Representation Appendix C11.1 – Working paper on the approach to implicit allowances relating to enhancement operating expenditure – Reckon LLP

Wessex Water

August 2019

Wessex Water
YTL GROUP

This appendix comprises a report by Reckon LLP dated 6 June 2019:

> Working paper on the approach to implicit allowances relating to enhancement operating expenditure.

Reckon LLP
Data analysis | Economic regulation | Competition law

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Working paper on the approach to implicit allowances relating to enhancement operating expenditure

Table of contents

Reckon LLP, limited liability partnership registered in England (number OC307897)
31 Southampton Row, London, WC1B 5HJ • www.reckon.co.uk

1. Introduction and summary

Background

Ofwat is currently carrying out its periodic review of the price controls for English and Welsh water companies to apply in the period 1 April 2020 to 31 March 2025 (the PR19 review). As part of this review, Ofwat published its initial assessment of water companies' business plans (IAP) on 31 January 2019. One of the major elements of Ofwat's work for the IAP has been its cost assessment, which drew on a range of analysis and approaches to produce provisional allowances for each water company's efficient expenditure requirements over the period 2020-25.

We carried out a short piece of work in February and March 2019, for three companies: Anglian Water, Northumbrian Water and Wessex Water. This concerned one quite specific aspect of Ofwat's wholesale cost assessment for its IAP, which is the treatment of "enhancement operating expenditure". The main output of this work was a report entitled *Review of the treatment of enhancement opex in Ofwat's PR19 initial assessment of business plan*s (7 March 2019), which was submitted to Ofwat. We also discussed the findings from our review with Ofwat in early March 2019.

The same three companies asked us to carry out further work on the price control treatment of enhancement operating expenditure, which we began at the start of May 2019. We met with Ofwat on 1 May 2019 to discuss potential avenues for that further work and, following that, agreed with the three companies that we would prioritise work on the topic of implicit allowances relating to enhancement operating expenditure. This was one of the topics we had raised and discussed in our earlier review. This working paper captures our progress, to date, on implicit allowances relating to enhancement operating expenditure.

This paper is not a substitute or an update for our report from March 2019, but rather a more detailed follow-up on one specific topic arising from that report. Other developments of Ofwat's approach, besides those relating to implicit allowances, might be needed to Ofwat's cost assessment approach to reduce risks of a bias towards capital expenditure and to help encourage innovation and efficiency.

Recap of relevant parts of our March 2019 report

Ofwat's approach to cost assessment ultimately produces an annual totex allowance for each company, for each separate wholesale control; totex is defined as the sum of operating expenditure and capital expenditure on a cash basis. However, the cost assessment approach used for the IAP is not a pure totex approach: it is not indifferent to the balance of operating and capital expenditure in companies' business plans. The way that Ofwat approached the cost assessment for the IAP entailed significant differences in the treatment of operating expenditure and capital expenditure.

The approach involved marking a boundary between (*a)* the assessment of the capital expenditure proposed by companies to accommodate increases in customer demand, increases in service quality and improvements to environmental outcomes, and *(b)* the assessment for the remainder of companies' costs.

Ofwat's IAP was generally dismissive of the forecasts put forward by water companies for the operating expenditure associated with plans to accommodate increases in customer demand, increases in service quality or improvements to environmental outcomes. While Ofwat carried out analysis and review of companies' forecasts of the capital expenditure associated with enhancements, it generally swept aside companies' forecasts of the operating expenditure associated with enhancements. This is a significant issue for the PR19 cost assessment. Across the sector, the operating expenditure put forward in companies' business plans, from September 2018, to cover such enhancements during 2020-25 was around £975 million for wholesale water services, and £625 million for wholesale wastewater services (2017/18 prices).

The rationale given in the IAP for the treatment of enhancement operating expenditure was that allowances for this expenditure is already covered (implicitly) within the allowances for base costs over the 2020-25 period, which are based on the results from econometric models of historical base costs. Our report from March 2019 reviewed the treatment of enhancement operating expenditure within the IAP. We found that the allowances for base costs may include some implicit allowances for some of the operating expenditure associated with enhancements. But implicit allowances could not explain, or justify, the wide-ranging dismissal of companies' claims for enhancement operating expenditure.

Ofwat's regulatory framework is intended to reward and encourage efficiency and innovation. But this policy intention could be undermined by the approach to enhancement operating expenditure used for the IAP. It would create incentives for water companies to favour capex-intensive approaches at the expense of more opex-intensive solutions when it comes to accommodating increases in the number of customers supplied, achieving better environmental outcomes and delivering improved service levels.

Our report from March 2019 was primarily concerned with an explanation of the deficiencies with the treatment of enhancement operating expenditure in the IAP. We also made suggestions on how Ofwat could further develop and adapt its IAP approach to tackle those deficiencies. We emphasised that it would be important to develop a better understanding of implicit allowances, and of the relationship between the allowances derived from the econometric models of historical base costs and the costs that an efficient company faces to accommodate increases in customer demand, deliver increases in service quality and achieve improvements to environmental outcomes.

Implicit allowances relating to enhancement operating expenditure

This working paper is tightly focused on implicit allowances relating to enhancement operating expenditure. It aims to help provide the basis for an improved understanding of how these implicit allowances arise and what might be done, in practice, to take account of them as part of the PR19 cost assessment process.

The position taken in Ofwat's IAP – that no allowances are needed for enhancement operating expenditure because these are covered implicitly by allowances from the base cost modelling – seems mistaken. But the concept of an implicit allowance relating to enhancement operating expenditure is a useful one.

The implicit allowances that we are concerned with form part of the base cost allowances for the 2020-25 period, which Ofwat calculates using results from econometric modelling of historical base costs. They represent an element (in £m) of the base cost allowance which can be considered "available" for funding enhancement operating expenditure in that forecast period. There could be double counting if the wholesale price controls for a company were to be calculated by adding a reasonable estimate of the company's efficient level of enhancement operating expenditure for the 2020-25 period to the base cost allowance for that company, without taking account of implicit allowances relating to enhancement operating expenditure. Whether double counting applies in practice will depend on what is covered by the estimates of enhancement operating expenditure.

One of the challenges in seeking to take account of these implicit allowances, as part of the PR19 cost assessment, is that there is at present a limited understanding of the nature and scale of the implicit allowances within the base cost allowances. This is especially so for implicit allowances that relate to enhancements to enable service quality or environmental improvements which are not captured or recognised through explanatory variables used in econometric models of base costs. This in turn, is a symptom of a broader problem with Ofwat's price control framework. Ofwat builds up price controls based on allowances derived from econometric models of base costs which overlook the way that differences in service quality and environmental performance may affect companies' