either support or question the assumption that a particular rate of overall efficiency improvement should be achievable.

Among the top-down studies, some regulators have used separate methods to estimate frontier shift efficiency improvements, based on TFP growth in comparable sectors. These estimates can then be combined with separate estimates of catch-up efficiency to provide an overall efficiency target. For example, Ofgem added its TFP estimates of frontier shift to the firm-specific catch-up targets from its cross-section analysis to arrive at the total efficiency target for the price control period.

For more specific evidence of particular opportunities to improve efficiency, regulators have generally used one of the methods focused on the firm's operations (review of business plan, review of firm's activities or process benchmarking), often combined with function benchmarking to assess the scope to reduce overhead or management costs. For example, the CAA used function and process benchmarking to assess BAA's efficiency in the 2009 price control, while Ofgem and ORR have combined function benchmarking with expert review of activities. In Postcomm's case, this was also supplemented by internal benchmarking, which Postcomm's consultants used to support the conclusion that the more ambitious of its two bottom-up scenarios was the most relevant.

[92] Postcomm's consultants stated that no individual method could provide a precise estimate of possible efficiency savings, and all required judgement to determine the implications for Royal Mail. By using a number of different methods, they avoided placing undue weight on any single piece of analysis. See LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, paragraph 1.47, Paragraphs 1.61 to 1.65; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Top-down final conclusions", 23 January 2006, paragraph 1.34.

4. Suitability for Application to Royal Mail

4.1. Context

The seven year regulatory framework that Ofcom introduced in 2012 gives Royal Mail greater pricing flexibility and commercial freedom than it had before. Alongside measures to ensure that universal services remain available and affordable to all and, where appropriate, to promote effective competition, Ofcom will be monitoring Royal Mail's performance under the new regulatory framework. It may consider re-regulation if the incentives to deliver greater efficiency are demonstrably failing.[93]

Ofcom's monitoring will cover the financial performance of Royal Mail (particularly with respect to the universal service), operational performance (i.e. efficiency), customer and consumer metrics such as quality of service and affordability of universal services, and competition. On efficiency, Ofcom has stated that:

> "we expect Royal Mail to improve efficiency levels and to sustain such improvements thereafter. While there are many ways to measure efficiency, our focus will be on the level of costs. It would not be in keeping with our regulatory objectives if Royal Mail were to return to a position of sustained profitability, but had done so solely as a result of price rises, and not cost reduction. Conversely, a situation where Royal Mail is able to demonstrate a healthy level of profitability that has been driven by cost savings or business improvements would be consistent with our regulatory objectives, and would not warrant our intervention."[94]

Ofcom has said that it does not consider it necessary at this stage to set out its own efficiency targets. However, it does not rule out carrying out its own analysis in future, if the monitoring regime identifies potential concerns about operating efficiency, to inform its view of what a "good" outcome for operating performance might look like.[95]

In Section 4.2, we consider the suitability of the different methods used by postal and other economic regulators for helping Ofcom to form an initial view of what might represent a reasonable rate of improvement. We focus on sources of information that are already available, or could be developed with relatively little upfront work, and also comment on any implications for Ofcom's monitoring of Royal Mail's efficiency.

There are several situations in which Ofcom might need to carry out a more detailed assessment of the scope for Royal Mail to improve its efficiency. These include:

- the case where Royal Mail's performance falls short of Ofcom's initial view of a reasonable rate of improvement. Further analysis could then be carried to investigate the

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93 Ofcom (2011), "Securing the universal postal service: Proposals for the future framework for economic regulation", paragraph 1.38.

94 Ofcom (2012), "Securing the universal postal service: Decision on the new regulatory framework", paragraph 1.35.

95 *Ibid.*, paragraphs 7.55 to 7.61.

reason for this shortfall – whether Ofcom's initial expectations were too optimistic or whether Royal Mail really has underperformed;

- a review of the impact of end-to-end competition. Ofcom may need to carry out a more detailed analysis of the potential for Royal Mail to improve its efficiency as well as review the progress it has made as part of any future review of the need for intervention in relation to end-to-end competition.[96] This would inform a number of aspects of Ofcom's review, including:[97]
  - the expected financial position of Royal Mail, taking account of expected future efficiency savings;
  - Royal Mail's potential commercial response to end-to-end competition, including the impact of stronger incentives to improve efficiency; and
  - the extent to which any poor current or expected future financial performance was the result of factors within Royal Mail's control, including an assessment of whether Royal Mail had achieved (or was expecting to achieve) a reasonable rate of efficiency improvement.
- the possible re-introduction of a more comprehensive price control. Ofcom has not ruled out re-regulation during the current seven year period if the incentives for Royal Mail to improve its efficiency are demonstrably failing; and
- the establishment of a universal service compensation fund, for which Ofcom would need to estimate the net cost of the universal service and consider whether Royal Mail was complying with its universal service obligations in a cost efficient manner.[98]

In Section 4.3, we consider the methods that Ofcom could use in these situations. In the first two cases, Ofcom will need to carry out a more detailed assessment in order to reach a considered view on whether Royal Mail could improve efficiency at a faster rate than it is currently achieving (or is planning to achieve). But even more work will be required if Ofcom decides that it is necessary to implement a price control or establish a compensation fund, as it will need to reach a conclusion on the specific rate of improvement that it believes should be reasonably achievable by Royal Mail.

In all of these situations, Ofcom's main interest will be the rate of efficiency improvement, rather than the absolute size of any efficiency gap. Some of the methods described in Section 2 have the advantage that they are focused on the rate of improvement over time, whereas others may provide information mainly about Royal Mail's current level of efficiency. The latter may still be useful, however, as:

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[96] Ofcom cannot prevent end-to-end competitors from entering the market, but it can take measures such as imposing general universal service conditions if this is necessary to secure the provision of a universal service, or introducing a fund to compensate Royal Mail for the net cost of providing the universal service.

[97] Ofcom (2013), "End-to-end competition in the postal sector: Final guidance on Ofcom's approach to assessing the impact on the universal postal service", paragraphs 4.7, 4.12 and 5.29.

[98] *Ibid*., paragraph 6.30.

- they can provide confirmation that a significant efficiency gap still exists. Even though there may be little doubt at present that Royal Mail has scope to improve its efficiency in the short to medium term, the situation may change in future; and
- some methods may shed light on particularly important sources of inefficiency. These may be important because some inefficiencies may be large in absolute terms (so specific analysis of these is useful), or because tracking Royal Mail's progress in addressing specific inefficiencies might yield useful insights.

4.2. Ongoing Assessment and Monitoring of Efficiency

4.2.1. Reasonable rate of efficiency improvement

Among the methods of assessing potential efficiency improvements described in Section 3, many would require Ofcom to carry out significant new analysis, and some would also need a degree of interaction with Royal Mail specifically on efficiency performance. For this reason, these methods are less well suited to a situation where Ofcom is simply monitoring Royal Mail's performance, and where it requires only a general indication of what rate of efficiency improvement might represent a "good" outcome. We consider such methods in Section 4.3, which deals with the case where Ofcom needs to carry out a more detailed assessment or perhaps even a comprehensive price cap review. These include an active review of Royal Mail's business plan, some types of internal benchmarking, process and function benchmarking, international time series comparisons, and cross-section comparisons with other postal operators (either in the UK or overseas).[99]

In this section, we consider how Ofcom could reach an initial view of what might represent a reasonable rate of efficiency improvement and whether Royal Mail's performance raises any possible concerns. First we describe the potential sources of information that Ofcom could draw on to inform its initial view. Then, in Section 4.2.2 we provide some more specific comments on how Ofcom might use these methods as part of its monitoring regime.

One readily available source of information that might help to inform Ofcom's initial view of potential efficiency improvements is Royal Mail's business plan. As this is Royal Mail's own plan, it is a rate of change that Royal Mail believes (or believed at the time the plan was constructed) to be achievable, given the realities of its business and the constraints it faces. However, an important disadvantage is that, as discussed in Section 3.3.2, regulated firms have strong incentives to understate the efficiency improvements achievable, and indeed this has led to some regulators adopting specific measures to attempt to overcome this bias. Moreover, regulated firms may revise their business plans on a regular basis, in which case it could be difficult for regulators to distinguish between revisions that reflect changing market conditions (or other external factors) and, for example, revisions that simply reflect the firm's poor performance and its failure to achieve its previous targets.

[99] A further disadvantage of some of these methods is that they are focused on the size of the efficiency gap, rather than the potential rate of improvement.

Some of these difficulties might be overcome, for example by engaging independent experts to review Royal Mail's plan. We consider such further analysis in Section 4.3, rather than in this section in the context of Ofcom's monitoring.

In addition to reviewing forward looking business plans, some regulators have examined the evidence of previous efficiency improvements achieved by the regulated firm. In Royal Mail's case, this is unlikely to provide a useful indication of what might represent a reasonable rate of efficiency improvement in future. Ofcom itself, for example, noted that under the previous regulatory regime Royal Mail was unable to improve efficiency at the rate expected either by the regulator or by its own internal targets.[100] However, the rate at which Royal Mail was able to improve efficiency in the past could provide an approximate lower bound of what Royal Mail might reasonably be expected to achieve in future.

As noted in Section 3.1.4, several postal regulators (including Postcomm) have carried out internal benchmarking analyses, for example comparing the efficiency of individual mail centres or delivery offices within a single firm. Econometric analysis is often used to control for the impact of external factors (such as differences between urban and rural areas, or differences in the volume and mix of mail), and we discuss this approach further in Section 4.3 as this approach would require significant initial work.

An alternative approach to controlling for external factors would be to use data on mail volumes and expected labour inputs that Royal Mail already collects to calculate its "productivity" performance indicator. This measure (which is currently provided to Ofcom on an aggregated basis) uses a comparison between:

- actual labour hours spent on delivery and processing activities at delivery offices and mail centres; and
- Royal Mail's "workload" measure of the number of hours that should be required to handle the relevant volume and mix of mail (see Appendix A.6.4).

Similar ratios calculated for individual delivery offices and mail centres could allow a comparison of labour productivity rates, and thus provide an indication of the scale of improvement achievable if poorly performing units can be brought closer to Royal Mail best practice.

This would provide information about the size of the efficiency gap, rather than the rate at which Royal Mail can improve its efficiency,[101] or indeed the proportion of the observed

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[100] Ofcom (2011), "Securing the universal postal service: Proposals for the future framework for economic regulation", paragraph 1.23.

[101] As noted in Section 4.2.2, if Ofcom were to monitor Royal Mail's progress in improving the efficiency of poorly performing units, then this could provide useful information for future assessments of the reasonable rate of improvement. In principle, it is possible that past data on the relative efficiency of individual delivery offices or mail centres, and how this has changed over time, could also give some insights into potential future rates of improvements. At present, however, this would require a retrospective assessment drawing on past data, which might require additional work to assemble and process the data. This approach would also raise questions about whether past data were reliable and sufficiently consistent over time (Royal Mail has in the past expressed reservations about the quality of some of the data, for example identifying 240 delivery offices where large recorded volume changes suggested possible

efficiency differences that might be eliminated even in the long term. Nevertheless, this could provide useful evidence in future years to help confirm whether or not a significant efficiency gap still exists. And, as discussed in Section 4.2.2, there may be some advantages to Ofcom from monitoring how productivity differences between individual mail centres or delivery offices change over time.

An advantage of this approach is that Royal Mail's workload measure already adjusts for the effect of changes in volumes and product mix (on a basis that also is used for internal management purposes), and for the effect of some of the differences in operating environments such as physical layouts and delivery route characteristics.[102] But there are some other disadvantages, including that:

- it is based on labour hours rather than financial measures, and therefore would not reflect cost inefficiencies caused by high rates of pay (or to inefficient use of materials or capital inputs);
- it covers the operational processing and delivery activities only, so does not provide information about efficiency improvements achievable elsewhere in Royal Mail; and
- it does not address improvements that may be achievable by even the best performing Royal Mail mail centres and delivery offices (and therefore may provide a conservative estimate of the efficiency gap).

The other readily available sources of information on potential rates of efficiency improvement are from other regulated industries or other sectors of the economy. As described in Section 3.2.3, some regulators (including Postcomm) have used the efficiency gains achieved by other UK regulated firms as a useful high-level indicator of the rates of improvement that might be achievable in their own industry. As a top-down method, this may help to address the commonly-observed problem that bottom-up methods tend to underestimate potential efficiency improvements. It reflects the general improvements that firms have managed to achieve following some combination of regulation, liberalisation, market restructuring and/or privatisation, and which would be difficult to predict using a bottom-up or similar method that relies on finding evidence of specific potential improvements.

As a number of other regulators have drawn on the general experience of regulated firms, there is already a body of existing evidence (from previous studies) that Ofcom could draw on as a "do minimum" option, in order to inform itself about the improvements achieved in other industries. One potential disadvantage of relying on previous studies, however, is that some of the existing evidence may not have been adjusted for the specific circumstances

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measurement problems), and also whether improvements achieved in recent years were a reliable guide to what Royal Mail might be able to achieve in future.

[102] It would be useful for Ofcom to review these adjustments, how they are carried out and the evidence on which they are based, in order to consider the possibility that observed productivity differences will still reflect factors other than efficiency (for example, because of external factors that are difficult to measure, or because very large differences in volumes or product mix might have a greater or lesser impact on costs than that suggested by Royal Mail's workload measure).

facing the postal industry (such as the impact of volume decline and the high level of fixed costs).

Unlike the methods described above, this approach does not use information or data specific to Royal Mail. Careful consideration must be given, therefore, to possible reasons why Royal Mail might not be able to achieve similar rates of improvement to those realised by other regulated firms. There are possible reasons why the efficiency improvements achievable by Royal Mail might be either larger or smaller than those achieved by other regulated firms:

- modernisation might offer a source of significant potential efficiency improvements in addition to the general inefficiency associated with public sector ownership and limited exposure to commercial pressures. And even if this is not the case, if further automation leads to a switch from labour to capital inputs, this could mean that changes in RUOE overstate the underlying improvement in Royal Mail's productivity, perhaps to a greater extent than for other regulated firms;
- the impact of volume declines may be an important factor that did not affect other regulated firms, and could mean that Royal Mail will be unable to achieve the rates of improvement realised by some of the most successful firms in the sample.[103] Similarly, the universal service obligation could act as a stronger constraint on Royal Mail's ability to improve efficiency than the obligations that apply to other regulated firms. And even though it has not been privatised, Royal Mail has already been subject to both economic regulation and competition for a number of years.

One possible approach, therefore, might be for Ofcom to reach a view on whether it considers that a reasonable rate of efficiency improvement for Royal Mail might exceed, match or fall short of the improvements typically achieved by other UK regulated firms. If, for example, it believed that Royal Mail would not be able to match the improvements achieved elsewhere, then Ofcom might examine the range of improvements achieved by individual firms within the sample, and take a benchmark towards the bottom of the range (such as the lower quartile) as a possible indicator of potential Royal Mail efficiency improvements (after necessary adjustments for volume and product mix changes).

Another method that has been used by many regulators (including Postcomm) is an assessment of long term historical trends in total factor productivity (TFP) in comparator sectors of the UK economy. In most cases, the comparators chosen to represent the activities of the regulated firm are sectors of the economy that are largely or entirely competitive, therefore this method is usually viewed as providing an estimate of frontier shift efficiency improvements only (and not catch up improvements). This limits the potential insights from this method for Ofcom, though it might still be used either:

- alongside a method that addresses catch up improvements only (e.g. internal benchmarking), to generate an estimate of total potential efficiency improvements; or

[103] For example, efficiency improvements that require headcount reductions may be more difficult to implement if Royal Mail is already having to reduce its workforce because of falling volumes.

- to provide a lower bound of what might represent an acceptable rate of efficiency improvement (as a failure to achieve improvements in line with frontier shift would mean that Royal Mail's efficiency gap was increasing).

As with comparisons with other regulated firms, there are already a number of studies of TFP growth available, including LECG's 2005-06 analysis of Royal Mail's efficiency. But the data required for these studies are easily available, and an updated original study would be relatively straightforward to carry out.

Conclusions

Royal Mail's business plan provides a useful indicator, specific to Royal Mail, of efficiency improvements that management regard as achievable. But regulated firms' business plans are often conservative or, in the event of poor performance, may be revised in the light of outturns and no longer reflect the rate of improvement that could be achieved.

Efficiency improvements achieved by other regulated firms provide an alternative benchmark, which may be especially useful if Royal Mail's business plan is likely to be conservative. This shows rates of improvements that have been achieved in practice, though few if any of the firms in the sample were experiencing falling demand. But there are reasons why this may either understate or overstate the improvements reasonably achievable by Royal Mail.

Two further sources - Royal Mail's previous efficiency improvements and total factor productivity changes in relevant sectors of the UK economy – could be viewed as providing a lower bound on the rates of improvement that Royal Mail should be able to achieve.

And while internal benchmarking (using Royal Mail's workload measure to control for external factors) is focused on efficiency levels rather than rates of change, monitoring of disaggregated efficiency indicators could provide useful information and also help to confirm that an efficiency gap still exists.

4.2.2. Monitoring

The main purpose of applying some of the methods described above would be simply to help Ofcom form an initial view about what might represent a reasonable rate of improvement. We consider, in Section 4.3 below, how these and other methods might contribute to a more detailed investigation of Royal Mail's efficiency performance, for example if the improvements that Royal Mail achieves in practice fall short of Ofcom's view of a reasonable outcome.

First, we consider how Ofcom might monitor Royal Mail's progress, in particular to compare outturn efficiency improvements with its view of what might represent a reasonable rate of improvement. Ofcom has stated that its monitoring will focus on cost reductions, rather than details underlying the costs (such as headcount), though it will also need to consider a range of other factors (including volumes, product mix, service quality, modernisation investment

and overall internal targets/modernisation) that may help it understand and interpret operating performance.[104]

For this reason, even if Ofcom's initial view is based partly or wholly on Royal Mail's business plan, we consider the most relevant comparison is with the overall level of efficiency improvement implied by the business plan, rather than whether or not specific initiatives included in the plan have been implemented. In the next section, therefore, we consider possible measures of the overall change in Royal Mail's efficiency. Then in Section 4.2.2.2 we discuss some additional specific indicators that might be useful for Ofcom to monitor.

4.2.2.1. Measuring the overall change in Royal Mail's efficiency

There are two main methods that have been used in the economics and regulatory literature to measure the overall productivity of individual firms:[105]

- academic studies often measure changes in total factor productivity (TFP);[106] and
- regulators and consultants' studies are more likely to examine changes in real unit operating expenditure (RUOE).

Conceptually, TFP is the most appropriate measure of productivity, as it takes account of all inputs and outputs, whereas RUOE excludes capital inputs (and so will overstate improvements achieved through modernisation that substitutes capital for labour inputs) and may use a simple or incomplete measure of output. However, RUOE has some important practical advantages over TFP. It is easier to calculate and, especially in a context where short term changes (such as year-on-year growth rates) are important, it may be less affected by potential measurement errors. TFP, in contrast, requires a measure of the capital inputs used in each period, which will be difficult to measure.[107] In Royal Mail's case, moreover, the relatively high proportion of labour (and other non-capital)[108] inputs means that RUOE may be a more reliable measure of productivity changes than in some other regulated industries.

There are three main components of RUOE, as described in Box 3.1. Any RUOE calculation for Royal Mail would require:

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[104] See Ofcom (2012), "Securing the universal postal service: Decision on the new regulatory framework", paragraphs 7.55 to 7.61.

[105] See Box 3.1 above for an explanation of these measures, and also the closely related measure of real unit operating cost (RUOC).

[106] See, for example, Parker D and Martin S (1995), "The impact of UK privatisation on labour and total factor productivity", *Scottish Journal of Political Economy*, Vol 42 2, p201-220.

[107] This reflects, among other things, the difference between accounting and economic measures of depreciation, and the difficulty of generating economically meaningful measures of asset values.

[108] For example fuel costs, conveyance costs and terminal dues payments to other postal operators.

- total operating expenditure, which could be taken from Royal Mail's regulatory accounts. This could be adjusted to remove the impact of economies of scale, and any exceptional items (or other non-recurring costs) should also be excluded;
- a measure of output, which can be used to calculate unit (rather than total) operating expenditure. In Royal Mail's case, we understand there is a "weighted volume" measure that has been used, for example, in previous benchmarking reports for Postcomm. This, or a similar volume measure that adjusts for product mix by weighting different types of mail according to their estimated marginal cost,[109] is likely to provide a suitable basis on which to track RUOE changes for Royal Mail;
- a price deflator to convert from nominal to real expenditure. Previous studies have used a general price index such as the "all items" Retail Prices Index (RPI), and any RUOE calculated for Royal Mail should probably use a similar approach so that it is consistent with existing evidence.[110]

Changes in RUOE should provide a good practical measure of overall changes in Royal Mail's productivity. RUOE is also relatively well aligned with at least some of the methods described in Section 4.2.1 for assessing potential Royal Mail efficiency improvements:

- it should be relatively straightforward to calculate the changes in RUOE implied by Royal Mail's business plan (using the three components of RUOE, as described above), and the improvements previously achieved by Royal Mail;
- most studies of the gains achieved by other regulated industries focus on changes in RUOE; and
- while estimates of frontier shift efficiency improvements are usually based on TFP rather than RUOE, assumptions could be used to switch from one measure to the other.[111]

When comparing outturn RUOE changes with Ofcom's view of a reasonable rate of improvement, it will clearly be important to ensure this is carried out on a consistent basis. As a first stage, Ofcom should ensure that, as far as possible, the evidence it takes from other sources (whether previous studies or work it commissions or carries out itself) has been adjusted to remove the impact of productivity changes due to volume effects.

For monitoring purposes, Ofcom should then ensure that its view of a reasonable rate of productivity improvement is based on the same set of assumptions about future volume (or product mix) changes as the outturns it monitors. One option would be to calculate all indicators on a "constant volume and mix" basis, so that outturn RUOE changes are adjusted to remove the impact of all volume and product mix effects.

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[109] If weights are based on marginal costs, then this will capture at least some of the likely cost impacts of changes in product mix.

[110] Studies have not generally tried to use more specific price indices, for example to adjust for differences in input price inflation between industries. But when interpreting Royal Mail's RUOE changes, Ofcom should consider whether there is any reason to expect that real input price changes (i.e. the difference between input price changes and general inflation) for Royal Mail are systematically different from those of other firms covered by the available evidence.

[111] The argument for any formal adjustment may be weak, as this method provides only an approximate lower bound for potential efficiency improvements, rather than an accurate central estimate.

In making any such adjustment, Ofcom will need to form a view on the likely implications of changes in volume and product mix. It could draw on information from several possible sources, including:

- the cost relationships implied by Royal Mail's "workload" measure (see Appendix A.6.4), which could provide an estimate of the change in labour inputs associated with volume or mix changes;
- other information that either Ofcom or Royal Mail may have about cost marginality and the relative cost of different products, for example as reflected in existing cost models or from previous research; and
- evidence from the economic literature and other postal industry studies, for example including a number of studies of the extent of economies of density in delivery.

Further analysis could be carried out by Ofcom to compare the cost elasticity estimates suggested by these different sources and, if there are significant differences, to consider whether there are reasons for regarding some estimates as more robust than others.

With information on the cost implications of changes in volume and product mix, it should be straightforward for Ofcom to calculate their impact on outturn RUOE, and remove the effects to arrive at an adjusted (constant volume and mix) indicator.[112]

Alternatively, when forming its view of what might represent a reasonable rate of improvement, Ofcom could make an up-front adjustment for the impact of expected changes in volumes, product mix and other relevant cost drivers, perhaps based on the forecasts in Royal Mail's business plan. If actual volumes and product mix are close to Royal Mail's forecasts, then changes in RUOE can be compared directly with this "reasonable rate" without the need for any further adjustment. But if volumes or other cost drivers are significantly different from Royal Mail's forecasts, then further work might be required to assess how much of any difference between the outturn and Ofcom's reasonable rate is attributable to the impact of lower than expected volumes (or other factors).

4.2.2.2. Other potential indicators

In addition to monitoring general changes in Royal Mail's efficiency, some of the methods described in Section 4.2.1 may allow other aspects of Royal Mail's performance to be monitored, and this may provide useful information in addition to overall changes in RUOE or similar measures.

A more detailed reconciliation between outturns and Royal Mail's business plan could be helpful in identifying specific areas where Royal Mail is failing to meet (or exceeding) its targets. This could include a general comparison between outturns and forecasts for each major cost category, an assessment of changes in specific indicators (such as RUOE), and an examination of whether specific changes have been implemented. More generally, disaggregated information about Royal Mail's performance, how this compares with previous

[112] See Appendix B.4.2.3 for an example of this adjustment

projections and progress made on specific initiatives, is likely to enhance Ofcom's understanding of Royal Mail's current situation and help it to interpret the information provided by high level indicators, such as overall RUOE changes.

It will be important, however, to interpret this information carefully. If the efficiency of particular pipeline elements or activities has not improved as much as expected, this could indicate either (a) that this is an area where, in practice, it is proving to be genuinely difficult and perhaps costly to push through efficiency improvements, or (b) significant failings in Royal Mail's efforts to improve efficiency in this area. The difference between these cases is significant, as (b) suggests that Ofcom might encourage Royal Mail to focus its efforts on improving efficiency in this particular area, whereas if (a) is true then such action could be counterproductive, perhaps leading to Royal Mail neglecting opportunities elsewhere to improve efficiency at a faster rate or at a lower cost to the overall business.

Further problems associated with the ongoing monitoring of Royal Mail's performance in comparison with its business plan are that:

- information asymmetries mean that Ofcom will often be reliant on Royal Mail for an explanation of differences between forecasts and outturns. Royal Mail will have incentives to identify external factors that can explain any changes, even if at least some of the true reason is straightforward underperformance; and
- if Royal Mail revises its plan regularly, then comparisons against the most recent plan may fail to identify important changes that have already been reflected in the revised plan or that are occurring gradually over time.

If Royal Mail provides Ofcom with regularly updated information, based on its "productivity" measure, about the relative efficiency of individual delivery offices and mail centres, then this could also be useful for Ofcom to monitor. Among other things:

- information about the speed at which individual delivery offices and mail centres have improved their relative performance may help Ofcom in future assessments (based on internal benchmarking) of what might represent a reasonable rate of efficiency improvement; and
- regular monitoring of this information, and identification of persistent poor performing units or pipeline elements, might highlight cases that could be investigated further.

As with the information from Royal Mail's business plan, detailed data from internal benchmarking would also need to be used very carefully. It would be important to consider potential problems with the data, for example if some of the disaggregated data from individual units may be unreliable or if Royal Mail's workload measure does not capture a sufficiently high proportion of the external factors that might cause cost differences. And there could be a risk that active monitoring might distort Royal Mail's incentives, for example encouraging it to take measures to reduce apparent differences in performance or to focus on a small number of individual units, even if there are other initiatives (perhaps aimed at improving the performance of all units) that might have a greater impact on Royal Mail's overall efficiency.

4.3. Further Investigation

The methods described in Section 4.2 either rely on readily available information or could be implemented by Ofcom with relatively little additional work. In this section, in contrast, we consider methods that are more resource intensive. There are several different situations in which Ofcom might be required to carry out a more detailed assessment of Royal Mail's performance and the efficiency gains that are reasonably achievable over a certain period of time. For simplicity, we distinguish between two types of situation:

- Ofcom needs to carry out a more detailed assessment in order to reach a firmer view on whether Royal Mail could reasonably achieve a faster rate of efficiency improvement than its current performance. This might be because Royal Mail's current performance falls short of Ofcom's initial view of a reasonable rate of improvement, therefore it needs to investigate whether its initial view is too optimistic or whether Royal Mail is underperforming. Or it might be in the context of a review of the need for intervention in relation to end-to-end competition, where Ofcom will consider potential changes in efficiency when assessing either Royal Mail's financial position absent end-to-end competition or its potential commercial response to an increase in competition; or
- Ofcom decides to carry out a review of the regulatory framework, including introducing a more comprehensive price control. This might occur if Royal Mail was not responding to the efficiency incentives provided under the current regulatory framework, or if it was abusing the commercial and pricing freedoms that it currently enjoys. A similar situation might arise if Ofcom were to introduce a compensation fund and therefore needed a specific estimate of the expected cost of the universal service obligation.

There are important differences in the way that Ofcom's findings would be used in each of these cases. In the first case, a largely qualitative answer might be sufficient, indicating whether there is scope for Royal Mail to improve its performance and roughly how large the gap is between its current rate of efficiency improvement and the approximate rate that Ofcom considers should be reasonably achievable. Moreover, the conclusions in relation to efficiency will inform a separate policy decision (such as whether to tighten the current regulatory framework, or whether to impose general universal service conditions on end-to-end competitors). Such decisions will require reliable evidence on whether or not Royal Mail could improve on its current performance, but not necessarily a specific quantitative estimate of the efficiency improvements that Ofcom believes Royal Mail could reasonably achieve.

In contrast, the conclusions from the analysis that Ofcom might carry out for a comprehensive price cap review would have a direct effect on Royal Mail's price control, and so a greater degree of accuracy and robustness is required. Most of the methods described in Section 3 have been used in this context.

4.3.1. A more detailed assessment

In Section 4.2 we identified the most promising methods for informing Ofcom's initial view, with an important consideration being to avoid methods that would require significant upfront work. This constraint is less important in the situation where Ofcom needs to carry out a more detailed assessment. Instead, there are strong arguments for concentrating on methods that:

- are focused on Royal Mail's specific situation, as Ofcom will have a particular interest in whether there is robust evidence that Royal Mail should be able to achieve greater efficiency improvements than it is currently doing. For this reason, it seems unlikely that either the experience of other UK regulated firms or TFP growth in comparator sectors will provide further insights to help Ofcom in this particular case. Similarly, evidence on Royal Mail's past efficiency improvements under the previous regulatory framework (or before the introduction of regulation) may be of limited use in addressing the specific question of whether it should be able to achieve greater efficiency improvements under the current regulatory framework; and
- provide information on the rate of improvement that should be achievable in the short to medium term. A number of the methods described in Section 3 can provide valuable information about the size of the efficiency gap, but not necessarily about the speed at which Royal Mail should be able to reduce the size of this gap. Methods such as internal benchmarking, process benchmarking and function benchmarking probably fall into this category, and therefore are discussed in Section 4.3.2 below.[113]

These apply either if the assessment is being carried out in response to concerns arising from Ofcom's monitoring, or if it is contributing to a review of end-to-end competition. In principle, the situations might seem different because the first arises when there may be suspicions that Royal Mail is underperforming and this needs to be investigated further, whereas the second may be a response to external events or simply a commitment to carry out a review at a particular time. In practice, however, a review of end-to-end competition will need to consider whether Royal Mail might be able to improve efficiency at a faster rate than at present and the extent to which any poor financial performance is due to factors within its control. Therefore, there is a substantial degree of overlap between the issues to be addressed, and the same methods are likely to be suitable in each case.

We identified Royal Mail's business plan as one potentially useful source of information in Section 4.2, though with important caveats that regulated firms have strong incentives to understate potential efficiency improvements, and that business plans may be revised in line with actual (rather than potential) performance levels. But we also noted that expert review of the business plan could help to overcome these disadvantages.

Observing differences between outturns and previous projections could be useful in identifying areas where Royal Mail might appear to be underperforming. Similarly, and especially if it is using internal benchmarking data to monitor efficiency differences between individual mail centres or delivery offices, Ofcom could consider investigating specific patterns or cases of poor performance. But for the reasons set out in the previous section, underperformance in one particular area of its business may or may not suggest that Royal

[113] Some use of these methods might be considered at an earlier stage, either to enable a more detailed assessment of a sample of processes or functions, or to focus on areas where Ofcom suspects that Royal Mail has significant scope for improvement.

Mail should focus on these areas as part of its efforts to achieve faster efficiency improvements in future.[114]

A review of Royal Mail's business plan could be carried out by experts familiar with its business and also with successful postal operations elsewhere. It could address questions such as:

- whether the range of efficiency improving initiatives included in the business plan is sufficiently ambitious in general, and also whether there are specific initiatives not included in the plan that have the potential to generate further, significant efficiency improvements;
- whether the timetable for implementing these initiatives (and rolling them out across all relevant areas) is sufficiently challenging;
- whether the cost savings projected for the specific measures included in the business plan are realistic, or whether they are either too optimistic or unduly pessimistic; and
- in cases where the business plan has been revised and efficiency targets have changed, whether there is a reasonable justification for such changes and, especially in cases where targets have been reduced, whether this represents poor performance or the impact of factors outside of the firm's control.

In addition to reviewing the business plan itself, relevant experts might also be asked to review the processes that Royal Mail uses to construct and revise its business plan, and to consider whether there are improvements that might lead to more ambitious or more achievable plans in future.

While some other regulators have carried out detailed reviews of firms' business plans, this approach is particularly suitable for postal industries at present because of the observable nature of many of the current measures that might lead to significant efficiency improvements (different forms of automation, more flexible labour practices, changes to the structure of the network, etc.).

The reliability of any revised efficiency target will depend on the quality of the expert reviews, the time and resources made available for these reviews, and the information available (from Royal Mail) to the reviewers. We would expect the review to be based on a general knowledge of best practice among postal operators in the EU and perhaps elsewhere, covering most or all parts of the postal supply chain. We consider comparisons of particular activities (process benchmarking or function benchmarking) in the next section, as potential contributions to the implementation of a more comprehensive price control. These approaches appear more suited to that context, mainly because of the amount of analysis required, but also because of the difficulty of knowing whether inefficiency observed for

[114] Especially if Royal Mail provides its own explanation for certain cases of apparent underperformance (for example during the course of wider discussions about current, past and future business plans), information asymmetries mean that it may be difficult for Ofcom to challenge such explanations or to investigate other possible factors that may contribute to poor productivity growth.

particular processes or functions represents a special case or is indicative of more widespread inefficiency across the whole of Royal Mail.[115]

Another approach, which falls somewhere between expert review of the business plan and process benchmarking, would be to carry out qualitative comparisons with selected overseas postal operators that are thought to represent best practice. This would address similar questions to those listed above, including the range of automation and other modernisation programmes adopted, the implementation timetable (both the start date, indicating for example that a technology is ready for use, and the speed of rollout) and the results achieved.

Such comparisons might still be relatively subjective, and would still need to consider any specific reasons why Royal Mail might not be able implement measures introduced by certain other postal operators. For example, they are focused on observable large scale changes, such as major automation programmes, so would be less suitable if, instead, the best way to improve efficiency was to implement a number of smaller (and perhaps not readily observable) measures or to start a programme of gradual improvements.[116] But qualitative comparisons might nevertheless provide a valuable supplement to the expert review of business plans, helping to establish a more tangible evidence base for any challenge to Royal Mail's own efficiency targets.

In contrast, and especially in the context where Ofcom needs to understand the reasons for potential underperformance by Royal Mail, we do not think that quantitative international comparisons of the overall improvements achieved by postal operators would be likely to provide much reliable additional information to Ofcom. Even though comparisons of the improvements achieved over time might be less affected by external differences than cross-sectional comparisons of the level of efficiency, significant problems remain in obtaining data that are comparable between countries and over time, and also in allowing for specific changes that may have affected productivity growth in particular countries. Evidence from individual countries would need to be interpreted with great care, and as noted in Section 3.2.2 there was a very wide range between the productivity growth rates measured for postal operators in individual EU countries.

[115] In addition, process and function benchmarking provide information mainly about the size of the efficiency gap, rather than necessarily whether Royal Mail is making reasonable progress in closing the gap.

[116] These might include improved management or a number of smaller, specific changes to operational processes. Or they might reflect general opportunities to improve efficiency across most or all of Royal Mail, following a prolonged period during which it has been exposed to only limited commercial pressure.

Conclusions

Expert reviews of Royal Mail's business plan may the most useful method for a specific assessment of Royal Mail's progress in improving efficiency, and whether there is reasonable scope for it to achieve a faster rate of improvement.

Selected qualitative comparisons with modernisation (or similar improvement) programmes implemented by other postal operators could also help to indicate whether Royal Mail is making sufficiently rapid progress in implementing specific measures to improve efficiency.

If further evidence is needed, then Ofcom might consider some of the benchmarking analyses discussed below in the context of a detailed price cap review.

4.3.2. A detailed price cap review

Much of the experience of efficiency assessments described in Appendix A and Appendix B has been in the context of regulators carrying out full price cap reviews. As discussed in Section 3.4, in industries where it is not possible to carry out benchmarking of comparable domestic firms (including airports, air traffic control, postal services and rail), regulators have tended to use a range of different approaches. These have generally included both top-down and bottom-up methodologies, some methods that investigate the size of the efficiency gap and others that assess the potential rate of improvement, and a mix of methods focused either on the firm as a whole or on specific activities. In reaching their conclusions from the studies carried out, regulators have exercised judgement, based on the robustness of the results from particular studies and the extent to which they provide a consistent picture.

If in future Ofcom decides that it is necessary to re-introduce a comprehensive price control, or conducts a similar assessment that requires a detailed examination and firm quantitative conclusions on the scope for potential efficiency improvements, then there continues to be a strong argument for seeking evidence from a wide range of different sources. This could include all of the methods described in previous sections as potentially suitable for either informing Ofcom's initial view or for a more detailed investigation:

- Royal Mail's own business plan provides information that is specific to Royal Mail and which Royal Mail believes to be achievable. An expert review of this plan can help to overcome the risk that Royal Mail will understate potential improvements, or some potential improvements will disappear as the plan is revised;
- efficiency gains achieved by other UK regulated firms provide a top-down cross-check that is focused on the rate of improvement rather than size of the efficiency gap, and is not affected by the potential conservatism of Royal Mail's own business plan or the tendency of bottom-up studies to understate potential efficiency improvements;
- TFP growth in comparable sectors of the economy provides an estimate of frontier shift improvements that can be added to estimates of catch up efficiency improvements generated using other methods; and
- qualitative international comparisons with modernisation or similar programmes implemented by other postal operators can also provide valuable information about whether Royal Mail's plans are sufficiently ambitious.

In addition to these, if Ofcom needs to carry out a detailed price cap review, then there may well be a useful potential role for three other methods not included in the above list: internal benchmarking; process benchmarking and function benchmarking. These were largely or wholly omitted from previous sections, as they are resource intensive and provide evidence mainly about the size of the efficiency gap (rather than necessarily the speed at which Royal Mail can achieve improvements).

Very similar considerations apply if the efficiency assessment is needed instead because Ofcom is proposing to establish a universal service compensation fund and therefore needs an estimate of the expected cost of Royal Mail's universal service obligation. Section 44(2) of the Postal Services Act 2011 states that, when reviewing the financial burden of the universal service, Ofcom "must consider the extent to which, in their opinion, the provider is complying with its universal service obligations in a cost-efficient manner". The main difference from a comprehensive price cap review is that Ofcom's assessment of the expected net cost of the universal service may cover a different mix of costs. Compared to their importance to Royal Mail's regulated business as a whole, certain activities might account for a significantly higher or lower proportion of any estimate of the net cost of the universal service. In part, this might just affect the scope of the review. So, for example, if Royal Mail's HR function would be of a similar size with or without the universal service obligation (and so HR costs have little or no effect on the net universal service cost), there would be no point using function benchmarking to assess the efficiency of Royal Mail's HR activities. But if certain activities account for a particularly high proportion of the estimated net universal service cost, then Ofcom might tailor its approach so that more resources are devoted to any methods that are likely to shed light on the efficiency of those particular activities.

To the extent that inefficiency may be caused by the poor performance of individual mail centres and delivery offices, compared with best practice within Royal Mail itself, then internal benchmarking may be particularly relevant. Such comparisons have the advantage that they provide evidence that is specific to Royal Mail, so this avoids the need to consider factors that might distort comparisons with firms in other countries or in other industries. And the benchmark level of performance is one that has already been achieved by at least some units within Royal Mail, therefore it might be argued that similar levels of performance should be achievable by other units.[117] However, as already noted in Section 4.2.1, internal benchmarking of mail centres and delivery offices would not capture improvements that might be achievable by even the best performing units within Royal Mail, and it covers only processing and delivery activities.[118]

As discussed in Section 4.2.1, Royal Mail's "productivity" measure provides one potential method of comparing productivity while controlling for external factors that could lead to some units having higher costs than others. An alternative approach, as used by LECG in

[117] The credibility of this claim depends, among other things, on the ability of the benchmarking analysis to reflect the impact of all significant external cost drivers that may lead to costs being unavoidably higher in some units than others.

[118] The data provided to LECG for its internal benchmarking during Postcomm's last full price cap review covered labour costs of £2,771 million. This represented 78 per cent of total mail centre and delivery office costs, and 47 per cent of LECG's assessment of base year operating costs for Royal Mail's letters business as a whole.

2005, is to carry out an econometric analysis of labour costs for individual delivery offices and mail centres, using data that capture the main potential external causes of cost differences.[119] While LECG tested several different econometric methods and functional forms, its results still required a number of judgements, for example to decide which results were most useful, to apply an adjustment for cost differences not explained by the econometric analysis and not caused by inefficiency, and to decide what represents "best practice" (e.g. the best performer, the top decile, or some other subset of the sample). But the econometric approach has the advantage that it covers labour costs rather than hours.

One option for Ofcom, therefore, might be to carry out an initial comparison between the econometric approach and Royal Mail's workload measure as alternative ways of controlling benchmarking data for differences other than efficiency. It could then decide whether to carry out further comparative analysis using just one of the measures, or whether to retain both approaches.[120] But in either case, incomplete data and estimation difficulties may mean that the results should be viewed as indicative rather than wholly accurate and reliable.

Among the other comparative methods described in Section 3.1 and the expert reviews described in Section 3.3, both process benchmarking and function benchmarking could also be used to shed light on Royal Mail's current level of efficiency. These are complementary methods, as they cover different types of cost within a regulated firm, and indeed each of these methods may be applied separately to a number of different processes or functions.

Both of these methods are often used in traditional price control reviews, and indeed were included in LECG's analysis for Postcomm in 2005-06. If carried out carefully, with appropriate choice of comparators and due consideration of possible differences with Royal Mail, these methods offer a practical approach to identifying specific potential efficiency improvements that should be able to be implemented by Royal Mail.

The main reason we did not consider these methods for informing Ofcom's initial view or more detailed assessment (in Sections 4.2.1 and 4.3.1) is that each is likely to require specific original research.[121] This could be quite resource intensive, as separate assessments would be required for individual functions and processes. For functions, these might include broad categories such as IT costs, finance costs, facilities management, etc. But for processes, the comparisons might be quite detailed, for example looking separately at automation levels at different stages of the postal pipeline, or specific aspects of certain pipeline stages (such as delivery route optimisation and indoor/outdoor delivery).

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[119] LECG included measures of scale and output (such as mail volumes and the number of delivery points), drivers of workload differences per unit (such as size and type of area covered, or extent of automation), measures of labour costs and the competitiveness of local labour markets, and other exogenous cost drivers (including measures of service quality, industrial action and absence rates).

[120] LECG had originally expected that Royal Mail's similar "Effective Performance" measure would have been useful, particularly in relation to its internal benchmarking work. But it did not pursue this as it was told by Royal Mail that this measure was being phased out. See LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Bottom-up review of Royal Mail's strategic plan: Final conclusions", paragraph 5.10.

[121] Some function benchmarking studies may be available, though Ofcom would need to ensure that these are sufficiently recent and provide enough information that it could be confident that comparisons with Royal Mail are being carried out on a consistent basis using a sample of sufficiently similar firms.

Further potential disadvantages of each method are that:

- as they focus on specific activities, they offer only partial coverage of Royal Mail's costs;
- in common with other bottom-up methodologies, they may underestimate the overall scope for efficiency improvements; and
- as they compare current levels of efficiency, they will not take account of potential frontier shift improvements over the next few years.

Nevertheless, either of these methods or internal benchmarking could be used to shed light on Royal Mail's current level of efficiency.

To the extent that these three or other methods reveal an efficiency gap, then a reasonable rate of improvement might be inferred from information or assumptions about the speed with which this gap can be closed. In the case of process benchmarking, this may be informed by expert judgement about how fast Royal Mail could change its operations to introduce best practice as demonstrated elsewhere. But such a judgement may still be relatively subjective, and for the other methods any assumptions about the speed of improvement may be even more so. And Ofcom might also consider whether any allowance for frontier shift efficiency improvements should be added, as the improvements necessary to close the estimated efficiency cap will be solely catch up improvements.

In contrast, none of the other comparative methods described in Section 3.1 appears suitable for assessing Royal Mail's efficiency:

- international cross-section benchmarking would be unlikely to yield reliable results, due to both the lack of a standardised dataset and the significant difficulty of adjusting for external factors that cause cost differences; and
- comparisons with other UK operators are not feasible because, unlike the water or energy sectors, there are no other UK postal operators sufficiently similar to Royal Mail.

Conclusions

If it needs to carry out a comprehensive price cap review (or similar detailed assessment), then Ofcom might consider evidence from a wide range of sources. All of the methods identified in previous sections as potentially suitable could also be used as part of a detailed assessment.

In addition, three additional forms of benchmarking could well provide useful information on both the size of the efficiency gap and the nature of the underlying inefficiencies. These are process benchmarking, function benchmarking, and internal benchmarking of mail centres and delivery offices. For the latter, Ofcom would need to consider whether to use econometrics or Royal Mail's workload measure (or both) to control for external factors.

None of these methods alone is sufficiently reliable. But, in combination, a consistent picture may emerge. And if there are significant differences between the results from different methods, then the results from a range of studies should provide Ofcom with sufficient information to make an informed judgement.

Appendix A. Efficiency Assessment in Postal industries

In this section, we present further information on efficiency assessments undertaken in a selection of postal administrations. Table A.1 summarises the methods used in each case study.

Table A.1
Efficiency Assessment in Postal Industries

	Australia	Germany	Guernsey	Jersey	Portugal	UK	US
Cross-section – international	✓	✓			✓	✓	
Cross-section – other national							
Cross-section – internal benchmarking						✓✓	✓✓
Function benchmarking			✓✓			✓✓	
Time series – international comparators					✓	✓	
Time series – other national regulated						✓	
Time series – regulated firm	✓✓	✓✓	✓✓		✓✓	✓	✓
TFP growth – comparator sectors		✓				✓	
Expert review – business plan	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	
Expert review – regulated firm activities	✓		✓✓	✓✓		✓✓	✓✓
Process benchmarking	✓✓					✓✓	

✓✓ = used with significant reliance

✓ = used with limited reliance

A.1. Australia

A.1.1. Context

The Australian Competition and Consumer Commission (ACCC) has considered the efficiency of Australia Post (AP) in the context of several reviews of AP's proposals to alter the prices of its "notified services".[122][123] These reviews have been based on assessing the evidence provided by AP in support of its proposed price changes.[124] This is different from a system of periodic price reviews initiated by national regulatory authorities (NRAs), where the regulator must generate its own evidence base in order to propose future price levels.

Recently, ACCC has reviewed proposed price changes for letters in 2002, 2008, 2009 and 2010, as well as business letters in 2011. It has also undertaken analyses in reaction to the proposed removal of Ad Post in 2001, restructuring of the pricing of Reply Paid mail in 2003 and the introduction of Impact Mail in 2004.

As a part of its assessment of proposed changes in prices, ACCC considers the extent to which the prices will recover the efficient costs of providing the service.[125] The reviews have considered a range of methodologies; ACCC stressed in its 2009 review that it would not rely on a single measure to inform its view, but have regard to evidence from both top-down benchmarking information and bottom-up reviews of AP's operating practices and strategic plans.[126]

A.1.2. Application of methodologies

A.1.2.1. Cross-section - international

The ACCC noted in 2008 that there was only a limited amount of research on international benchmarking of postal service performance in the academic literature.[127] It cited:

- a study from 2000 which compared postal operators across 22 countries using data envelopment analysis (DEA), and concluded that AP still had room for productivity improvements. The ACCC noted that the study had been constrained by data availability,

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122 The contents of this section are mainly based on documents published by ACCC, but have also been informed by discussion with ACCC, which kindly agreed to contribute to our review.

123 Until recently, AP was required to notify ACCC of proposed changes to any of its reserved services. Since 2011, AP is not required to gain approval of price changes to services if: (i) they constitute a "special service for which a special charge or additional fee is payable"; or (ii) they are provided under an incoming mail service to which a convention applies. See *Price Notification Declaration (Australia Post Letter Services) (No. 2) 2011*, clause 5.

124 ACCC states that "ACCC's preference is to adopt an assessment process which reflects the individual characteristics of each price notification. For example, the complexity of issues raised, the length of the pricing period and the number of goods and services covered will affect how the ACCC approaches an assessment.", ACCC (2009), "Statement of Regulatory Approach to assessing price notifications", June 2009, section 4.4.

125 ACCC (2009), "Australia Post's draft 2009 price notification: ACCC view", December 2009, section 4.

126 *Ibid*., section 4.

127 ACCC (2008), "Australia Post's draft price notification, Preliminary view", June 2008, section 8.

and results had not been adjusted for differences in services provided and operating environments; and

- a 2005 study by LECG for Postcomm which compared letters delivered per employee across five European countries.

It suggested that the scarcity of existing work in the literature reflected the challenges associated with benchmarking postal operations internationally, including:

- the lack of an internationally consistent set of country level data on the postal services industry; and
- difficulties of identifying operators with similar operating environments (such as geographical conditions and jurisdictional regulations) and of adjusting for remaining differences in operating environments.

The ACCC concluded that it would not be possible in the time available to collect and construct a consistent dataset for an international benchmarking study. However, it did undertake a less detailed comparison of letter prices across international operators, but cautioned that comparability difficulties remained, even after adjusting for purchasing power parity and labour cost differentials.

In 2009, the ACCC reviewed a study, commissioned by AP, which benchmarked the productivity of AP against postal operators in six other countries. The study made comparisons using TFP and partial productivity measures using data obtained from a confidential survey from 2002 to 2009.[128] It applied adjustments to control for both mail density (mail items per delivery point) and customer density (delivery points per kilometre of route), and presented both unadjusted and adjusted results. The results indicated that AP was the third most efficient out of the seven countries in terms of unadjusted TFP, with steadily improving performance, and first for adjusted TFP.

The ACCC, however, expressed some caution in drawing any firm conclusions from the study, for the following reasons:

- lack of transparency of the underlying data and regression analysis due to confidentiality agreements with participating operators;
- inherent data consistency and comparability issues in international benchmarking studies;
- severe constraints on model specification and sample size due to data availability issues;
- lack of sensitivity analysis with respect to input and output specifications; and
- certain postal operators, from countries with more liberalised and competitive postal markets, have been excluded from the sample.

[128] These partial measures included employment, operating expenditure, land and buildings, other capital.

The ACCC has not conducted further international benchmarking work. While it noted the 2009 study again as a part of the 2010 price review it concluded that, for the reasons listed above, it could provide only limited assistance in forming a view on efficiency.[129]

A.1.2.2. Time series - regulated firm

The ACCC has undertaken work examining AP's previous efficiency performance at all of its price reviews since 2002. This work has focused on a number of different metrics, including AP's previous TFP performance, labour productivity, total employment and operating cost trends.

In 2002, the ACCC considered the results of three studies of AP's historical productivity growth: a TFP analysis commissioned by the ACCC, another TFP analysis in an academic paper by an ACCC employee, and a labour productivity analysis by the National Competition Council. The ACCC examined differences between the methodologies used in the studies, decomposition of productivity gains between factors, and the impact of volume growth rates, changes in employment practices and labour/capital substitution. It concluded that:

- annual labour productivity growth of over five per cent over the last decade overstated total productivity growth due to labour/capital substitution;
- annual TFP growth of around 3.5 per cent over the same period had nevertheless been significant, boosted by strong volume growth; and
- as a result it was reasonable to accept current cost levels as a starting point for projecting potential future productivity growth.

The ACCC noted that AP had forecast a rate of labour productivity growth of less than half of that it had achieved historically. The ACCC drew attention to the fact that historical productivity gains had been primarily driven by volume increases, which were expected to be lower over the forecast period, and also noted that input usage was expected to decline due to site rationalisation and changes in employment practices. The ACCC therefore concluded that, while there could be further scope for productivity growth, AP's forecast was reasonable.[130]

The ACCC considered trends in TFP and labour productivity growth again for the 2008 price review, based on studies commissioned by AP. It noted that AP's forecast annual TFP growth of 1.3 per cent to 1.6 per cent was lower than the 1.9 per cent to 2.4 per cent that it had achieved between 1989/90 and 2006/07. However, it noted again that historical productivity growth was partly attributable to growth in mail volumes in the period up to 2000.

Alongside its TFP analysis, the ACCC also analysed historical and forecast trends in:

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129 ACCC (2010), "Australian Postal Corporation 2010 price notification, Decision", May 2010, p70.

130 ACCC (2002), "Australian Postal Corporation pricing proposal: Preliminary view", September 2002, section 5.

- total employment, noting that, despite falling over the preceding five years, headcount was forecast to rise in 2008 before falling again. The ACCC expressed some doubt over the robustness of this forecast due to forecast volume growth;
- contractor costs, noting a rise consistent with information provided by AP; and
- other operating costs, involving reviewing assumed input price inflation trends.

In 2008, the ACCC also examined AP's TFP performance over the period following the 2002 review, and noted that productivity growth had been stronger than forecast. It reported that this was potentially a result of incentives on AP to underestimate future potential productivity gains during price reviews. As such, the ACCC stressed the importance of assessing AP's forecasts on the basis of specific potential productivity gains, and formed its conclusions in conjunction with knowledge of the scope for specific bottom-up efficiency improvements (e.g. in automated walk sequencing).[131]

In 2009, the ACCC considered trends in TFP growth again, based on a study commissioned by AP. It noted that AP had experienced strong TFP growth until 2003, weaker growth until 2008, and then a decline during the following year, mainly as a result of declines in volumes. It also reported that AP was forecasting a continuing decline in TFP due to volume declines. Alongside this, it considered other productivity metrics including total headcount, the ratio of labour costs to non-labour costs, wage rates, pension costs, and contractor costs. The ACCC noted in particular:

- concerns with the lack of correlation between forecast cost levels and forecast falling volumes, in contrast with historical trends and international evidence;
- significant increases in forecast pension costs;
- the fact that past growth in wage rates appeared to be lower than the national labour price index, which might have been associated with factors such as pension benefits; and
- concerns with the relationship between forecast contractor costs and forecast labour costs and volumes.

In the 2010 review, the ACCC reported that AP was forecasting substantial reductions in operating costs compared with its 2009 forecasts, with total costs falling in real terms by an average of 2.8 per cent per year rather than 0.7 per cent per year.[132] The ACCC noted that this aligned better with its expectation of a cost response to forecast falls in volume as it included a specific cost-volume elasticity assumption.

However, the ACCC concluded that AP's assumed elasticity of 0.14 was low compared with studies of overseas postal operators, which estimated elasticities of between 0.6 and 0.7. For the purposes of assessing efficient costs, the ACCC applied an elasticity of 0.65 to the volume forecasts. AP used similar forecasts and assumed cost-volume elasticities in its

131 ACCC (2002), "Australian Postal Corporation pricing proposal: Preliminary view", September 2002, p145.

132 ACCC (2010), "Australian Postal Corporation 2010 price notification: Decision", May 2010, section 4.

submissions for the 2011 review, so the ACCC again adjusted the elasticity assumed in forecast costs.

A.1.2.3. Expert review - business plan

The ACCC has reviewed elements of AP's business plan on a number of occasions. In 2008, the ACCC reviewed AP's forecast savings from automated sequencing and network restructuring, and in 2009 it reviewed several component initiatives of AP's "Future Delivery Design" (FDD) programme. This included:

- enhanced OCR address recognition software;
- extension of automated letter sequencing, where it concluded that planned deployment was slow and limited in scope compared with international best practice, and that this justified an adjustment to AP's cost base to better reflect efficient costs; and
- reconfiguration of mail delivery network, including a more flexible, part time workforce with remote delivery rounds, deployment of power assisted bicycles and buggies, and delivery office network restructuring. ACCC noted that AP had not forecast any associated cost savings, and suggested that in principle network rationalisation ought to provide some potential for savings.

The ACCC noted that AP had been slow in deploying its FDD programme compared to similar operators overseas, but that it was likely to lead to significant efficiency improvements in future.

In the 2010 price review, the ACCC noted that AP had provided details of it planned cost reduction initiatives, but had not linked the initiatives clearly to its cost drivers and cost forecasts. It noted in respect of specific initiatives:

- while AP had increased the forecast pace, scale and benefits from automated sequencing, AP's deployment remained behind world best practice, and the ACCC therefore brought forward the assumed timing of savings in assessing an efficient cost base; and
- savings from delivery round optimisation had now been introduced.

The ACCC reviewed AP's main cost reduction initiatives again in its 2011 review, and made similar adjustments to those made in the 2010 review.

A.1.2.4. Expert review - regulated firm activities

The ACCC noted in 2008 that AP had made no major capital investments in automation for several years, and that this made it likely there was more scope for improvement than suggested by AP. It cited opportunities for flats sequencing technology as an example. However it returned to the issue of flats sequencing in 2009, accepting that there was some doubt as to whether it would be viable in AP's context.[133]

[133] ACCC (2009), "ACCC view on Australia Post's draft price notification", December 2009, p91.

In 2010, the ACCC expressed concerns with AP's maintenance of its defined benefit pension plan, stating that any future excess in costs over that of a defined contribution plan would not be considered efficient.

A.1.2.5. Process benchmarking

In its reviews since 2008, the ACCC has examined evidence from international comparators on the pace and extent of certain modernisation initiatives. In considering AP's 2008 draft price notification, the ACCC noted that the proposed deployment of automated walk sequencing appeared slow and small-scale compared to what had been achieved by other national mail operators (including USPS, Deutsche Post and Royal Mail).

For example, USPS began its implementation of walk-sequencing in 1993 and, by 2007, 86 per cent of standard-sized letters were sequenced automatically.[134] The ACCC also noted that Royal Mail's plans to deploy walk-sequencing technology would allow it to sort 75 per cent of addressed letters in delivery-point order within three years.

The ACCC concluded from this evidence that AP was behind best-practice in the deployment of automatic sorting and sequencing, and that its plan to have 70 per cent of metropolitan small letter delivery rounds sequenced by 2012 was not sufficiently challenging. It reaffirmed this view in 2009 and noted in 2010 that, despite AP's proposed increased pace of its implementation of walk sorting, it was still behind best-practice.

A.1.3. Outcomes

The ACCC has examined evidence from a range of different studies in assessing AP's price notifications, including:

- quantitative international benchmarking;
- qualitative international process benchmarking;
- AP's historical productivity performance; and
- expert reviews of AP's business plan and activities.

The ACCC allowed AP to increase prices in 2002, 2008, 2010 and 2011 but objected to the proposed increases in 2009. The ACCC concluded from its 2009 review that AP had not demonstrated that its forecast costs were efficient, which contributed to its objection.

The ACCC did not consider the results of (quantitative) international benchmarking to be robust. While it considered an international benchmarking study commissioned by AP, it noted that data limitations reduced the robustness of the results and so did not rely on the analysis in making its decision. However, the ACCC concluded that while the three[135]

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134 ACCC (2008), "Australia Post's draft price notification, Preliminary view", June 2008, p137.

135 The other two being a report analysing Australia Post's past and forecast TFP performance, and a report examining at the extent to which Australia Post's 'productivity dividend' had been allocated between its stakeholders over time. See ACCC (2009), "ACCC view on Australia Post's draft price notification", December 2009, p56.

productivity studies commissioned by AP "provide only limited assistance to the ACCC in forming a view on the efficiency of Australia Post's forecast costs", in general "productivity studies can provide valuable supporting evidence" in assessing performance.[136]

However, the ACCC has relied extensively on qualitative international comparisons for specific processes. Notably, in all reviews since 2008 the ACCC has compared AP's proposed (and achieved) implementation of automated walk sequencing against other large postal operators including USPS, Deutsche Post and Royal Mail. The ACCC concluded from these comparisons that there was scope for AP to make further efficiency gains from full utilisation of existing technology, and challenged its business plan as being overly conservative.

The ACCC has also examined AP's historical efficiency improvements as an indication of potential future performance. In recent reviews, it has undertaken work to account for forecast changes in volumes by adjusting its productivity metrics using an assumed cost-volume relationship. In 2002, it used historical performance to support its conclusion that AP's costs were efficient.

In 2008, the ACCC used its historical analysis alongside its process benchmarking and review of AP's business plan. It noted that changes in productivity are driven by three main factors: efficiency, technical change and economies of scale, and reported that AP believed that it had "shifted from a phase of technical advancement to a phase of sustained process improvement", making future productivity improvements more difficult to obtain.[137] However, combined with its process benchmarking it concluded that future efficiency improvements should be available from increased deployment of existing technology.

[136] ACCC (2010), "Australian Postal Corporation 2010 price notification: Decision", May 2010, p70.

[137] ACCC (2008), "Australia Post's draft price notification: Preliminary view", June 2008, p136.

A.2. Germany

A.2.1. Context

The German NRA, the Bundesnetzagentur (BNetzA), has conducted several efficiency assessments in the context of setting periodic price controls for the USP Deutsche Post AG (DPAG). Its most recent decision was in 2011, covering prices for the period 2012 to 2013.[138]

A.2.2. Application of methodologies

A.2.2.1. Cross-section - international

BNetzA's principal focus in international benchmarking has been on quality of service levels rather than efficiency. However, it has encountered comparability problems, since different operators use different approaches to measuring quality of service.

DPAG has submitted comparisons of price levels across different European countries, adjusted for differences in labour costs and some other country specific variables. BNetzA has considered this evidence as context for its efficiency assessment, but has not relied on it heavily due to concerns that the data cannot account for different economic and operational circumstances faced by operators in different countries.

A.2.2.2. Time series - regulated firm

BNetzA places significant emphasis on time series analysis based on DPAG's Activity Based Costing product cost accounting system. It uses this to adjust both historical and forecast cost data for changes in traffic volumes and product mix, using data on the split between fixed and variable costs in different parts of the value chain, and on the relative cost of different products. It then considers forecasts trends in adjusted costs, compared with historically achieved trends over the previous five year period.

A.2.2.3. TFP growth – comparator sectors

BNetzA considers aggregated labour and capital productivity trends in comparable competitive markets and industries (e.g. logistics). This can include separating the postal operation value chain into pipeline segments, each of which is compared to its own set of benchmark industries. It uses the resulting rates of productivity improvement as a benchmark to compare with trends historically achieved by DPAG and the results of the business plan review.

A.2.2.4. Expert review - business plan

BNetzA reviews DPAG's business plans and efficiency initiatives in some detail. The reviews are not contracted out to third parties, but use BNetzA's own internal resources, familiarity with the postal industry and commercial judgement. These resources are

[138] This section is based on discussion with BNetzA, which kindly agreed to contribute to our review.

supplemented by BNetzA's consultation process through which stakeholders, including other postal operators, comment on BNetzA's preliminary findings and make suggestions for specific improvements. The reviews usually come to conclusions which differ from DPAG's submissions, and these conclusions are used to adjust the baseline forecast time series analysis of adjusted costs referred to above.

A.2.3. Outcomes

In its most recent determination for price regulation during 2012 and 2013, BNetzA set an X factor of 1.4 per cent per year, calculated as a 0.6 percentage point outperformance over economy-wide productivity growth of 0.8 per cent. This reflected the forecast unit cost trend suggested by DPAG's business plan and activity level cost data, adjusted for BNetzA's conclusion that future mail volume declines would be slower than those forecast by DPAG.

BNetzA mostly relied on DPAG specific data, noting that international comparisons were less informative due to structural differences, and that national comparisons with other industry sectors were difficult due to differences in cost structures and processes.

A.3. Guernsey

A.3.1. Context

The Guernsey Competition and Regulatory Authority (GCRA, formerly the Office of Utility Regulation) has commissioned a number efficiency reviews of Guernsey Post Limited (GPL) over the last ten years, in connection with its assessment of GPL's 2004, 2006, 2007, 2010 and 2011 tariff applications.

The broad conclusions of these reviews have been disclosed in the GCRA's published tariff application consultation documents.[139] These documents give relatively little detail on the specific methodologies employed in the efficiency reviews; however, the efficiency reviews were conducted by members of the NERA project team.[140] This section therefore summarises the team's own experience of the methodologies used in these reviews.

GPL is a small postal operator: the population of Guernsey is around 63,000,[141] and GPL employs a total of around 250 people.[142] This made it possible for GCRA to use some methods of efficiency assessment, for example an in-depth review of processes, without a significant resource requirement.

A.3.2. Application of methodologies

A.3.2.1. Function benchmarking

The reviews benchmarked both total overhead costs and the costs of specific overhead functions, such as finance, human resources, and information technology against other international post operators and publicly available data on European or global company surveys. Typically, the comparisons were made on the basis of the function's cost as a proportion of total costs.

GCRA also compared pay levels for operations staff against those at Royal Mail, adjusting for cost of living and taxation differences, and against public sector pay levels for comparable grades in Guernsey. The analyses also considered certain forecast terminal dues charges for international outbound mail, and compared them against retail and downstream access prices in the destination countries.

A.3.2.2. Time series - regulated firm

The reviews made extensive use of time series analysis of costs and cost drivers, analysing and reviewing trends over periods of up to ten years. For instance, the analyses examined:

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139 See for example, Office of Utility Regulation (2011), "Guernsey Post's tariff changes - Final decision", January 2011; Office of Utility Regulation (2010), "Guernsey Post's tariff changes - Consultation paper", October 2010; and Office of Utility Regulation (2009), "Guernsey Post's tariff changes - Final decision", December 2009.

140 Adam Mantzos, Peter Portnoi and Ian Bethel

141 States of Guernsey (2012), "Guernsey annual population bulletin", 21 March 2012.

142 Guernsey Post (2012), "Annual Report and financial statements", p7.

- operational staff costs, hours, headcount and overtime levels, in total and split by pipeline element (collection, processing, delivery, etc.) and by grade;
- weighted items per operational hour (adjusted for relative workload of different items), in total and split by pipeline element and by grade;
- staff costs per employee and per hour, in total and split between components (basic pay, overtime, pension costs, etc.);
- conveyance costs and terminal dues charges for international outbound mail, in total and per item, split by destination, priority and format;[143]
- retail network costs, in total and by outlet; and
- overheads, in total and by function, in absolute cost terms, headcount terms, and as a proportion of total costs and total headcount.

The results were used to give an overall view of cost and productivity trends, and to compare against previous plans provided by GPL. Also, the trends were used to identify specific cost areas for detailed bottom-up review and test the reasonableness of cost allocations.

A.3.2.3. Expert review - regulated firm business plan

The reviews included detailed assessments of GPL's business plans and efficiency improvement initiatives. Plans were discussed with management, analysed and compared against the reviewers' independent assessments of available efficiency improvements.

A.3.2.4. Expert review - regulated firm activities

The reviews included detailed assessments of GPL's principal operational processes, conducted by operational experts on the basis of site visits, requests for information, and supporting analysis. The assessments identified specific opportunities for efficiency improvements in areas such as productivity monitoring; shift configurations; productivity levels; duty structures; delivery route optimisation; overtime levels; and use of part time labour. Progress against these opportunities was tracked in subsequent reviews.

Outside of postal operations, further bottom-up analysis was carried out in certain key areas, including conveyance costs and terminal dues charges for international outbound mail; cost of the retail network; overhead cost levels; and pension costs.

A.3.3. Outcomes

GCRA has conducted several reviews of GPL's efficiency in the context of price control reviews, with the most recent review concluded in 2011.[144] The conclusions of this review focused on an analysis of GPL's business plan. In particular, it identified two main factors likely to affect GPL's operating costs over the control period:

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[143] International outbound mal forms a very significant proportion of GPL's volumes.

[144] Office of Utility Regulation (2011), "Guernsey Post's tariff changes – Final decision", p9.

- increases in Royal Mail's charges to GPL for delivery in the UK; and
- specific GPL efficiency initiatives, which it expected to generate total savings of around £3 million between 2009/10 and 2013/14.

While the details of the assessment are confidential,[145] it included an analysis of certain assumptions made by GPL in its business plan (such as on pension costs and inflation), and the regulator reports that it made revisions to some of these.

[145] *Ibid.*, p10.

A.4. Jersey

A.4.1. Context

The Jersey Competition and Regulatory Authority (JCRA) commissioned an efficiency review of Jersey Post (JP) in connection with its assessment of JP's 2011 tariff application. The terms of reference of this study were to:[146]

- review staffing levels, staff utilisation and other measures of staffing efficiency;
- observe operational supervision and allocation of work hours to workload; and
- examine machine mis-sorts, machine utilisation and postcode penetration.

The broad conclusions of these reviews have been disclosed in the JCRA's published tariff application consultation document. As is the case with Guernsey, the document gives relatively little detail on the specific methodologies employed in the efficiency review; however, the review was conducted by members of the NERA project team.[147] This section therefore summarises the team's own experience of the methodologies employed in the review.

JP is a small postal operator: the population of Jersey is around 98,000,[148] and JP employs a total of around 360 people.[149] Similarly to the Guernsey review, this made it possible to use certain methods of efficiency assessment without a significant resource requirement.

A.4.2. Application of methodologies

A.4.2.1. Expert review - business plan

The review assessed JP's business plan and efficiency improvement initiatives in postal operations. Initiatives included:

- re-grading of duties to improve alignment between pay rates and skill levels;
- upgrading of automation equipment;
- changes to annual leave arrangements;
- overtime reductions; and
- reduction from six deliveries per week to five.

Plans were discussed with management, analysed and compared against the reviewers' independent assessments of available efficiency improvements.

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146 JCRA (2012), "Jersey postal sector review", February 2012, p35.

147 Peter Portnoi and Ian Bethel

148 States of Jersey (2013), "Jersey facts and figures", States of Jersey website [online], available at: www.gov.je/Leisure/Jersey/Pages/Profile.aspx

149 JCRA (2012), "Jersey postal sector review", February 2012

A.4.2.2. Expert review - regulated firm activities

The review assessed JP's principal operational processes, conducted by operational experts on the basis of site visits, requests for information, and supporting analysis. The assessments identified specific opportunities for efficiency improvements in areas such as:

- collection route optimisation;
- traffic forecasting;
- shift configurations;
- phasing of non-premium mail workflow;
- processing cut-off flexibility;
- automated walk sequencing; and
- operational management structure.

A.4.3. Outcomes

As an input to the review of JP's 2011 tariff application, JCRA's consultants estimated that efficiency savings of £6.8 million could be made by JP over four years. They also identified further potential savings of £350,000 from a number of specific initiatives, including modified sorting office opening times and introducing better measurement and traffic forecasting tools. [150]

[150] *Ibid.,* p35.

A.5. Portugal

A.5.1. Context

The Portuguese NRA ANACOM has conducted efficiency assessments in the context of setting periodic price controls for the USP CTT – Correios de Portugal (CTT). It is also currently considering efficiency in the context of assessing the net cost of the universal service.[151]

CTT must submit proposed tariff modifications for universal service products to ANACOM for approval. ANACOM must then assess whether the modifications are transparent, non-discriminatory, cost-related and affordable. In making its assessment, ANACOM considers the basket of mail products affected as a whole and examines the overall operating margin, which, when positive, should "decrease, or ultimately not increase" as a result of the tariff changes.[152]

A.5.2. Application of methodologies

A.5.2.1. Cross-section - international

ANACOM has undertaken international benchmarking of prices for a limited number of services.[153] However, this analysis is aimed at considering affordability and the relative position of CTT's prices rather than efficiency.

It has also explored the more direct use of international benchmarking for efficiency assessment, using metrics including operating margin. However it has identified a number of challenges which make comparisons difficult, including:

- unavailability of comparable data;
- differences in the scope of postal operator activity; and
- differences in product mix and resulting differences in cost structures.

ANACOM has not yet identified methods for adjusting for these differences with the data available.

A.5.2.2. Time series - regulated firm

In its assessment of proposed tariff changes for universal service products, ANACOM has focused primarily on changes to CTT's operating margin.ANACOM also uses information from CTT's financial and regulatory accounts and other submissions to compare forecasts with historical time series for metrics such as:

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[151] This section is based on discussion with ANACOM, which kindly agreed to contribute to our review.

[152] ANACOM (2013), "Decision on the universal postal service tariff proposal, notified by CTT – Correios de Portugal, S.A., on 14.02.2013", p7.

[153] ANACOM (2011), "Comparisons of prices of the providers of the universal postal service in the European Union in 2011".

- unit total costs;
- unit labour costs; and
- revenues per item.

It adjusts cost data for inflation, and also makes adjustments for changes in product mix (using granular cost data) and overall levels of demand.

It generates baseline cost forecasts by extrapolating historical trends of these adjusted metrics. ANACOM then adjusts these forecasts to account for specific information from CTT's business plans, including the effects of specific cost reduction initiatives and other cost drivers.

A.5.2.3. Expert review - business plan

ANACOM reviews CTT's business plans, making use of:

- business and investment plans submitted by CTT to ANACOM; and
- publicly available information, including financial accounts, press releases and press articles.

ANACOM's reviews are mainly a qualitative assessment, although it occasionally makes adjustments to submitted forecasts.

A.5.3. Outcomes

ANACOM focuses its assessment of proposed tariff changes for universal service products on changes to CTT's operating margin. In its most recent decision, ANACOM did not oppose the price proposal notified by CTT for 2013, which featured an average overall price increase of 3.7 per cent, noting that the margin for 2013 would be positive, but lower than that estimated for 2012.[154]

[154] ANACOM (2013), "Decision on the universal postal services tariff proposal, notified by CTT - Correios de Portugal, SA, on 14.02.2013".

A.6. United Kingdom

A.6.1. Context

As part of its 2006 price control review, Postcomm commissioned LECG to conduct a comprehensive efficiency study. This was a major piece of work, with five published reports totalling nearly 1,000 pages.[155] LECG used a number of different methodologies, emphasising that this should avoid placing undue weight on any one piece of analysis, and minimise the extent to which conclusions were subject to error.[156]

Royal Mail (2012) also monitors the progress of its current transformation plan using a variety of efficiency metrics which it reports internally to management.

A.6.2. Application of methodologies

A.6.2.1. Cross-section - international

LECG considered comparing Royal Mail's unit costs against other international operators, on the basis that there were no directly relevant UK comparators. However, it concluded that there are particularly significant data comparability problems in post, which make comparisons of absolute efficiency unreliable. These include differences in scale economies, standards of service, and levels of competition, along with more specific postal sector issues such as the geography and topography of the delivery network, strength of labour unions and the rate and extent of transformation in response to the EU Postal Directive.

LECG examined whether comparison of letter prices could provide a high-level indicator of comparative efficiency. It concluded that little weight should be placed on such comparisons without adjustment for differences in cost allocations and the impact of competition and regulation on the price setting process.

LECG also considered the use of letters delivered per employee as an indicator of comparative efficiency across operators. It concluded that, although comparisons should be conducted with some caution, the measure had merit. However, it came to no significant conclusions on RM's efficiency on the basis of the measure.[157]

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155 LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005; LECG (2006). "Future efficient costs of Royal Mail's regulated mail activities: Internal benchmarking final conclusions", 19 January 2006; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Top-down final conclusions", 23 January 2006; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Base year and baseline final conclusions", 23 January 2006; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Bottom-up review of Royal Mail's strategic plan: Final conclusions", February 2006. References to page numbers are to the published, excised versions. Note that commentary on the LECG study in this section is based both on these published documents and on the personal experience of two members of the NERA project team, Peter Portnoi and Ian Bethel, who were core members of the team which undertook the study.

156 LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, paragraph 1.17.

157 *Ibid.*, section 25; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Top-down final conclusions", 23 January 2006, section 5.

A.6.2.2. Cross-section - internal benchmarking

LECG conducted internal benchmarking analysis to identify the current efficiency frontier for Royal Mail's 70 Mail Centres (MCs) and 1,377 Delivery Offices (DOs). The analysis was intended to provide an estimate of productivity improvements achievable through the propagation of existing best practice, rather than identifying specific practices that enable high performance.

The study considered making comparisons between Royal Mail's units on the basis of simple performance ratios (such as average labour cost per item), but concluded that this analysis would not allow efficiency to be identified separately from differences in other cost drivers (such as product mix and local geography). Instead, it used a number of more sophisticated parametric and non-parametric benchmarking techniques to control for some of these external cost drivers, including Deterministic Frontier and Stochastic Frontier regression analyses (DFA and SFA respectively) as well as Data Envelopment Analysis (DEA).

LECG noted that these more advanced benchmarking techniques require information on costs, output levels and quality for each unit being studied. It used data provided by Royal Mail, but noted a number of concerns over the consistency and completeness of the dataset. For example, Royal Mail could only provide information on labour costs, as it could not allocate remaining costs to DOs or MCs. Royal Mail also noted that the data are not audited internally to check accuracy or completeness, and that DO managers might have an incentive to inflate the volume measures to make their own performance appear stronger. LECG made a number of adjustments in response to these concerns, such as excluding a number of DOs with missing data or with recorded year-on-year volume growth (or contraction) of over 15 per cent.

For the DO analysis, a large number of variables were tested for inclusion in the cost equation, including:

- weighted volume (with different types and formats of mail awarded different weights to reflect their relative impact on workload and account for variations in product mix);
- number of delivery points;
- business delivery points as a proportion of total delivery points;
- weighted volume of mail per delivery point;
- length of road per delivery point and delivery point density;
- proportion of mail walk sorted at the MC; and
- average wage rate.

LECG applied a 20 per cent reduction to its DEA and DFA efficiency estimates, to account for statistical error in the results. It made a further allowance for statistical error in its DFA

analysis, benchmarking DOs to the top decile (i.e. the least efficient DO of the most efficient 10 per cent). It identified annual savings of between £250 million and £300 million.[158]

For the MC analysis, variables tested for inclusion in the cost equation included:

- weighted volume;
- proportion of mail from distant, neighbouring, and the same MC;
- proportion of mail walk sorted at the MC;
- equipment levels;
- size of MC;
- layout of MC (number of floors); and
- average wage rate.

Similar to its approach to benchmarking DOs, LECG applied a 15 per cent reduction to the estimates from its MC DFA and DEA analyses, and benchmarked to the top decile for its DFA estimates. It concluded that efficiency improvements of around £100m were available.[159] The analysis also indicated the presence of diseconomies of scale in large MCs. LECG judged these as avoidable, and estimated that an additional £50m of efficiency improvements were available as a result.

LECG estimated that if these improvements were realised over a period of three to five years, this would equate to annual efficiency improvements of 2.0 per cent to 4.6 per cent (assuming constant volume and product mix). LECG's view was that RM would not be able to realise these improvements over a three year period, but it ought to be able to realise them over a four to five year period, both of which roughly coincided with the proposed length of the forthcoming price control, depending on the date on which such savings were assumed to begin to be made.

LECG stressed that this could be regarded as a lower bound for achievable savings, as it was based simply on applying RM's existing internal best practice more widely, as opposed moving RM's efficiency frontier, for example by increasing levels of automation.[160]

A.6.2.3. Function benchmarking

Noting that staff costs accounted for approximately 64 per cent of total costs, LECG benchmarked a number of aspects of staff costs. It compared:

- pay levels for operational grades with those for comparable roles in the UK private and public sectors. LECG concluded that RM was paying above average market rates, and

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158 LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, p361-2.

159 *Ibid.*, p373.

160 *Ibid.*, section 20; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Internal benchmarking final conclusions", 19 January 2006

used this conclusion to consider the reasonableness of the assumptions of future pay increases in RM's Strategic Plan;

- absence levels with UK comparators. LECG concluded that absence levels were higher than most UK comparators, and used this conclusion to consider the assumptions on reductions in future absence levels in RM's Strategic Plan; and
- staff attrition rates with data from the UK labour market. LECG concluded that RM's forecast rates of staff attrition were very low, and used this conclusion to consider the assumptions on future recruitment, training and redundancy costs in RM's Strategic Plan.[161]

LECG performed function benchmarking of a variety of overhead costs. LECG compared metrics calculated for RM with those generated from established global company surveys and available for European postal operators:

- finance, legal, marketing and corporate communications costs were each considered as a percentage of total revenue;
- human resources costs were considered as a percentage of total operating costs, and human resources headcount was considered as a proportion of total headcount; and
- total overheads costs were considered as a proportion of total operating costs.

In its August 2005 report, LECG concluded that annual savings of between £68 million and £128 million were available (relative to the 2003/04 financial year),[162] compared with estimated annual savings in RM's original Strategic Plan of £34m. In the revised plan submitted in response to that report, RM raised its estimated annual savings from £34m to £98m. LECG revised its benchmarking analysis and concluded that savings of £138m per year were available,[163] around £40m more than assumed in the revised plan.

A.6.2.4. Time series - international comparators

LECG analysed efficiency trends across a number of European postal operators. It noted an annual average reduction in unit costs of 1.8 per cent between 1998 and 2003. However, after adjusting for volume increases, it found the trend in unit costs was mixed, with an overall average annual increase of 0.8 per cent.[164] Volume adjusted RUOE changes ranged from -7 per cent a year to +7 per cent a year. LECG used evidence of efficiency improvements at Sweden Post following privatisation in 1993 to suggest that regulation and liberalisation can provide incentives for efficiency improvement.

LECG advised caution in interpreting unit cost trends, noting that they would be affected by differences in the scope of operator activities, and the pace and timing of liberalisation and

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161 LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, section 16.

162 *Ibid.*, p317.

163 LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Bottom-up review of Royal Mail's strategic plan: Final conclusions", February 2006, p139.

164 LECG used a cost elasticity estimate of 65 per cent, which was slightly higher than RM's estimate but more in line with European evidence

operator modernisation. It also noted that the relatively low average efficiency improvements were driven by a number of outliers, starting from an already high level of efficiency.

A.6.2.5. Times series - other national regulated

LECG reviewed efficiency trends in other UK regulated industries, which it stated could provide high-level indications of the scale of potential future efficiency savings. It estimated that annual efficiency targets incorporated in price controls typically averaged 2.5 per cent in real constant volume terms, but that evidence from a range of studies indicated achieved efficiencies outperformed these targets, averaging between 4.0 and 4.8 per cent.

LECG noted that these reductions captured both frontier shift efficiency gains and catch-up gains associated with privatisation and the introduction of regulation and competition (the "privatisation effect"). In order to allow for closer comparison with Royal Mail, it combined estimates of long-run efficiency gains in the economy (an estimate of frontier shift) with evidence from other studies on the size of the privatisation effect. It concluded from these studies that the privatisation effect might be a 1.25 to 3.5 per cent annual RUOE improvement (in addition to frontier shift).

It believed that Royal Mail, facing increased competitive pressure after an extended period of public ownership, ought to be able to achieve these catch-up efficiency improvements, regardless of its ownership. Based on its analysis, it concluded that annual improvements in RUOE of between three and four per cent were typical for firms in Royal Mail's position.[165]

A.6.2.6. Time series - regulated firm

LECG analysed trends in RM's operating costs between 2000/01 and 2003/04. LECG estimated that during this period, RM had achieved an average annual efficiency improvement of 2.9 per cent in Real Unit Operating Expenditure (RUOE).

In arriving at its estimate, LECG adjusted reported operating costs to exclude:

- one-off expenditure to deliver Royal Mail's 2002 "Renewal Plan";
- pension deficit payments; and
- capital expenditure.

The estimate of 2.9 per cent incorporated both improvements in efficiency and gains from scale economies due to increasing volumes over the period. LECG adjusted for changes in volumes by applying a cost elasticity estimate of 60 per cent, based on RM estimates, cross-checked against previous estimates made in European and US studies. This resulted in an estimated annual rate of efficiency improvement of 1.9 per cent in RUOE in constant volume terms. It also examined RM's actual (and forecast) volume adjusted RUOE reductions over the period from 2002/03 to 2005/06, estimating annual reductions of 2.9 per cent. LECG

[165] LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, section 23; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Top-down final conclusions", 23 January 2006, section 3.

concluded that this historically achieved rate of efficiency improvement was a reasonable minimum expectation for the 2006 price control.[166]

In addition to estimating unit cost trends over time, LECG performed high-level analyses of historical cost trends in specific pipeline segments (collection, sorting, etc.) to support its bottom-up review.

A.6.2.7. TFP growth – comparator sectors

LECG considered TFP trends in comparable sectors based on a previous analysis conducted by Royal Mail. It split Royal Mail's operations into seven separate activities, such as delivery and management, and compared each of these to the long-term TFP trend in sectors that undertake similar activities.[167] It then constructed a single index by averaging the trends, weighted by the associated activity's cost share in Royal Mail. It considered two scenarios, which compared Royal Mail's activities to different sectors, although it believed that more weight should be placed on the results of Scenario 2.[168]

[166] LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, section 22; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Top-down final conclusions", 23 January 2006, section 2.

[167] It adjusted these trends for volume effects using a cost elasticity factor of 90 per cent. This was consistent with Royal Mail's study, and other regulatory practice (for example ORR).

[168] For example, it believed that manufacturing was a better comparison for mail centres due to a trend towards mail centre automation.

Table A.2
LECG's TFP Scenarios

Nature of work	Scenario 1		Scenario 2	
	Comparator	Volume adjusted TFP trend (%)	Comparator	Volume adjusted TFP trend (%)
Delivery	Distributive trades	0.5	Financial & business services, distributive trades excluding hotel & catering	0.7
Mail Centres	Distributive trades	0.5	Manufacturing	1.9
Management	Electricity, gas & water	2.3	Electricity, gas & water	2.3
Vehicles	Transport	2.7	Transport	2.7
Logistics	Distributive trades	0.5	Transport	2.7
IT	Financial & business services	0.4	Financial & business services	0.4
Property	Construction	1.6	Construction	1.6
Weighted average total		0.8		1.5

Source: LECG (2005).

LECG found that in the long run, Royal Mail might achieve TFP increases of between 0.8 and 1.5 per cent a year. It used the resulting indices as the basis of an RUOE target (so that it could compare it with the results of its other top-down approaches). To convert the estimates to RUOE, it applied additional adjustments for long-term capital substitution and changes in input prices. It concluded that Royal Mail should be able to achieve a trend growth of -0.1 to 0.6 per cent a year in RUOE in constant volume terms. Factoring in catch-up efficiency gains, LECG judged that Royal Mail should be able to achieve annual efficiency improvements of 1.1 to 4.1 per cent in RUOE.

LECG noted that its estimate was approximate, with scope for double counting between nature of work estimates and subsequent adjustments. It stated that because of the approximate nature of the estimate, it was important that it was used as only one of a range of indicators of potential rates of efficiency improvement.[169]

[169] LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, section 24; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Top-down final conclusions", 23 January 2006, section 3.

A.6.2.8. Expert review - business plan

LECG performed a detailed review of Royal Mail's December 2004 Strategic Plan and supporting submissions. It assessed whether the efficiency assumptions in the Strategic Plan were robust, internally consistent, and adequately supported. LECG reviewed 46 specific initiatives set out in the Royal Mail's plan, including:

- improved planning of collection routes and timings;
- simplification of the MC network;
- investment in MC letter, flat, and packet automation;
- refurbishment of DOs;
- investment in automated walk sequencing; and
- revision of delivery methods (e.g. motorised trolleys).

LECG structured its review of these around considering whether Royal Mail had:

- identified the appropriate scope for business-wide cost savings, including assessment of whether the plans were sufficiently challenging and justified, along with potential areas of cost saving not identified.
- accounted for inter-relationships between efficiency initiatives;
- addressed the timing and level of investment necessary to achieve projected savings, including an assessment of whether potential barriers to implementation had been identified and accounted for; and
- planned to implement its initiatives in an appropriate sequence, that allowed targets to be reached at lowest cost over the time period.

It found that many initiatives (comprising the majority of planned investment) had poorly supported business cases, with a negative impact on value. LECG excluded these initiatives from its projections.

LECG concluded that its review supported annual savings of £380m to £760m, equating to efficiency improvements of 1.2 per cent to 2.6 per cent in RUOE in constant volume and mix terms.

Royal Mail responded to LECG's August 2005 report by submitting a revised Strategic Plan in September 2005. The revised plan featured some significant operational differences in areas such as part-time delivery staff, remote walk sequencing, flats automation and materials handling. The revised plan generated an average annual forecast efficiency improvement of 1.5 per cent, double the 0.8 per cent assumed in the original plan.

LECG noted that the support provided in relation to the revised plan had improved significantly. Based on its review of the revised plan, LECG concluded that a number of the initiatives that had been excluded from the projections in its August 2005 report could now be incorporated. However it believed that in a number of areas, the levels of investment

forecast by Royal Mail had been overstated, and the benefits understated, and made adjustments to the forecasts as a result. Initiatives affected included:

- replacement of out of date automation equipment;
- reconfiguration of the MC network;
- DO refurbishment; and
- absence reduction and team working.

LECG concluded that its revised review supported annual savings rising to £782m, equating to efficiency improvements of 3.1 per cent in RUOE in constant volume and mix terms, above the range of 1.2 per cent to 2.5 per cent set out in its original review.[170]

A.6.2.9. Expert review - regulated firm activities

LECG focused its bottom-up analysis on a detailed review of the specific initiatives in Royal Mail's Strategic Plan, as discussed below. It supplemented that review by suggesting a number of initiatives it had identified independently, based on its understanding of Royal Mail's operations, the operational expertise in the team, information gathered from site visits and information requests, meetings with senior Royal Mail managers and project teams, and analysis conducted, including:

- reviews of payroll costs, management to staff ratios, overtime levels, leave reserves, mapping of hours to traffic, sick absence, annual leave arrangements; and
- reviews of mail presentation, automation levels, machine utilization, machine performance (actual versus capability), mail diverted to manual sorting, manual sorting rates.

Initiatives identified included:

- a scaling back of weekend operations;
- better utilisation of distribution capacity;
- delivery route optimisation; and
- extended delivery spans for part-time workers.[171]

A.6.2.10. Process benchmarking

LECG supplemented its review of Royal Mail's Strategic Plan with international benchmarking of a number of specific processes.[172] It conducted its analysis on the basis of

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[170] LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, sections 9 to 19; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Bottom-up review of Royal Mail's strategic plan: Final conclusions", February 2006.

[171] LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, sections 9 to 19; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Bottom-up review of Royal Mail's strategic plan: Final conclusions", February 2006.

survey responses from international postal operators and a number of case studies on a selection of specific issues. Due to potential differences in measurement and terminology between operators, it reasoned that making comparisons on the basis of actual methods and working practices could be more reliable than simply comparing numerical indicators.

For example, LECG's process benchmarking suggested that Royal Mail's proposal to introduce a tool to redesign collection routes, and the associated forecast cost reduction of between five and 10 per cent, might put it ahead of existing best practice.[173] In another example, it assessed Royal Mail's proposal to restructure its mail centre network, noting that similar initiatives have been beneficial in other operators, but that Royal Mail's proposed pace of change was slower than has been achieved elsewhere.[174] It also used its process benchmarking to assess initiatives Royal Mail set out regarding automation levels,[175] materials handling,[176] and delivery route optimisation.[177]

A.6.3. Outcomes

LECG derived its estimates of the efficient level of Royal Mail's costs over the price control period using a wide variety of evidence. It considered that no individual method could provide a precise estimate of possible efficiency savings, and all required judgement to determine the implications for Royal Mail. However, LECG considered that by using a number of different methods, it avoided placing undue weight on any single piece of analysis.[178] It drew on three key inputs to form its overall conclusions: top-down analysis, bottom-up analysis, and internal benchmarking.

LECG considered its top-down analyses to be necessary because bottom-up analyses are likely to understate the total scope for efficiency gains.[179] Its top-down analyses suggested potential annual RUOE savings of between 2.5 and 4.0 per cent. However, it reasoned that, as Royal Mail had significant scope for catch-up, estimates towards the top of this range were most reasonable. It concluded that the analysis supported annual RUOE savings of between three and four per cent.[180]

LECG used its expert review of specific activities and process benchmarking analysis to supplement its review of Royal Mail's Strategic Plan. As a result of this review, it concluded that certain initiatives were insufficiently well justified and excluded them from its

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172 LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, paragraphs 11.35 to 11.38.

173 *Ibid.*, paragraph 12.18.

174 *Ibid.*, paragraphs 13.33 to 13.34.

175 *Ibid.*, paragraphs 13.47, 13.90 to 13.95, and 15.37 to 15.39.

176 *Ibid.*, paragraphs 13.62 to 13.64.

177 *Ibid.*, paragraph 15.76.

178 *Ibid.*, paragraph 1.17.

179 *Ibid.*, paragraph 26.25.

180 LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, paragraph 1.47, Paragraphs 1.61 to 1.65; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Top-down final conclusions", 23 January 2006, paragraph 1.34.

assessment entirely. For other initiatives, it disagreed with Royal Mail's assessment of the associated costs and benefits and identified alternative estimates. This resulted in two different scenarios of potential efficiency savings over the course of the price control: a "higher" case, which reflected LECG's amendments to the Strategic Plan, and a "lower" case which generally represented Royal Mail's own figures. On the basis of the bottom-up analysis, LECG concluded that Royal Mail should be able to achieve annual RUOE improvements of between 1.2 and 2.6 per cent, revised to 3.1 per cent following Royal Mail's re-submission of its Strategic Plan.

In considering its internal benchmarking analysis, LECG identified total potential savings of between £350 and £450 million, which it believed should be achievable over a four year period. It compared these results with the projected savings identified in its bottom-up analysis from initiatives related to propagation of existing best-practice, and found them to be broadly comparable.[181]

Combining evidence from its top-down, bottom-up and internal benchmarking analyses, LECG concluded on an overall rate of annual RUOE efficiency improvement of three per cent in constant volume terms.[182] Postcomm accepted LECG's conclusions, concluding that LECG's estimated efficiency savings were an achievable but challenging target for Royal Mail.[183]

Royal Mail suggested that the RUOE used for setting the price control should be based on econometric internal benchmarking and bottom-up analysis , with less detailed top-down and historical analyses used as a cross-check.[184] It challenged the details of LECG's analysis on a number of grounds, arguing that neither its top-down nor bottom-up analyses supported annual RUOE reductions of three per cent. In particular:

- it commissioned its own econometric internal benchmarking which highlighted a number of technical concerns with LECG's analysis.[185] This study estimated potential annual savings in of between £150 million and £250 million. Over a five year period, this corresponds to annual reductions in RUOE of 1.1 per cent to 1.9 per cent; and
- it disagreed with a number of LECG's conclusions from its top-down analyses. For example, Royal Mail argued that the proposed RUOE improvements of three to four per

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181 The relevant bottom-up initiatives would generate savings of between £235 and £494 million.

182 LECG (2005), "Future efficient costs of Royal Mail's regulated mail activities", 2 August 2005, paragraphs 1.89 to 1.94; LECG (2006), "Future efficient costs of Royal Mail's regulated mail activities: Bottom-up review of Royal Mail's strategic plan: Final conclusions", paragraphs 1.23 to 1.26.

183 Postcomm (2005), "2006 Royal Mail price and service quality review: Initial proposals", June 2005, paragraph 8.79; Postcomm (2005), "Royal Mail price and service quality review: Final proposals for consultation", December 2005, paragraph 9.60.

184 Royal Mail (2005), "Response to Postcomm's initial proposals for the 2006 price and service quality review: Detailed response", 17 October 2005, paragraphs 12.15 – 12.30.

185 In particular, it disputed LECG's choice of functional form and assumptions on the distribution of efficiency in its econometric analysis.

cent were the result of "selective presentation of data that is ultimately misleading and bears no specific relation to the postal sector."[186]

A.6.4. Royal Mail internal monitoring

Royal Mail has stressed that product mix and the presence of fixed costs are both critical to the assessment of efficiency. For these reasons, it does not focus on unit cost measures for internal efficiency assessment, as these are influenced by both product mix and overall volumes.

Instead, Royal Mail uses its own performance metric called "productivity" which measures its ability to process and deliver mail efficiently. This is measured by reference to the weighted items (workload) that Royal Mail's Core Network handles per gross hour. Workload is derived by applying different weightings to the different products and formats, based on the work required to process and deliver them. This is determined by industrial engineering analysis which establishes the time that should be required to perform specific tasks on different types of mail, accounting for some of the differences in operating environments (including physical layouts and delivery route characteristics).[187] Gross hours represent the total number of paid hours needed to process and deliver the total annual volume of letters and parcels (frontline delivery, processing, regional logistics and collections hours only) and includes non-operational time such as holidays and sick absence. This can be used to estimate the number of hours each DO or MC, operating at a reasonable rate of efficiency, should take to process a given volume and mix of mail.

Royal Mail compares the number of hours actually spent at each of its DOs and MCs with the efficient number of hours implied by its workload measure, allowing for the performance of MCs and DOs to be compared against each other (and over time) in a way that corrects for differences in the volume and mix of mail and some of the differences in operating environments. It considers that productivity gains are achieved when the number of gross hours in processing and delivery is reduced at a higher rate than the reduction in workload.[188]

Royal Mail uses internal benchmarking of its productivity measure in a number of ways, including:

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[186] Royal Mail (2005), "Response to Postcomm's initial proposals for the 2006 price and service quality review: Detailed response", 17 October 2005, paragraph 12.17.

[187] The standard of efficiency assumed for the calculation is the "Standard Rating", defined by British Standard BS3138 as "the average rate at which qualified workers will naturally work, provided that they adhere to the specified method and that they are motivated to apply themselves to their work. If the standard rating is consistently maintained and the appropriate relaxation is taken, a qualified worker will achieve standard performance over the working day or shift." Royal Mail has defined a unit of workload as the "work required to put one average, sequenced letter through the Royal Mail Core Network". Royal Mail plc Prospectus, September 2013, page 137.

[188] We note that Royal Mail's use of gross hours (i.e. hours paid) rather than work hours (i.e. hours worked) to monitor productivity trends means that these trends are affected not only by changes in the underlying productivity of operational hours (i.e. the relationship between hours worked and output), but also by changes in the relationship between hours worked and hours paid (driven by factors such as rates of sick leave). There are significant benefits from monitoring both components of productivity (underlying productivity, and hours worked to hours paid) at a disaggregated level.

- to monitor efficiency improvements, promote competition between MC/DO units, and identify best practice;
- to estimate best practice productivity levels by reference to the best performing units (stressing that best practice exists within Royal Mail, but that many units fall short of best practice);
- to estimate the absolute scope for efficiency improvement by comparing average unit performance with top decile unit performance; and
- to inform targets for reasonable rates of efficiency improvement by targeting a proportionate realisation of the absolute scope over a specific period.

Royal Mail is also making use of time series analysis to monitor the rate of achieved efficiency improvement under its current transformation plan. An element of its monthly performance reports (circulated to its Board, Executive, Shareholder and Ofcom) is a set of tracked efficiency metrics which include:

- total hours and headcount;
- Royal Mail's productivity metric (as described above);
- automation levels (proportion of outward letters automated, proportion of letters sequenced);
- number of MCs closed;
- number of DOs modernised with revised delivery methods; and
- proportion of MCs/DOs using World Class Mail techniques.

It examines these metrics over time (for example, annual rates of improvement) and in comparison with Royal Mail's transformation plan (for example variance against plan).

A.7. United States

A.7.1. Context

The Postal Regulatory Commission (PRC) reports annually on the performance of the United States Postal Service (USPS), including some limited commentary on efficiency performance.[189] However, the PRC neither assesses formal efficiency targets nor considers formal efficiency forecasts. Instead, USPS overall price levels are set by Congress through legislation, not by the PRC. Annual price increases are limited to CPI-U, the consumer price index for urban consumers.

The USPS Office of Inspector General (OIG) is a statutory body independent of both USPS and the PRC that reports to Congress. OIG performs audits and investigations of USPS in order to prevent and detect fraud, waste and misconduct, and to promote economy, efficiency and effectiveness. It is a large organisation, with over 1,000 staff, and publishes over 100 reports per year.[190]

A.7.2. Application of methodologies

A.7.2.1. Cross-section - internal benchmarking

The OIG has used internal benchmarking on a number of occasions to estimate the scope for efficiency savings. For example:

- in 2011, the OIG estimated efficiency savings available in city delivery operations by comparing labour productivity across districts. The labour productivity for each district was calculated by comparing actual labour hours with standard labour hours (based on mail volumes and the number of delivery points). It estimated annual available savings of $88m if the least productive districts were raised to the average (mean) national level of productivity.[191]
- in 2012, the OIG estimated efficiency savings available in mail processing operations by comparing labour productivity across processing facilities (comparisons were made in seven groups, according to facility size). It estimated annual available savings of $665m if the least productive facilities were raised to the average (median) national level of productivity.[192]
- in 2012, the OIG estimated efficiency savings available in the Cleveland Processing & Distribution Centre (PDC) comparing its labour productivity with that of the average for

[189] This section is partly based on discussion with the PRC, which kindly agreed to contribute to our review.

[190] Source: USPS OIG website, available at: www.uspsoig.gov

[191] USPS Office of Inspector General (2011), "National assessment of city delivery efficiency 2011 - Office performance: Management advisory report"

[192] USPS Office of Inspector General (2012), "Assessment of overall plant efficiency 2012: Management advisory report"

all similar sized PDCs. It estimated annual available savings of $11million if USPS productivity were raised to the average (median) national level of productivity;[193] and

- in 2012, the OIG estimated efficiency savings available in the Los Angeles Network Distribution Centre (NDC) by comparing its labour productivity with that of the average for all NDCs. It estimated annual available savings of $7m if its productivity were raised to the average (median) national level of productivity.[194]

A.7.2.2. Time series - regulated firm

USPS reports historically achieved trends in productivity over time and against business plan targets, and the PRC also considers productivity trends in its annual reports. The analyses generally focus on two metrics:

- TFP, adjusted for mail volume, number of delivery points and product mix;[195] and
- deliveries per work hour (DPWH), i.e. the total number of deliveries[196] divided by the total number of work hours across the whole of USPS. The PRC has expressed some concern with this measure, as it does not recognise major workload components included collections, processing, transportation and sequencing.[197]

The OIG tracks trends in productivity (defined as actual labour hours compared with standard labour hours) over time in a number of contexts. For example, in 2012 the OIG compared productivity levels in a sample of five delivery offices before and after the implementation of a delivery optimisation initiative. It found that productivity levels did not improve as a result of the initiative, and recommended revisions to the details of the initiative.[198]

A.7.2.3. Expert review - regulated firm activities

The OIG performs a large number of detailed bottom-up reviews of the efficiency of USPS operations. For example, the OIG is currently conducting a study on USPS's use of rail transportation, noting that intermodal rail could deliver the same service standards as highway transportation at lower cost. It has indicated that, by shifting a portion of mail volume from road to rail, USPS could make annual savings of $100 million without needing to change its network.[199]

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193 USPS Office of Inspector General (2012), "Efficiency review of the Cleveland, OH processing and distribution center: Audit report"

194 USPS Office of Inspector General (2011), "Efficiency review of the Los Angeles Network Distribution Center: Audit report"

195 See, for example, USPS (2012), "Annual Report to Congress 2012", and PRC (2012), "Annual compliance determination report - Fiscal year 2011".

196 Defined as the number of delivery points multiplied by the number of delivery days.

197 PRC (2013), "Annual compliance determination report: Fiscal year 2012", p41.

198 USPS Office of Inspector General (2012), "Delivery unit optimization initiative: Audit report".

199 USPS Office of Inspector General (2012), "Semiannual report to Congress: April 1 - September 30 2012".

The OIG also carried out a review of USPS's use of carrier optimal routing (COR) software, which is intended to configure efficient travel patterns. It found that USPS did not use COR consistently across its routes, which it estimated could save it $84 million annually in consolidation of city carrier routes.[200]

As a final example, the OIG investigated efficiency at the Los Angeles national distribution centre (NDC), finding that it did not take full advantage of existing automation. As a result, the OIG estimated that the Los Angeles NDC used 200,000 more work hours than necessary annually which, if eliminated, would generate savings of $6.5 million. The OIG recommended that USPS advise the NDC management to reduce work hours and implement periodic operating efficiency evaluations. [201]

During the 6 months from April to September 2012, OIG also conducted investigations into: USPS's use of air transportation; shortages of containers; mail processing efficiency; delivery fleet strategy; delivery staffing structure; San Diego, Louisiana, and Capital District delivery operations; and vehicle staff scheduling.

A.7.3. Outcomes

The OIG carries out a large number of studies into specific efficiency initiatives each year, and reports to Congress (which sets prices for USPS). However, as its role is simply to conduct investigations, it can only recommend to USPS on ways it can improve efficiency and cannot enforce its recommendations. For example, following its investigation into the use of carrier optimal routing software described in Section A.7.2.3, USPS management disagreed with the recommendation to implement the system across all of its routes.

[200] USPS Office of Inspector General (2012), "Semiannual report to Congress: April 1 - September 30 2012".

[201] *Ibid.*

Appendix B. Efficiency Assessment in Other UK Regulated Industries

In this section, we present information on the efficiency assessments undertaken in other UK regulated industries. Table B.1 summarises the methods used in each case study.

Table B.1
Efficiency Assessment in UK Regulated Industries

	Airports	Air Traffic Control	Energy	Rail	Telecoms	Water
Cross-section – international		✓		✓	✓	
Cross-section – other UK			✓			✓
Cross-section – internal benchmarking						
Function benchmarking	✓	✓	✓	✓	✓	
Time series – international comparators						
Time series – other UK regulated				✓		
Time series – regulated firm	✓				✓	
TFP growth – comparator sectors			✓			
Expert review – business plan			✓	✓	✓	✓
Expert review – regulated firm activities			✓	✓		
Process benchmarking	✓					

B.1. Airports

B.1.1. Context

The Civil Aviation Authority (CAA) sets price caps at Heathrow, Gatwick and Stansted. An input to the review is constructive engagement (CE) between BAA and airlines.[202] The current price control period (Q5) was scheduled to end in March 2013, but has been extended by one year to March 2014. At the time of the Q5 price control, all three airports were owned by BAA but Gatwick and Stansted airports have since been sold.

In assessing cost efficiency for Q5, the CAA combined two broad approaches:

- a top-down analysis of BAA's operating expenditure performance over the course of Q4, as compared to the Q4 determination, and a detailed review of its forecasts for Q5; and
- function and process benchmarking to examine BAA's operating processes and its IT, finance and employment costs.

The analyses were intended to inform the CAA's final conclusions before the Competition Commission (CC) reference.[203]

B.1.2. Application of Methodologies

B.1.2.1. Function benchmarking

During Q5, the CAA commissioned three function benchmarking studies, for central (finance and facilities management), IT and employment costs.[204] These studies, along with the process benchmarking discussed in Appendix B.1.2.3, formed the basis of its efficiency assessment, and the rationale for its Q5 efficiency targets. It has commissioned similar work for the current Q6 review.

The three function benchmarking studies were commissioned to provide overall insights into BAA's costs, rather than to identify specific savings. This reflects the CAA's view that all types of benchmarking have certain limitations and therefore caution has to be exercised in interpreting results.

Each of the studies compared the relevant function costs to those of firms in a comparator population:

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[202] CE places an emphasis on airlines and BAA agreeing on forecasts for regulatory building blocks, with the CAA reserving the right to impose its own view, as an input to the review.

[203] Currently, the CAA must make a reference to the CC before it can set a price cap. This will change when the Civil Aviation Bill passes into law, when the CC will become an appeals body as in the case in other regulated industries.

[204] KPMG (2006), "Benchmarking the Finance and Facilities Management Costs of BAA plc", *Initial Proposals Supporting Paper IV*; KPMG (2006), "Scrutiny of BAA plc's IT costs", *Initial Proposals Supporting Paper V*; Incomes Data Services (2006), "Advice to the CAA on scrutinising employment costs at BAA's designated airports", *Initial Proposals Supporting Paper VI.*

- For finance, the comparator firms were drawn from a KPMG propriety database of 400 finance functions in Europe and the US. The study compared BAA to the total population, firms with similar revenue, and the service industry sector, as well as comparing finance staff salaries to national salary surveys.
- For facilities management, BAA was benchmarked against firms contained in the Investment Property Databank (IPD), a dataset covering 40,000 properties and 50 major occupiers in the UK. For each BAA property, comparable sub-sets of the IPD were identified in terms of use, occupier type and location (for instance, a general office occupied by a large corporate in outer London).
- For IT, the study used three sources of benchmarking information:
  - The National Computing Centre's annual benchmarking report on IT spending, containing data from 217 respondents of different sizes and in different industries;
  - The Corporate IT forum benchmarking reports, which provide benchmarking metrics for 29 subscriber organisations;
  - Gartner's annual IT spending and staffing survey for Western Europe, covering 403 organisations throughout Western Europe in 12 industries.
- For employment costs, different comparator datasets were used for different aspects of the analysis:
  - Security guards' pay was benchmarked against pay reported in the ONS Annual Survey of Hours and Earnings (ASHE) dataset, filtered by occupation and work region (i.e. compared against the median wage of security guards in the same area). Comparisons were also made against subcontracted airport security staff, and other "premium" security jobs in the area (such as Police Community Support Officers);
  - Engineers' pay was benchmarked against technician and engineering jobs contained in the Incomes Data Services (IDS) Pay and Conditions in Engineering dataset, and Remuneration Economics' Salary Survey of Engineers;
  - Absence and turnover rates were compared to Chartered Institute of Personnel and Development (CIPD) and Confederation of British Industry (CBI) datasets for the whole economy, within the transport sector, and by occupation type.

Each of the studies adopted a similar benchmarking approach, comparing BAA to the relevant comparator firms on the basis of partial productivity measures. To illustrate, the study benchmarking finance and facilities management costs calculated productivity statistics such as finance costs as a proportion of net revenue and total occupancy cost per square metre.[205] It compared these to each quartile of the comparator dataset for finance, and the mean for facilities.[206]

[205] It also conducted similar analyses for a set of finance sub-processes, such as accounting, statutory reporting and tax.

[206] The study compares against the mean for facilities because this is the figure provided by IPD, the data supplier.

A similar approach was adopted for IT costs, which compared IT productivity metrics to the median of the benchmark dataset, and for employment costs, for which pay for each job type was compared to the median of the comparator dataset.

The analyses found that:

- BAA's finance function was relatively efficient, with scores generally better than the median in the comparator datasets. However, not all of BAA's finance sub-processes achieved median efficiency, indicating potential efficiency improvements of between zero and £0.7 million (six per cent).
- Facilities management scores were also generally better than the benchmark. However, in eight of the 17 properties, costs per FTE were higher than the benchmark, equating to a gap of £1.25 million. The consultants concluded that there were "potential actionable improvements" of between £0.2 million and £1.25 million (seven per cent).
- BAA's IT infrastructure operations costs were found to be generally in line with (or better than) benchmark averages. While BAA's total IT costs are relatively high, this reflects the high proportion of project spending, including both IT investment embedded in construction projects and also specific IT projects.
- For employment costs, both security and engineering staff were paid between the median and upper quartile of similar jobs in the relevant regional labour market. Some specific findings were that:
  - Security guards earned 40 per cent more than median security guard earnings in the UK as a whole, although this was in line with other premium security jobs in the relevant regional market;
  - Engineering technicians are paid around the market median;
  - Staff turnover was below the UK and transport sector averages;
  - Days lost to absence per employee was significantly above the national average (54 per cent higher than the average in CIPD, 86 per cent higher than CBI).

B.1.2.2. Time series – regulated firm

The CAA compared BAA's operating expenditure during Q4 to the amount allowed in the determination.[207] The objective was to identify any significant discrepancies and the reasons for these. The CAA used the analysis primarily to set the scene for Q5: it is simply descriptive, and the CAA's assessment of potential efficiency improvements in Q5 was based instead on the studies described below.[208]

Over Q4 as a whole (based on three years of actual data and two years of forecasts), BAA forecast that operating expenditure would exceed the determination by 14 per cent at Heathrow and eight per cent at Gatwick. BAA attributed the overspends to:

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[207] CAA (2006), "Airports price control review – Initial proposals for Heathrow, Gatwick and Stansted"

[208] However, the CAA used this analysis to inform its view of the appropriate starting level of costs, for example to identify costs that were unusually high in the baseline year (2005/06).

- higher security staff costs arising from DfT security directives;
- an increase in accounting pension costs;
- high termination payments following change programmes in finance and engineering; and
- higher than expected utility costs.

The CAA also examined BAA's forecasts for operating costs over Q5, which predicted increases of seven per cent at Heathrow and one per cent at Gatwick, in order to understand BAA's view of future operating costs.

B.1.2.3. Process benchmarking

In addition to the function benchmarking studies discussed in Appendix B.1.2.1, the CAA commissioned an assessment of specific operating activities and processes, including passenger security screening, management of passengers with reduced mobility, trolley management, management of check-in infrastructure and baggage systems, and airside and perimeter security.[209] Together, the processes accounted for an estimated 20 to 30 per cent of total operating costs. The study included both bottom-up analyses of specific processes and quantitative benchmarking against 14 UK, European and other international airports. Each airport was contacted directly with data requests, and encouraged to participate with the promise of results sharing.

The CAA's consultants examined both financial efficiency metrics and physical measures, such as passengers per member of security staff. They used different comparator airports for each process, with the overall objective of selecting a basket of comparators that were similar in terms of primary cost drivers. For instance, in constructing a comparator dataset for passenger security screening at central search, they selected airports that were similar in terms of:

- standards imposed by statutory requirements;
- passenger profile, which can impact throughput rates at X-ray machines; and
- scale, as there may be economies (or diseconomies) of scale in central search.

The analysis made use of simple productivity measures for each process, such as the ratio of security staff to passengers. It presented the metrics for each process plotted against the principal cost driver (such as passenger volume) for all airports, with an estimated OLS regression superimposed. The vertical distance of any observation from the line represents a potential productivity gap.

The study identified where there is scope for improvement in each process, as well as airport-specific good practices that could be implemented at other BAA airports. For instance, in assessing the processes for passengers with reduced mobility, the consultants conducted interviews at nine participating airports to assess performance against seven process measures

[209] Booz Allen Hamilton (2006), "Airport efficiency assessment", *Initial Proposals Supporting Paper III.*

(such as staff capability and service accessibility). It found opportunities for the BAA London airports to improve in the areas of process governance and supplier management.

B.1.3. Outcomes

While the CAA commissioned a number of studies assessing BAA's scope for efficiency improvements, none of them fed directly into setting allowances for Q5. Indeed, the CAA noted that it is important not to convert the findings of the efficiency studies into efficiency targets "too mechanistically".[210] Moreover, while it considered that, on the basis of the studies, it would "not be unreasonable" to expect efficiency savings of one per cent per year, in addition to possible "frontier shift" improvements of around 0.5 per cent per year, the CAA's initial proposals adopted a total efficiency assumption of one per cent per year. This lower target was in recognition of the challenge that BAA faced in achieving some of the potential efficiencies, particularly those associated with high labour costs.[211] However, this was subsequently revised to 1.5 per cent on the recommendation of the Competition Commission, which considered that the CAA had been overly cautious in interpreting parts of its evidence pointing to BAA inefficiency.

Each of the external studies commissioned by the CAA had been discussed with BAA and, where appropriate, its comments were taken into account in the final report. The Competition Commission supported the CAA's overall methodology for cost assessment, and used the same approach in its own analysis.

[210] CAA (2006), "Airports price review - Initial proposals for Heathrow, Gatwick and Stansted", p99

[211] The CAA stated (in paragraph 12.12 of its Initial Proposals document) that "the CAA is, however, conscious of the need to pay particular regard to the actual circumstances faced by the management and staff of Heathrow and Gatwick airports, and the importance of service quality to passengers using these airports. In this context, the CAA notes that BAA's operating cost base is significantly affected by labour costs and therefore that managing real wage growth will present BAA with a greater challenge than that presented to many other firms, including some operating in other regulated sectors. The CAA accepts that there is some evidence that BAA's wages are towards the high end of the range of comparable companies, but nevertheless, the importance of the staff working at the airport suggests to the CAA it would be wise to ensure that adequate allowance was made for these costs."

B.2. Air Traffic Control

B.2.1. Context

The CAA also regulates NATS (En Route) plc (NERL), the division of NATS that provides en route air traffic services in the UK. The current price control period (CP3) runs from 2011-2014. In its assessment of NERL's costs, the CAA carried out a number of separate analyses, including:

- international benchmarking of NATS's cost performance relative to European Air Navigation Service Providers (ANSPs); and
- function benchmarking of employment costs and back-office functions.

Similarly to its approach to airport price controls, as discussed in Appendix B.1, the CAA did not place particular emphasis on any of its approaches in reaching its final efficiency targets.

B.2.2. Application of Methodologies

B.2.2.1. Cross-section – international

The CAA commissioned a cost benchmarking study to examine NERL's performance against international comparators.[212] In contrast to ORR's international benchmarking work, discussed in Appendix B.4.2.1, the CAA did not make comparisons using an econometric approach. Instead, it focused on simple productivity metrics, such as en route cost per flight hour, or Air Traffic Control Officer (ATCO) employment costs per flight hour.

The study made use of the Eurocontrol Performance Review Unit's (PRU) dataset, which contains consistent data for a selection of European ANSPs. The study for the CAA selected nine of these as comparators for NERL on the basis of comparable income and traffic complexity. The PRU dataset identifies certain costs as "exceptional", and these were excluded from the analysis. In addition, the consultants made a number of adjustments to the data:

- changes in reported costs associated with changes in accounting standards were spread over 15 years;[213]
- the cost of capital was excluded due to differences in that way it is calculated between ANSPs; and
- costs associated with North Sea Helicopters and military operations were excluded, as comparator ANSPs do not undertake similar functions.

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212 Helios (2010), "Cost benchmarking of NATS relating to Air Navigation Service Providers".

213 Article 12 of EC Regulation No 550/2004 requires ANSPs to publish financial accounts complying with international accounting standards. This meant that some ANSPs had to restate some of their balance sheet items (particularly pension provisions)

The analysis compared NERL's performance metrics for each indicator against the mean of its nine comparators, both in 2008 levels and in changes over the period from 2003 to 2008.

While the study focused on the situation in 2008, it noted that NERL had become more cost effective in the period since 2003. As of 2008, NERL was more efficient than the average European comparator. For instance, it was found to have 13 per cent lower ATCO employment costs per unit output than the benchmark average, while its ATCOs were 21 per cent more productive.

The CAA has also examined the possibility of similar benchmarking analyses against comparators from outside of Europe. As the PRU dataset does not contain information for such comparators, the CAA would need to collect its own data. However, as it would not have been subjected to the same validation that PRU undertakes with Eurocontrol data, this analysis has not yet been deemed to be robust.

B.2.2.2. Function benchmarking

The CAA commissioned separate studies to benchmark NERL's back-office and employment costs against comparator firms and industries.[214]

The analysis of NERL's employment costs examined pay, benefits, absence, turnover and pensions. The pay analysis involved making indirect market comparisons to a representative sample of positions from each of NERL's three main occupational groups (ATCOs, air traffic control engineers and management support staff). The objective was to compare NERL's employees' pay to those in other organisations with similar skills and responsibilities. To achieve this, the study compared the appropriate NERL pay grade midpoint with a relevant market rate for each job.

Finding a relevant market comparison for ATCOs posed a particular challenge, as they require a very specific skill set with no directly comparable jobs. The analysis compared ATCOs at less busy airports to higher-skilled rail network controllers and electricity power control engineers, while it compared more highly skilled ATCOs to similarly skilled ATCOs in the Netherlands.

The CAA's consultants matched engineers and management support to an IDS job level, and benchmarked against quartiles of the distribution of UK market rates for similar jobs in the appropriate region.[215] The study used a number of data sources to benchmark non-ATCO jobs, such as:

- the IDS Pay dataset;
- specialist reports on the engineering sector, including the EEF Management and Professional Engineers Pay Survey 2008-09;

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[214] Incomes Data Services (2009), "Assessment of NERL employment costs"; LECG (2009), "Assessment of NERL's back-office costs".

[215] This is the South East for all except sales ledger clerk, which has been matched to Scotland.

- specialist financial staff surveys; and
- a specialist HR survey.

The study found that top NERL ATCOs earned 79 per cent of the equivalent Dutch salary (though, after taking account of pace and length of career progression, the difference was small). Engineering staff earned slightly above the market median rate, although the differences were not significant. NERL management was paid below the market median, but again the differences were not significant. The study concluded that there appeared to be little or no scope for making cost savings through adjustments to salary levels.

In addition to pay, the study assessed NERL's benefit provision, pensions, absence and turnover rates:

- NERL's benefit provision for the each job type was compared to the level of provision for the comparator jobs. NERL was found to be broadly in line with market median practice in the provision of company cars and private health;
- absence due to sickness was compared to CIPD and CBI surveys, with NERL absence rates below average for major sectors; and
- NERL's staff turnover was benchmarked against itself over time and departments. Turnover was found to be stable across departments, as well as over the two years for which data were available, at approximately seven per cent.

A separate study benchmarked four NERL back-office cost functions (finance, IT, HR and facilities management) against comparable firms and industries. It made comparisons using a number of simple efficiency metrics (such as finance FTEs as a percentage of all FTEs, IT cost per user, and finance cost as a percentage of revenue) for the 2007/08 financial year.

For all except facilities management, NERL was benchmarked against companies included in PwC's Global Best Practices dataset.[216] For each efficiency metric, NERL was compared against the median and upper quartile in three different subsets of comparators:

- worldwide companies with annual revenue between £500 million and £1 billion;
- all UK, North and West European companies; and
- all worldwide companies.

For each back-office function, the consultants excluded costs for individual sub-processes if they were, for example: one-off costs (such as relocation costs); unique to NERL's operations (such as security); or not included in the benchmark dataset.

Where NERL was found to be less efficient than the benchmark, this could indicate potential scope for efficiency improvements. The study found:

[216] Facilities management costs were benchmarked using datasets specific to each of NERL's properties, based on the office type, office centre type and geographic location.

- NERL's finance function was more efficient than the median benchmark for most metrics and, for sub-processes where there was found to be scope for improvement, NERL had already identified planned cost savings for CP3.
- IT costs as percentage of revenue were high, and NERL would need to make savings of 27 per cent to meet the median benchmark. However, NERL was also a more intensive IT user than other companies in the benchmark dataset, and the study concluded that there might be only limited scope for NERL to reduce IT costs by much more than already anticipated in its business plan.
- NERL's HR costs were also high relative to its comparators, at 29 per cent above the benchmark. However, NERL had already committed to savings of 35 per cent in its business plan for CP3; and
- the benchmarking of facilities management costs suggested theoretical savings of between £0.9 million and £2 million. However, it was not clear to what extent these savings could actually be realised as they mainly related to costs that are largely outside of management's control.[217]

Overall, the study concluded that NERL's back-office function is relatively efficient (or will be by the end of CP3).

B.2.3. Outcomes

While the CAA considered the evidence from the function and international benchmarking studies that suggested that NERL was relatively efficient, it also noted that the studies pointed to a number of specific efficiency improvements that might be possible (leading to greater cost savings that those assumed in NERL's business plan).

In setting the efficiency factor, the CAA did not explicitly use any single piece of evidence. Instead, it took the efficiency factor proposed in NERL's business plan (0.8 per cent) and, on the balance of evidence, chose to increase this to two per cent.[218] The CAA simply adopted NERL's actual costs for the 2009/10 financial year as the baseline, removing items that it deemed to be uncontrollable. It applied the efficiency factor to these costs.

The CAA controlled for changes in volumes by assuming that operating expenditures increase by 30 per cent of traffic growth, reflecting the potential for economies of scale arising from fixed costs. The CAA determined that it would allow NERL to be compensated for any traffic growth above a five per cent threshold relative to 2009/10.

While the CAA did not undertake work to estimate the relationship between traffic levels and operating expenditure precisely, it is consistent with NERL's view that two-thirds of its costs are fixed. Stakeholders were generally supportive of the approach.

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[217] Such as security restrictions that prevent letting under-utilised space to third parties.

[218] This assumption takes account of expected volume changes. NERL's assumption of 0.8 per cent is equivalent to a 2 per cent annual improvement in real unit operating expenditure (RUOE).

B.3. Energy

B.3.1. Context

Ofgem sets price controls for firms that operate the energy distribution and transmission networks in Britain. The most recent price controls for GB gas and electricity transmission owners (referred to as RIIO-T1) and gas distribution networks (GDNs) (RIIO-GD1) were concluded in December 2012 and will apply for an eight year period from April 2013 to March 2021.

The RIIO-T1 price control set charges to three electricity transmission owners,[219] as well as the GB gas transmission network, National Grid Gas Transmission (NGGT). The RIIO-GD1 price control set charges for eight GDNs (corresponding to four ownership groups) who operate the medium and low pressure gas mains in GB. The four groups are: National Grid Gas Distribution (NGGD) which owns four of the eight GDNs; Scotia Gas Networks (SGN) which owns two GDNs; Northern Gas Networks (NGN), and Wales and the West Utilities (WWU).

RIIO-T1 and GD1 were the first price controls to be conducted under the new RIIO framework for regulating energy networks.[220] The price control for electricity distribution (RIIO-ED1), which will apply to the regional electricity distribution network owners (DNOs), is in the early stages of consultation and is expected to be implemented from April 2015.[221]

Ofgem's approach to cost assessment includes two components to incentivise companies to truthfully reveal their expected costs as part of their business plan submissions: the Information Quality Incentive (IQI) and the fast-tracking process.

Under the IQI, companies receive a reward if the ratio of their submitted costs to Ofgem's assessment of the company's efficient costs is low; conversely, firms may be penalised if the ratio is high. In addition, the lower the ratio, the greater the proportion of underspend (or overspend) retained by the company relative to allowed expenditure once the control has been set. This provides for risk-sharing between companies and their customers.

For example, at RIIO-GD1, a company that submitted a forecast for total costs equal to Ofgem's assessment of efficient costs (i.e. a ratio of one) would have received a reward of 2.5 per cent of its total expenditure, and a sharing factor of 65 per cent (implying the

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219 Scottish Hydro Electric Transmission (SHE Transmission), Scottish Power Transmission Limited (SPTL), and National Grid Electricity Transmission (NGET)

220 Ofgem introduced the RIIO (Revenues = Incentives + Innovation + Outputs) framework following a fundamental review of 20 years of regulating energy networks. Relative to previous price controls undertaken by Ofgem, the new framework aims to provide greater incentives to companies to innovate and to deliver services at least cost. For example, the RIIO framework places a greater emphasis on prescribing the outputs network companies have to deliver (e.g. improvement in network safety) as opposed to the inputs (e.g. length of network replaced), as well as setting out rewards and penalties for companies' output performance. Ofgem has also extended the price control from 5 to 8 years, and introduced a network innovation competition (NIC). See: Ofgem (2010) "Regulating energy networks for the future: RPI-X@20 decision document".

221 See: Ofgem (2013) "Strategy decision for the RIIO-ED1 electricity distribution price control".

company retains 65 per cent of any under- or over-spend).[222] Similar mechanisms to the IQI incentive mechanism have been adopted by other regulators, notably Ofwat at its most recent price review (PR09), as outlined in Section B.6.

The RIIO framework introduced a process for Ofgem to agree to companies' business plans early on in the price control process (referred to as fast-tracking) where Ofgem judges the business plan to be of sufficiently high-quality.

As part of RIIO-T1, Ofgem considered that both Scottish electricity transmission companies' business plans (SHE Transmission and SPTL) were of sufficient quality to be fast-tracked, and Ofgem therefore accepted their expenditure plans without adjustment. In addition, both companies received an additional reward under the IQI mechanism of 2.5 per cent of total expenditure for submitting costs consistent with Ofgem's view of efficient costs.[223]

By contrast, Ofgem did not consider that the business plans submitted by National Grid Electricity Transmission (NGET) and National Grid Gas Transmission (NGGT) in relation to RIIO-T1, or the business plans submitted by the eight GDNs under RIIO-GD1, were of sufficient quality to be fast-tracked. As such, the proposed expenditures were subject to detailed benchmarking.

For the eight GDNs, Ofgem undertook a comprehensive efficiency analysis to identify the level of efficient costs. This was comprised of four parts:

- cross-sectional econometric analysis of total expenditure (totex);[224]
- cross-sectional econometric analysis of selected individual activities;
- technical assessment of factors excluded from the regressions to ensure comparability; and
- function benchmarking of business support costs, against both other energy sector companies and external benchmarks.

While the electricity distribution price control is still in the early stages of consultation, Ofgem intends to follow a similar approach to that adopted for gas distribution.

By contrast, for NGET and NGGT, the cross-section efficiency analysis was less comprehensive given the lack of comparators. However, Ofgem did rely on function benchmarking for specific cost areas, for example in relation to business support costs (where it drew on data from GDNs for comparisons), as well as international comparisons for certain business activities. We describe the cross-section efficiency analysis in more detail below.

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222 Overall, gas distribution network operators (GDNs) received an income reward or penalty in the range of 1.5 per cent to *minus* 0.5 per cent (i.e. a penalty) of total expenditure, and a sharing factor of between 65 and 70 per cent. See Ofgem (2012) "RIIO-GD1: Final proposals – Supporting document – Cost efficiency", p62, Table 10.1

223 See: Ofgem (2011) "Decision on Strategy for the next transmission price control - RIIO-T1- Overview" paragraph 5.23, p34.

224 Ofgem focused on "controllable totex", which is controllable opex + capex + mains replacement expenditure (repex) + shrinkage (gas consumed within, or lost from, a transporter's system). Capex was smoothed using a seven-year moving average.

As well as undertaking cross-section efficiency analysis, for both RIIO-T1 and GD1, Ofgem examined both TFP and partial productivity measures to assess the scope for "ongoing" efficiency improvements in both gas distribution and transmission. These are intended to capture the productivity improvements that would be made by an efficient operator over the course of the control period: that is, the expected movement of the production possibilities frontier as opposed to movements towards the production frontier (as captured by the cross-sectional benchmarking).

In identifying efficient costs, Ofgem distinguishes between an assessment of companies' proposed output levels, for example the proposed level of gas mains replaced to improve safety and reduce gas losses, and the efficient level of unit costs. In general, Ofgem assesses companies' proposed levels of output by evaluating how well companies have undertaken investment appraisal.[225] We focus on Ofgem's approach to determining efficient (unit) costs as opposed to Ofgem's approach to investment appraisal.

B.3.2. Application of Methodologies

B.3.2.1. Cross-section – other UK

At RIIO-GD1, Ofgem's assessment of GDNs' comparative cost efficiency was focused on the results of regressions on panel data, using a variant of corrected ordinary least squares (COLS).[226] In total, Ofgem had access to a panel of eight separate GDNs (albeit only four separate ownership groups), and historical data for a four year period, i.e. a total of 32 observations, as well as up to eight years of forecast expenditure data [227]

Ofgem conducted its analysis at the level of both totex and individual activities (such as work management, repairs or maintenance), summing across activities to derive an aggregate efficiency score. Ofgem also considered separate econometric models for opex, capex and repex, but did not rely on such models in setting cost allowances: it considered that the model specifications and cross-section efficiency results were similar to the totex models (and therefore conveyed no additional information).[228]

Ofgem considered that both totex and activity-level models have merit. According to Ofgem, totex models allow for trade-offs between opex and capex, and therefore provide a measure of companies' total efficiency. However, the limited number of observations imposes a constraint on the number of explanatory variables it can employ. By contrast, the activity level models allow for a greater use of cost drivers specific to the activity.[229]

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[225] This includes whether the companies' investment appraisal has conformed to Ofgem's guidance in terms of, for instance, options analysis, values for non-marketed goods and discount rates. The assessment of the quality of companies' investment appraisal is undertaken separately from Ofgem's assessment of unit costs, which relies on cross-section efficiency analysis.

[226] All regression specifications assumed a Cobb-Douglas cost function and allowed for time fixed effects.

[227] See: Ofgem (2012) "RIIO-GD1: Initial proposals – Step-by-step guide for the cost efficiency assessment methodology", paragraph 1.24.

[228] Ofgem (2013) "RIIO-GD1: Final proposals – Supporting document – Cost efficiency", paragraph 1.9.

[229] *Ibid.*, paragraph 1.6.

For both totex and activity level model specifications, Ofgem estimated two models drawing on different datasets: (i) four years of historical data; and, (ii) two years of forecast data.[230] According to Ofgem, the use of forecast data ensures the models capture how GDNs expect costs to evolve over time. By contrast, the use of historical data is likely to result in more robust models as it anchors the analysis to actual data, and avoids inconsistencies arising from, for instance, different forecasting assumptions.[231]

The use of totex and activity level models, using both historical and forecast data, provided four distinct econometric specifications in total. The proposed efficiency target was based on the average comparative efficiency score, defined as the ratio of actual costs to predicted costs, from each of the four approaches.[232]

Ofgem excluded a number of costs from the econometric modelling. For example, it excluded street works costs (as the cost impact varies between networks) and smart metering (as the cost impact is still largely unknown). We discuss the approach to assessing these costs in Section B.3.2.4.

Additionally, to ensure that data were comparable, Ofgem made a number of pre-modelling adjustments. For instance, it introduced:

- regional adjustments for labour costs, to recognise the additional costs associated with working in London and the South East. For instance, it applied a 15 per cent adjustment to NGGD's London GDN's direct labour costs to reflect the higher costs of operating in London;[233]
- sparsity adjustments, recognising the additional emergency and repair costs associated with working in relatively sparse areas. GDNs' costs were adjusted according to their relative level of sparsity compared to the national average;
- urbanity adjustments, recognising both the increased cost of maintenance and repairs in dense urban areas, and also reflecting Ofgem's acceptance of reduced labour productivity in London; and
- a salt cavity adjustment for North West, as they are the only GDN with this type of storage.

Ofgem recognised that differences in estimated efficiency between firms might partly reflect the impact of unmodelled cost-drivers (i.e. statistical error). In response, Ofgem set the benchmark at the upper quartile, which lies between the second and third least cost GDN, rather than at the least cost company. Additionally, in setting final cost allowances, Ofgem

230 Ofgem (2013) "RIIO-GD1: Final proposals – Supporting document – Cost efficiency", paragraph 1.31.

231 Ofgem (2012) "RIIO-GD1: Initial proposals – Supporting document – Cost efficiency", Appendix 1 paragraph 1.10.

232 Ofgem considered that each modelling approach had its individual merit, and the use of a wider set of models addressed GDNs' concerns that there was no single correct model specification . See: Ofgem (2013) "RIIO-GD1: Final proposals – Supporting document – Cost efficiency", paragraph 1.7.

233 Ofgem (2013) "RIIO-GD1: Final proposals – Supporting document – Cost efficiency", Table 2.1.

required companies to close 75 per cent of the gap between the GDN's actual costs and the benchmark, rather than catch-up entirely.[234]

B.3.2.2. Function benchmarking

As set out above, not all GDNs costs were subject to econometric modelling. Ofgem assessed the efficiency of business support activities by benchmarking all UK energy companies[235] against each other and external benchmarks.[236] The activities included IT, finance and HR. However, while benchmarking was conducted at this disaggregated level, the aim was to set allowances for business support as a whole.

Ofgem benchmarked each support function for each company against comparators in two datasets:

- other UK energy companies, using data on 2010-11 costs submitted for RIIO; and
- 85 companies across nine sectors, in UK and overseas, from an external database managed by the Hackett Group.

In selecting relevant comparators from the Hackett dataset, Ofgem sought companies that would reflect the costs of an efficient company operating in a competitive market. As such, it excluded government owned or operated organisations, charities, and price control regulated companies. It also restricted attention to companies with revenues less than £2 billion and with fewer than 20,000 FTEs so as to be of a comparable size to UK energy companies.

In each of these two comparator groups, it calculated simple productivity metrics, such as total HR cost per employee and total finance cost as a percentage of revenues. It compared these to the upper quartile firm in each of the two comparator groups.

To arrive at cost allowances, Ofgem multiplied the activity cost driver by the productivity measure of the benchmark firm. For instance, it multiplied the benchmark cost per employee by the number of employees in each firm to arrive at the total IT cost allowance. Finally, it adjusted the allowance on a firm-by-firm basis to allow for any exceptional costs.

B.3.2.3. TFP growth – comparator sectors

In addition to analyses designed to assess the relative efficiency of network operators against each other, Ofgem also made an assessment of reasonable "ongoing" efficiency targets.[237] These are productivity improvements that it expected all network companies to make over the

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234 Ofgem (2013) "RIIO-GD1: Final proposals – Supporting document – Cost efficiency", paragraph 1.22.

235 The analysis covered both GDN and National Grid (transmission) support functions.

236 Ofgem (2012) "RIIO-GD1: Initial proposals – Supporting document – Cost efficiency", Appendix 6 paragraph 1.2.

237 Ofgem (2012), "Real price effects and ongoing efficiency appendix", *RIIO-T1/GD1 Initial Proposals.*

course of the price control period. Ofgem applied ongoing efficiency factors to all network operators in both the transmission and gas distribution industries.[238]

Ofgem arrived at its ongoing efficiency targets by examining historical TFP and partial factor productivity (PFP) measures for comparator sectors in the UK, drawn from the EU KLEMS dataset. It chose comparator sectors based on the similarity of their business processes to the energy networks. For example, Ofgem identified a number of manufacturing sectors, the construction sector, and retail functions as potential comparators for the different activities undertaken by network companies. For these comparator sectors, it considered productivity measures for different time periods, as well as for different definitions of output.

In particular, it considered two different TFP measures:

- value added (VA) TFP, which represents only productivity improvements due to the use of labour and capital; and
- gross output (GO) TFP, which estimates productivity improvements arising from the use of labour, capital *and* intermediate inputs.

Ofgem identified separate ongoing productivity assumptions for operating expenditure and capital expenditure. For capex, it considered that historical TFP growth rates for the construction sector provided the closest proxy for network companies' capital investment activities. It also based its conclusions for network companies on the average TFP growth for all comparator sectors. It preferred to draw on long-term time-series (for the period 1970-2007) to smooth for data error, and used both GO and VA TFP measures. On this basis, it concluded an ongoing efficiency improvement of 0.7 per cent p.a. for network companies' capex over the price control period.[239]

For opex, Ofgem relied on PFP measures for labour, and labour, energy, materials and services (or LEMS) combined, as it considered these factors of production broadly equated to the factor input shares for network companies' opex. As with capex, it also relied on long-term average productivity measures for all comparator sectors, resulting in an ongoing improvement of one per cent per year.[240]

B.3.2.4. Expert review – regulated firm activities

Ofgem excluded certain costs, such as street works, smart metering and holder decommissioning, from its main regression analyses to enable consistent comparisons between GDNs.[241] Instead, it assessed these costs by technical analysis and calculated a separate allowance for each activity.

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238 The efficiency factor applied is net of estimated Real Price Effects, which account for expected changes in real input prices over the control period.

239 Ofgem (2012), "RIIO-T1/GD1: Initial proposals – Real price effects and ongoing efficiency", p20-21

240 *Ibid.*

241 Ofgem (2012), "RIIO-GD1: Initial proposals – Supporting document – Cost efficiency", Appendix 6

It conducted the analysis by directly examining each activity's cost drivers. For instance, in assessing efficient street works costs, Ofgem conducted an assessment of the costs that would actually be incurred. It allowed:

- £80 per permit, three per cent of which would result in a further £80 fixed penalty notice;
- £8000 per project in administration; and
- £18 per metre of pipe abandoned.

If GDNs submitted costs above these allowances, they were revised downwards. Similarly, Ofgem allowed £0.5 million per gas holder due to be demolished, and a one-off allowance of £0.30 in set-up costs per smart meter forecast to be installed.

Some of the allowances, such as those for smart meters, did not result from similarly detailed analysis, but were instead simply assumed by Ofgem. Allowances for gas holder decommissioning were calculated as the average of the costs submitted by GDNs. Ofgem's objective for each activity was simply to provide a reasonable allowance, rather than to provide a rigorous assessment.

B.3.3. Outcomes

Ofgem calculated efficiency scores from each of its econometric approaches by taking the ratio of actual costs to modelled costs, and arrived at a final result by averaging the scores from the four regressions. It assumed that GDNs could close 75 per cent of the gap over the price control period. In addition to the baseline set by econometric analysis, Ofgem made separate allowances for business support costs and the activities subject to technical analysis.

According to Ofgem, the approach was generally well received by stakeholders. Two of the four GDN ownership groups commissioned work by external economic advisors, both of which supported the proposed framework, namely a reliance on a wide set of econometric models. However, in general the GDNs contested the specification of a number of the econometric models (both totex and activity level models), and proposed alternative model specifications. In general, the GDNs also considered that Ofgem should place greater reliance on econometric models using forecast data rather than historical data, as well as totex models as opposed to activity-level models.

All GDNs contested the cost allowances for individual areas. For instance, they argued that the preparatory allowance for smart metering was too low, as well as contesting the allowances for business support costs.

Of the set of respondents to Initial Proposals for RIIO-GD1, National Grid Gas Distribution (NGGD) – which owns four of the eight distribution networks – was the most critical. It highlighted the following concerns:[242]

[242] See: Ofgem (2013), "RIIO-GD1 – Final proposals – Overview", p24-25.

- NGGD considered that, given three of its four GDNs are consistently ranked in the top five (of eight GDNs) whereas its London GDN is consistently ranked least efficient, the approach to comparative efficiency cannot be robust as it operates the four GDNs as a single business. NGGD considered the results demonstrated flaws in the model specification, and an inadequate adjustment for the higher costs of operating in London.
- NGGD also noted that the different econometric modelling approaches do not provide consistent results for its GDNs (with the GDNs performing worse on activity level as opposed to totex level results).

NGGD also criticised Ofgem's approach to estimating ongoing productivity improvements, notably, in relation to the proposed time-period selected, the potential double-counting of efficiency targets, and inconsistency with regulatory precedent. It claimed that Ofgem had implicitly assumed that the historical average of productivity improvements represents only frontier shift efficiency, but cited an academic paper that attributes 25 per cent of historical UK productivity growth to catch-up efficiency.[243] Therefore, it argued, there is double counting of catch-up efficiency targets when the ongoing efficiency targets are combined with industry benchmarking results.

In relation to ongoing efficiency, Ofgem rejected all of NGGD's concerns, and argued that there will not be systematic catch-up over sufficiently long time periods.[244]

[243] Fare et al. (1994), "Productivity growth, technical progress and efficiency change in industrialised countries", *The American Economic Review*, Vol 84.

[244] See: Ofgem (2013), "RIIO-T1/GD1: Real price effects and ongoing efficiency appendix", p16-20.

B.4. Rail

B.4.1. Context

The Office of Rail Regulation (ORR) conducts periodic reviews to set Network Rail's outputs, revenue requirements and access charges. The most recent review was concluded in 2008 (PR08), and applies to the years 2009-2014. ORR is currently undertaking provisional work for PR14, including having commissioned a number of studies relating to efficiency assessment.

ORR undertook (or commissioned) a broad range of work to assess Network Rail's efficiency for PR08, including:

- assessing Network Rail's proposals regarding the scope for efficiency improvements, and accompanying evidence (which included bottom-up assessments carried out by Network Rail and its consultants, including internal benchmarking of renewals expenditure and an assessment of potential efficiencies in procurement);
- international cross-sectional benchmarking of maintenance and renewals costs;
- bottom-up "gap analysis" studies to understand the source of Network Rail's estimated inefficiency relative to its international comparators; and
- functional benchmarking of specific opex categories (such as employment costs) against market comparators.

While examining a broad range of evidence on the scope for efficiency improvements, ORR appears to have placed the most weight on the results from international benchmarking in reaching its final decision. Indeed, it adopted the estimated efficiency gap from this work as its maintenance and renewals inefficiency estimate, and assumed that Network Rail would be able to close two-thirds of the gap over the control period. This was based on the subjective judgement that Network Rail should be able to fully catch-up to its peers within ten years.

In addition to this analysis, ORR commissioned work to examine trends in total factor productivity (TFP) and unit costs in other regulated industries. While one objective of this work was to provide an early high-level assumption about potential efficiency improvements, it also provided information about potential frontier shift improvements.

B.4.2. Application of Methodologies

B.4.2.1. Cross-section – international

As an input to PR08, ORR used econometric models to benchmark Network Rail's maintenance and renewals costs against 12 European comparators over the period 1996-2006.[245] It used the Lasting Infrastructure Cost Benchmarking (LICB) dataset, compiled externally by the International Union of Railways (UIC). ORR has subsequently published

[245] Smith, A (2008), "International benchmarking of Network Rail's maintenance and renewal costs".

studies that extend this analysis, both to monitor Network Rail's progress and to develop the methodology, and intends to conduct similar analysis during PR13.

The analysis focused on assessing efficient total maintenance and renewal costs. The primary econometric technique was Stochastic Frontier Analysis (SFA), a method that attempts to explicitly account for unobservable differences between comparators so as to not confuse them with relative inefficiency. ORR's consultants assumed a Cobb-Douglas functional form for the cost function, with outputs (e.g. passenger and freight train km) and network features (e.g. stations per route km) as cost drivers.[246] The consultants cross-checked this analysis using COLS.

The analysis adjusted Network Rail's renewal cost figures over the entire sample period for "steady state" to account for the effects of the Hatfield derailment, which caused renewals expenditure to increase significantly. ORR did not want to penalise Network Rail for this by determining that it reflects inefficient operation. It considered that the steady state level of renewals corresponds to renewing 2.5 per cent of the network per year.

Similarly to Ofgem's approach, discussed in Section B.3, the benchmark was chosen as the top quartile firm. In an update to the PR08 analysis, ORR adopted the estimated frontier as the benchmark.[247]

Using its preferred model, ORR found an efficiency gap of 37 per cent to frontier (with results ranging from 28 to 44 per cent from variety of different functional forms). It determined that Network Rail should be able to close the efficiency gap within ten years, which translated into a target to close two-thirds of the gap during 2009-14, or five per cent cost reductions per year.

ORR concluded that its econometric models were robust, both statistically and from an engineering perspective. Nevertheless, it recognised the difficulties of international benchmarking, and that the available data did not allow a full explanation of the observed differences between Network Rail and comparable firms. It therefore made "considerable effort" to consider the likely impact of that omitted variables might have on Network Rail's score, concluding that there was no reason to believe that inclusion of these variables would be favourable to Network Rail. ORR also undertook a substantial amount of work to corroborate the findings from an engineering perspective (see below).

It updated the analysis in 2010, finding that the preferred estimate of inefficiency had fallen to 34 per cent. ORR had intended to update the analysis regularly, and so have a role in monitoring, but no further updates have been published.

B.4.2.2. Function benchmarking

ORR commissioned a study to examine Network Rail's employment costs against external market benchmarks.[248] It compared the employment costs for certain employee categories

[246] The cost drivers were chosen to reflect the findings of bottom-up analysis of cost drivers.

[247] ORR (2010), "International cost efficiency benchmarking of Network Rail".

within Network Rail, such as HR manager, quantity surveyor and call centre staff, to similar positions in a number of benchmark datasets including:

- Inbucon's employment cost dataset;
- the IDS pay benchmark;
- the Watson Wyatt manufacturing, distribution and services sector survey; and
- the EEF Management and Professional Engineers Pay Survey.

The analysis concluded that Network Rail's employment costs for support, administration and management functions were in line with the market rate, although costs for signalling and maintenance employees were respectively 18 and 35 per cent above the median of relevant comparator groups. On aggregate, it concluded that employment costs at Network Rail were between 15 and 20 per cent above the benchmark.

ORR did not use this evidence to form any specific conclusions or make recommendations. Rather, it was taken as indicative evidence that the findings of the international comparison studies were of the right order of magnitude.

B.4.2.3. Time series – other UK regulated industries

In addition to the work used to assess the efficiency gap, ORR commissioned an early study to provide a preliminary assessment of the scope for Network Rail to improve cost efficiency over the next two control periods.[249] The main reason for commissioning this analysis was the need for ORR to provide an initial assessment of Network Rail's revenue requirement, so as to allow Ministers to make informed decisions about the outputs the network should deliver and the amount of funding available. The selected consultants chose to examine:

- historical unit cost reductions achieved by other privatised, price-regulated UK network utility companies; and
- historical TFP growth in the UK economy as a whole, and in sectors comparable to Network Rail.

The unit cost assessments were made by examining Real Unit Operating Expenditure (RUOE), a partial productivity measure that scales inflation-adjusted operating expenditure by a relevant measure of output. Network Rail was compared to firms in the water and sewerage, electricity distribution, gas distribution and electricity transmission industries, as well as BT.[250]

In order to make consistent comparisons between network industries, which are characterised by economies of scale, the study used the following adjusted RUOE:

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[248] Inbucon (2008), "Network Rail: Employment costs efficiency review".

[249] Oxera (2008), "Network Rail's scope for efficiency gains in CP4".

[250] The analysis was conducted at the level of the industry: for industries made up of more than one firm, the weighted average RUOE was calculated as the sum of operating expenditure scaled by the sum of outputs.

$$RUOE_{corrected,t} = RUOE_t \times \frac{\left(1 + \Delta Y_{t,t+1} \times \varepsilon\right)}{Y_{t+1}}$$

Where Y is the measure of output and ε is the elasticity of cost with respect to output. The assumptions for ε for each industry were taken from the existing literature, and were assumed to remain constant over time.

ORR's consultants presented the average annual change in RUOE over the time period for which data was available, and also showed results for different time periods since privatisation. In the case of Network Rail, they assumed that the Hatfield derailment "reset" Network Rail to pre-privatisation levels of inefficiency.

The study also examined TFP trends in the UK economy, both as a whole and across comparable industries. Unlike partial productivity measures, TFP takes account of all factors of production, so captures changes in output not related to inputs.

Network Rail was benchmarked against a composite TFP benchmark, calculated separately for each of opex, maintenance and renewals. The EU KLEMS dataset provides historic TFP estimates at highly-aggregated sectoral levels, for example construction, financial intermediation and rental of machinery. The composite TFP benchmark was constructed by taking a weighted average of these indices, with the weights chosen to correspond to the importance of the activities to Network Rail's costs. As the comparisons were made against competitive firms, this was interpreted as a lower-bound for possible productivity gains as there may be less scope for catch-up efficiency gains among firms subject to competitive pressures.

B.4.2.4. Expert review – business plan

ORR, with the support of consultants, carried out a detailed review of Network Rail's strategic business plan, the efficiency assumptions Network Rail had adopted, and the supporting evidence for these. It concluded that the plan significantly understated the scope for potential efficiency improvements. This was because, among other things:

- the bottom-up targets had largely been identified by those managers with responsibility for achieving them, which ORR did not consider would result in a challenging set of targets;
- the additional "stretch adjustments" applied by Network Rail did not appear particularly challenging, and were not backed up by any robust justification;
- unlike the previous review, Network Rail's internal benchmarking had been applied to renewals expenditure only. Maintenance expenditure had been omitted because of "major inconsistencies" in the expenditure records between delivery areas; and
- Network Rail had adopted conservative assumptions about its ability to close efficiency gaps identified, for example, from its internal benchmarking of renewals and its review of procurement efficiency.

B.4.2.5. Expert review – regulated firm activities

In conjunction with the international cross-sectional analysis discussed in Section B.4.2.1, ORR commissioned work to understand the sources of the estimated inefficiency as an input to PR08.[251] This body of work involved visits to infrastructure managers in Europe, North America and Australia and had two related objectives:

- to understand the sources of Network Rail's estimated inefficiency relative to the European comparators in the LICB dataset; and
- to assess which of these technologies and working practices could be applied in Britain to improve Network Rail's efficiency.

The analysis identified seven specific initiatives for detailed study, including asset inspection and asset management, recycling of components and the use of specialised teams. For each category, the analysis identified European best practice and estimated the potential cost savings available to Network Rail if it were to conform to these practices.

For example, ORR's consultants identified that best practice European railways undertake fewer track inspections, but that they are of a higher quality and are conducted from an inspection train rather than foot patrol. This allows for earlier identification of faults than under Network Rail's system. ORR's consultants then constructed the savings that would be possible from adopting the best practice approach using bottom-up assessment, and estimated that Network Rail could reduce foot patrolling inspection costs by 75 per cent.

The expert review of specific working practices did not constitute a full bottom-up cost assessment, as its scope is too narrow. However, it pointed to a number of areas where Network Rail could feasibly improve efficiency. ORR interpreted this as supporting evidence that the gap estimated between Network Rail and its European comparators in the econometric analysis reflects inefficiency.

Network Rail disputed each of the recommendations of the gap analysis, on the grounds that:

- many of the suggestions were already included in its plans; and
- many of the calculations made by ORR's consultants were invalid.

However, ORR did not change its view that there is significant scope for efficiency improvements. It also noted that the specific suggestions were not meant to be prescriptive, but simply indicative that Network Rail had scope to improve efficiency by adopting European best practice.

B.4.3. Outcomes

While ORR commissioned a broad range of studies for PR08, it placed greatest weight on the findings of the cross-sectional international benchmarking. Indeed, it adopted the 37 per cent

[251] Including ORR (2008), "ORR best practice study"; RailKonsult (2010) "Relative infrastructure managers' efficiency, Issue 2" and RailKonsult (2011) "Relative infrastructure managers' efficiency, Issue 3".

efficiency gap estimated by the preferred econometric model as its estimate of opex, maintenance and renewals inefficiency. ORR determined that Network Rail should be able to close two-thirds of this gap over the price control period. This recognised the difficult measures, such as the implementation of new technologies and working practices, that would be required to close the efficiency gap. But it also took account of Network Rail's own aspirations to achieve "world class" status.

Network Rail criticised the results of the econometric work, in particular relating to:

- poor data quality in the LICB dataset;
- the need to adjust fully for steady state renewals levels across all countries;
- the need to include additional parameters; and
- the functional form of the econometric model.

However, ORR did not accept any of the criticisms, and an external academic advisor deemed its response to have "addressed and rebutted all the substantive points that Network Rail's consultants have made".[252] ORR noted that evidence from many independent studies pointed to inefficiency of a similar magnitude, which lent credibility to the econometric results.

As well as work carried out for periodic reviews of access charges, ORR monitors Network Rail's performance on an ongoing basis. It compares outcomes with targets set at the most recent access charges review, and also with the obligations set out in Network Rail's licence. It publishes a quarterly report ("Network Rail Monitor") on Network Rail's operational performance, including delays and cancellations, asset management, delivery of major projects and customer service. And it publishes an annual assessment ("Annual Efficiency and Finance Assessment of Network Rail") which covers efficiency improvements and financial indicators as well as operational performance.

The annual assessment also underpins a mechanism that allows train operators to share the benefits from Network Rail outperformance. As well as comparing expenditure outturns with the targets set at the most recent review, this requires ORR to adjust for savings due to other factors, such as required outputs that Network Rail has not delivered or expenditure that has been deferred.

[252] ORR (2008). "Determination of Network Rail's outputs and funding for 2009-14", p127.

B.5. Telecoms

B.5.1. Context

Ofcom regulates firms in the UK communications industries. It conducts market investigations and regulates markets where an operator is found to have significant market power (SMP), which might involve setting a charge control. For instance, it has recently set charge controls for:

- mobile call termination rates;
- BT Wholesale and Openreach's wholesale provision of leased lines;[253,254]
- BT Openreach's provision of Local Loop Unbundling (LLU) and Wholesale Line Rental (WLR) services; and
- BT Openreach's provision of wholesale ISDN30 services.

Ofcom conducted its most recent review of mobile call termination (MCT) in 2011. It set mobile termination rates (MTRs) for four national mobile communication providers (MCPs), and required all other MCPs to set "fair and reasonable" termination rates.[255] It set the MTRs on a purely bottom-up basis, relying on a "pure" long run incremental cost (LRIC) model for MCT. As such, it used the bottom-up model output as the benchmark for efficient MCT costs.[256]

In 2010, Ofcom completed market investigations of the Wholesale Local Access (WLA) and Wholesale Fixed Analogue Exchange Line (WFAEL), finding that BT (Openreach) had SMP for LLU and WLR services in each of the markets.[257] It concluded that charge controls were necessary to mitigate Openreach's ability to set excessive charges or operate margin squeeze.[258] The current charge controls were set to apply for the years 2012-2014. However, as discussed in Section B.5.3, BT appealed against the charge controls, although the Competition Commission is yet to reach a decision.

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253 Leased line broadband services may be provided using either traditional interface (TI) or alternative interface (AI) technologies. These are provided by BT Wholesale and Openreach respectively, and have separate charge controls.

254 BT Group is made up of: BT Global Services, which provides IT and telecoms services to multinationals; BT Wholesale, which provides wholesale telecommunications services to communication providers and ISPs; BT Openreach, which provides rival operators with access to BT's last mile network; and BT Retail, which provides retail telecommunications services to businesses and consumers.

255 The four national MCPs were: Vodafone, O2, Everything Everywhere, and H3G. See Ofcom (2011), Wholesale mobile voice termination – Statement, p2.

256 See Ofcom (2011), "Wholesale mobile voice termination – Statement", paragraph 9.98.

257 LLU covers a set of services sold by Openreach that allow other operators to take over (or share) a copper access connection from end-user to the BT exchange building, and provide services over that connection. WLR is used by other operators to provide retail customers with exchange lines.

258 Ofcom (2012), "Charge control review for LLU and WLR services – Statement", p5.

Ofcom conducted a number of efficiency analyses to assess Openreach's scope for delivering cost savings. Its objective was to set an efficiency factor to capture all means of delivering efficiency savings. Ofcom based its final determination on three primary analyses:

- function benchmarking of specific operating expenditure categories against market comparators;
- analysis of Openreach's historical efficiency savings; and
- a review of BT's MTP.

In setting the charge controls for LLU/WLR and leased lines, Ofcom also noted a number of econometric international cross-sectional studies upon which it placed less weight, such as:[259]

- an econometric analysis that to benchmarked Openreach's costs to US Local Exchange Carriers (LECs), but was unable to make comparisons on a reliable basis as Openreach's scale was far larger than any of its comparators; and
- an analysis that benchmarked BT Group costs to comparable European operators, which Ofcom did not consider to provide a reasonable proxy for costs that would be incurred in a competitive market.

Ofcom used the results of its efficiency assessment for LLU and WLR directly in setting the ISDN30 charge control.[260]

In March 2013, Ofcom published its final statement to address leased line provision in the UK, recommending charge controls in conjunction with other remedies.[261] It set separate charge controls, along with different efficiency assumptions, for traditional interface (TI) and alternative interface (AI) technologies. For each technology, Ofcom set the efficiency target based on:

- technology-specific historical trend analysis;
- efficiency estimates for the relevant BT Group division contained in BT's Medium Term Plan (MTP); and
- external benchmarking studies.

B.5.2. Application of Methodologies

B.5.2.1. Cross-section – international

In setting the charge controls for BT's LLU/WLR and leased line services, Ofcom considered two studies that compared BT to international comparators using econometric techniques (although ultimately did not place much weight on the results of either).

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259 These are the same studies Ofcom considered as a part of the leased line charge control.

260 Ofcom (2012), "Wholesale ISDN30 price control – Statement", p3-4.

261 These included certain restrictions on BT's behaviour, such as requirements to not discriminate unduly, to publish quality of service information and to notify Ofcom of charge changes.

The first was commissioned by BT Wholesale to assess its efficiency relative to five European comparators over the period 2005-2010.[262] The study used stochastic frontier analysis (SFA) and corrected ordinary least squares (COLS) to model costs in terms of output factors (such as switched lines, minutes and bandwidth) and environmental factors (such as GDP and population density). The study indicated that, of the six operators in the sample, BT was the most efficient.

The second study, originally commissioned by Ofcom in the context of the LLU/WLR review but also consulted for the leased line charge control, compared BT's efficiency against comparators in the US.[263] The study used SFA on a sample consisting of Openreach and 68 Local Exchange Companies (LECs) – US regional telephone network incumbents – for the years 1999-2006. The study noted the difficulty in comparing Openreach to LECs on a consistent basis, resulting in a wide range of efficiency estimates: the study concluded that Openreach's efficiency was in the range of -7.2 per cent to +6.8 per cent relative to the top decile.

B.5.2.2. Function benchmarking

Ofcom commissioned a study to examine the efficiency of Openreach's operating costs as an input to the LLU and WLR charge controls, and also considered its conclusions in setting charges for AI leased line provision.[264] [265] The study benchmarked costs incurred in four categories against companies in comparable industries for 2009/10. The categories examined were:

- employment costs;
- IT costs;
- fleet costs; and
- corporate overheads.

The study extrapolated the results to operating costs incurred in categories that were not examined directly, based on consideration of whether they might have similar characteristics and cost drivers. For instance, if a benchmarked activity was found to be inefficient, and it was considered to be sufficiently similar to an activity that was not benchmarked directly, the activities were considered to have the same level inefficiency. Overall, the study found Openreach's costs to exceed the comparable benchmarks by 1.2 per cent, which equated to 0.3 per cent per year over a four year period.

The analysis then added an estimate of productivity gains in the economy as a whole. It intended this additional productivity factor to reflect general efficiencies that Openreach

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262 Deloitte (2012), "Analysis of the efficiency of BT's regulated operations".

263 NERA (2008), "The comparative efficiency of BT Openreach".

264 KPMG (2010), "Efficiency review of BT Openreach".

265 Ofcom considered commissioning a similar efficiency assessment of BT Wholesale as an input to the TI charge control, but found that such differences Wholesale's approach to cost allocation meant that such a study would be required to review a significant portion of BT's costs, and so did not undertake the study.

should be able to achieve, in line with other firms in the economy. It was calculated as the 20 year average annual growth rate in GDP per hour worked, a proxy for labour productivity.

Accounting for this additional productivity factor, the analysis recommended target efficiency improvements of 2.3-2.6 per cent per year.

B.5.2.3. Time series – regulated firm

Ofcom placed considerable weight on analysis of BT's previous efficiency performance to inform its decision of an appropriate efficiency factor in both the LLU/WLR and leased line charge controls.[266]

In the LLU/WLR charge control, as well as in the AI leased line control, Ofcom examined Openreach's cost data, finding real efficiency savings of four per cent per year over the period 2007-2010. In 2010/11, Openreach delivered a nine per cent efficiency saving. Ofcom then considered whether it could reasonably expect Openreach to deliver similar efficiency savings in the future.

Openreach argued that some of the savings made during 2010/11 were one-off in nature, and could not be repeated during the charge control period. Ofcom reasoned that a particular efficiency saving being one-off in nature should not necessarily be a basis for exclusion, as while specific efficiencies might not be able to be replicated, it is reasonable to expect Openreach to find other savings. However, it agreed that part of the savings made in 2010/11, which related to a reduction in BT's Cumulo bill, should be excluded.

As a result, it reduced the estimated efficiency savings for 2010/11 to five per cent. Ofcom concluded that the analysis supported an annual efficiency target of between four and five per cent.

Ofcom also considered TI-specific historical trends in setting the TI leased line charge control, considering that "trends of reductions in real unit costs in the recent past for a given service offer a useful indicator for expected future efficiency gains."[267] It computes the historical values of a Tornqvist index by:

- calculating the change in an output volume index by summing the year-on-year volume changes across cost components;
- calculating the change in an input index by summing the year-on-year input changes across cost components;
- deriving the Tornqvist metric as the ratio of the input index to the output index; and
- adjusting the resulting metric for economies of scale, using an assumption on the cost-volume relationship.

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[266] Ofcom (2011) "Charge control review for LLU and WLR services – consultation document"; Ofcom (2012) "Charge control review for LLU and WLR services – Annex 3".

[267] Ofcom (2013), "Business connectivity market review – final statement", Annex 8 paragraph A12.77.

Ofcom found an average reduction in TI costs of 1.5 per cent over the period from 2006/07 to 2010/11 using this index.

B.5.2.4. Expert review – business plan

One further source of information used by Ofcom in setting both LLU/WLR and leased line charge controls was BT's MTP, an internal document that sets out the financial outlook for BT over the following three years.[268] In constructing the MTP, BT Group issues guidance on the appropriate efficiency targets for each of its lines of business, with targets reached by internal negotiation. The MTP is produced for internal planning within BT Group, not regulatory submission: Ofcom used its information gathering powers to obtain the most recent MTP projections for Openreach.

Ofcom considered that Openreach management's view of potential efficiency gains provides "a highly relevant benchmark" as the data are recent and specific to Openreach. Furthermore, as the MTP is not produced for regulatory submission, it reasoned that it is unlikely to be affected by downward bias in targeted efficiency savings.[269]

In the LLU/WLR review Ofcom used the savings that Openreach was expected to commit to over the period to 2013/14, and estimated that this is equivalent to an annual efficiency target of approximately four per cent over a three year period.

Ofcom placed less weight on the MTP during the leased line review. It noted that the efficiency targets for BT Wholesale only applied to Selling, General and Administrative Expense (SG&A) costs only, which represent only a small portion of BT Wholesale's costs and might not be reflective of its overall scope for efficiency savings.[270] In setting the AI control, Ofcom used the MTP only as a cross-check that its targeted efficiency improvements were reasonable.[271]

B.5.2.5. Expert review – activities

Ofcom set the MTRs for the four national MCPs operating in the UK based on a bottom-up LRIC model. It considered two model variants:

- pure LRIC, which measures fixed and variable costs, specific to MCT service provision, arising in the long-run as a result of providing MCT services; and
- LRIC+, which allows for a mark-up to cover joint and common costs, such as the cost of spectrum.

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[268] Ofcom (2011) "Charge control review for LLU and WLR services – consultation document"; Ofcom (2012) "Charge control review for LLU and WLR services – Annex 3".

[269] Ofcom notes that Openreach's actual efficiency figure for 2011/12 was lower than forecast, using this as further evidence that BT does not consistently underestimate potential efficiency improvements. Ofcom (2013), "Business connectivity market review – final statement", Annex 8 paragraph A.12.119.

[270] Ofcom (2013), "Business connectivity market review – final statement", Annex 8 paragraph A12.91.

[271] *Ibid.*, paragraphs A12.119-121.

Ofcom had based MTRs on a LRIC+ model in the 2007 review (and previously). However, it argued that pure LRIC is a closer approximation to marginal cost than LRIC+, and charges based on pure LRIC would consequently increase allocative efficiency.[272]

It used its pure LRIC model to estimate efficient unit MCT costs. It then set MTRs to follow a glide path from existing to efficient charges according to RPI-X, with X set so that charges would equal assessed LRIC by 2014/15.

B.5.3. Outcomes

In setting MTRs, Ofcom required the four national MCPs to reduce real MTRs from 4.18 pence per minute (ppm) in March 2011 to 0.69 ppm by March 2015 in real terms. This corresponded to an X factor of 37.8 per cent per year for each of the four years.[273]

Ofcom set annual efficiency targets of 1.5 per cent for BT Wholesale's provision of TI leased lines, and 4.5 per cent for BT Openreach's provision of AI (Ethernet) leased lines. In each case, it placed most weight on the results of the historical trend analysis, and considered that the other sources of evidence lent support to these findings.[274]

It followed a similar approach in setting a five per cent annual efficiency target for Openreach in the LLU/WLR charge control. It placed most weight on the analyses that had been based on Openreach-specific data, i.e. the historical analysis of efficiency savings and the analysis of BT's MTP. It also claimed that five per cent was consistent with the function benchmarking.[275]

The previous LLU/WLR charge control review, conducted in 2009, resulted in an appeal to the Competition Commission (CC). Within this appeal, the CC stated that both historical analysis of Openreach efficiency and the Openreach budget provide useful indicators of the scope for future efficiency reductions. Ofcom claimed that this lent support to its approach.

BT also appealed against the 2012 review on three grounds:

1. It claimed that Ofcom made a number of errors in its allocation of costs or income associated with LLU and WLR services, as well as in its valuation of relevant assets over the period of the charge control.
2. It claimed that Ofcom used a Regulatory Asset Value adjustment to its duct assets with insufficient justification, and that it should have valued all of BT's duct assets on a current cost accounting basis.

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272 Ofcom (2011), "Wholesale mobile voice termination – Statement" paragraph 8.21.

273 Ofcom set an X factor of 41.8 per cent for the first year of H3G's price control, as its charge was initially higher than the other three MCPs.

274 See Ofcom (2013), "Business connectivity market review – final statement", Annex 8 paragraphs A12.90-92 and A12.118-120.

275 The study found that an appropriate efficiency target would fall in the range 2.3-2.6 per cent. Ofcom then added an additional 0.5 per cent to reflect additional improvements that would result from a reduction in fault rates. It concluded that the evidence supported an efficiency estimate of "above 3%".

3. Ofcom did not allow BT to recover any of its pensions deficit repair contributions, nor did it make an allowance for BT to service its embedded debt. BT also claimed that Ofcom's cost of capital should have been calculated on the basis of a gearing level of 40 per cent rather than 50 per cent.

The Competition Commission is yet to pass judgement on BT's appeal.

B.6. Water

B.6.1. Context

Ofwat regulates 33 water and sewerage companies in England and Wales, comprised of:

- 10 companies which provide both water and sewerage services;
- 10 companies which provide water services only (12 at the time of PR09);[276]
- five local companies providing water or sewerage service (or both); and
- eight water supply licensees that provide water services to large customers and are subject to competition.

The most recently completed price review (PR09) was conducted in 2009 and applies for the five-year period from 2010 to 2015. Ofwat is currently consulting on its approach to the next review (PR14), to be applicable from 2016 to 2020, and is considering making changes to its approach to efficiency assessment.

During PR09, Ofwat conducted separate efficiency assessments for opex and capex. In assessing relative opex efficiency, it compared the 22 companies providing water services in England and Wales against each other, and similarly compared the 10 companies providing sewerage services, using two sets of analysis:

- simple unit cost comparisons; and
- econometric analysis, using Ordinary Least Squares (OLS) and one year of data submitted by companies.

Companies were targeted to close 60 per cent of the gap to frontier efficiency by 2015, with equal improvements each year.[277]

Ofwat's capex efficiency assessment relied on a bottom-up assessment of companies' business plans. It used this as a baseline in the capex incentive scheme (CIS), under which each company is allowed to recover its actual capex plus or minus an "incentive allowance" that depends on the ratio of actual capex to the baseline (known as the "CIS ratio"). All companies were given allowances equal to Ofwat's baseline, plus 25 per cent of the difference between baseline and actual capex. Furthermore, companies with a low CIS ratio were allowed to retain a higher percentage of outperformance: a company with a ratio of 0.8 would retain 45 per cent of outperformance, while a company with a ratio of 1.2 would retain 15 per cent.[278]

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[276] Ofwat had access to data for 12 companies, two of these (South East Water and Mid Kent Water) had merged in 2007.

[277] This figure appears to have been chosen arbitrarily.

[278] Ofwat intends to reconcile the rewards and penalties due from the PR09 period at PR14. See Ofwat (2009) "Future water and sewerage charges 2010 – 2015: Final determinations", Section 4 and Appendix 2.

Ofwat has confirmed that it will assess totex efficiency for PR14, rather than opex and capex separately. This is similar to Ofgem's current approach, as outlined in Section B.3 above. It is also proposing to use a number of more sophisticated econometric models to estimate relative efficiency, although it has not disclosed specific details.[279] Preliminary analysis has used a dataset covering 18 water companies and 10 sewerage companies over nine years (from 2001/02 to 2011/12).[280]

The initial analysis suggests that totex assessment with panel econometric methods is feasible for water services, but the models for wastewater totex are less robust. Instead, Ofwat is proposing to retain simpler unit cost models for separate wastewater sub-services. Additionally, it has proposed excluding specific costs from the assessment if they are uncertain or not controllable. However, it has not provided further details about which costs might be excluded.

B.6.2. Application of Methodologies

B.6.2.1. Cross-section – other UK

For PR09, Ofwat made simple comparisons between unit costs of water and sewerage companies. It made comparisons on the basis of total cost per property billed and total cost per cubic metre, ranking companies according to these metrics.[281] However, as unadjusted unit costs are only a very approximate measure of efficiency, Ofwat did not rely upon these results to provide more than an approximate picture of relative efficiency.[282] For instance, it notes that the company rankings may differ between the two measures as some large customers receive a large quantity of water but only one bill: the measures are not robust to this. Instead, Ofwat set allowances on the basis of econometric models run at the levels of individual activities, as discussed in Section B.6.2.2.

B.6.2.2. Function benchmarking

Ofwat used single-year cross-sectional econometric models to assess relative operating expenditure efficiency.[283] The models were estimated with OLS using data submitted by all 12 water-only and 10 water-and-sewerage companies operating in England and Wales at the time. Prior to PR09, Ofwat conducted similar analysis annually to monitor progress, although this has not been continued.

For PR09, Ofwat divided operating expenditures into nine cost areas, such as water distribution, water power or sludge treatment and disposal, and used separate models for each.

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279 Ofwat claims that its relative opacity is to prevent regulatory gaming.

280 CEPA (2013), "Ofwat: Cost assessment".

281 Ofwat also considered unit opex, capital maintenance and return on capital. See: Ofwat (2009), "Relative efficiency assessments 2007-2008 – supporting information", p1.

282 The operating environment faced by companies might differ in ways that affect costs, but making simple unit cost comparisons does not account for this.

283 Ofwat also considered unit opex, capital maintenance and return on capital. See: Ofwat (2009), "Relative efficiency assessments 2007-2008 – supporting information", p1.

It used econometric models for four aspects of water service and two aspects of sewerage service, alongside unit cost models for three further sewerage service categories.

Ofwat made a number of adjustments to the data submitted, such as:

- reclassifying leakage control costs as operating expenditure (if listed as capital maintenance expenditure) to ensure comparability;
- adjusting operating expenditure for pensions to correct for inconsistencies arising from changing accounting standards;
- excluding atypical/one-off costs such as extreme weather events, costs associated with takeover bids or bid defence, or provisions for restructuring, as reported by water companies;
- adjusting for company-specific factors that are beyond the control of management in the medium term, including particular legal requirements or circumstances relating to a particular geographical area of operation;[284] and
- adjustments to account for differences in regional salaries.

B.6.2.3. Expert review – business plan

As outlined in Section B.6.1 above, Ofwat implemented the CIS during PR09 to incentivise companies to reveal their truthful forecast of capital expenditure (capex). To arrive at its CIS baseline, Ofwat assessed proposed capex in companies' business plans. Its framework was designed to achieve a "central" estimate of efficient baseline capex.

Ofwat first considered whether companies had established that the proposed investment was necessary and accurately costed. It required all proposed investment to be justified with a robust CBA, justified by companies by demonstrating, for instance:[285]

- that cost estimations had conformed to Ofwat best-practice, accounting for project management, scope definition and approach to risk and value;
- that the company's approach to capex forecasting had been implemented at a project-specific level; and
- that the company was able to deliver the proposed capital programme in line with the projected profile.

In cases where Ofwat did not feel that the need for the proposed investment had been sufficiently justified, it removed it from the CIS baseline; where it felt that the need was established, but insufficiently justified, it either revised the scale of the proposed investment, or requested further evidence from the company.

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[284] Ofwat asked companies to identify any such special factors, and provide an estimate of the monetary impact, but retained the right to disallow any special allowances applied for.

[285] Ofwat (2009), "Setting price limits for 2010-15: Framework and approach".

To establish the efficiency of proposed expenditure, Ofwat used the "cost base comparative tool". [286] It examined companies' unit costs for a set of standardised capital works projects, based on submitted audited estimates of current and previous capital works programmes. For each cost type, it examined the distribution of costs submitted by companies, and selected the median as the benchmark comparator.

Based on draft business plan submissions, Ofwat noted a high variance in proposed costs. To confirm that this was truly reflective of relative efficiency, it commissioned a consultant to visit each company and establish reasons for material differences in unit costs.

Ofwat undertook further work in assessing the efficiency of proposed capital maintenance investment, using its Asset Management Assessment (AMA).[287] Under the AMA, Ofwat scored companies' business plans in 28 separate sub-services belonging to nine categories: stakeholder engagement; leadership, policy and strategy; management; processes systems; data analysis; and reporting balance.

It assigned a score to each sub-service of between zero and five, where a score of five indicated a soundly justified and trusted plan, while zero indicated that the plan's justification was "well below" expectation and considered unreliable. If a company achieved a score of four for a sub-service, 100 per cent of its proposed expenditure for that category was allowed into the baseline. Ofwat reduced (or increased) allowed expenditure for each sub-service by the percentage deviation from four. A score of less than four resulted in a reduction, while a score of above four meant that it was given an additional allowance in the baseline (up to a maximum of 25 per cent more).

B.6.3. Outcomes

In assessing opex efficiency, Ofwat combined the results of the four water models and the five sewerage models (resulting in separate assessments of water and sewerage). It did not directly consider the results of the preliminary unit cost comparisons in setting efficiency allowances.

Ofwat chose a benchmark company separately for water and sewerage operating expenditure. The benchmark company was not necessarily the most efficient, but chosen subjectively as one for which (at a minimum) there were no data consistency concerns and that represented a reasonable proportion of the sector. Each firm was compared to this benchmark company and grouped into five bands, where A was the most efficient. Band A companies were within five per cent of the benchmark, and subsequent bands were at 10 per cent intervals.[288]

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[286] In contrast to its approach to opex, Ofwat did not set an separate catch-up efficiency target for capex; rather, it built efficiency challenges into its assessment of the baseline for the CIS. See: Ofwat (2009), "Future water and sewerage charges 2010-15: Draft determinations", p87

[287] Ofwat (2009), "PR09/23: Asset Management Assessment (AMA) and baseline setting – Annexes", Appendix A.

[288] Band A may also include firms that are more efficient than the benchmark company, but not suitable to use as the benchmark for other reasons.

In the PR09 final determination, firms were targeted to catch-up 60 per cent of the assessed efficiency gap by 2015. This translated into annual operating expenditure efficiency targets of up to 2.9 per cent per year.

For capex, Ofwat reduced companies' total claim for £24 billion down to £22.1 billion, largely reflecting efficiency adjustments, as well as judgements on the scope and scale of proposed investment. At the industry level, the CIS ratios were 109 for water and 105 for sewerage, indicating that total proposed investment was above the CIS baseline. However, there was a large amount of variance around these averages, with some companies' ratios above 130.[289]

For PR14, Ofwat is considering changing its approach in a number of ways, including:

- assessing company efficiency on a total expenditure (totex) basis, rather than conducting separate analyses for opex and capex which might risk distorting firms' decisions regarding spending of different types;[290] and
- modelling efficiency costs based on a panel data approach using data that covers a longer period of time, rather than just one year.

It is also proposing a move towards "menu regulation", whereby Ofwat will make an assessment of the efficient cost baseline for each company, but allow firms to choose from a menu of options that combine allowed expenditure relative to the baseline with the fraction of cost savings to be retained.

[289] Veolia East's CIS ratio was 143, while Veolia Central's was 131.

[290] Note that this is consistent with Ofgem's approach under RIIO, as discussed in Section B.3 .

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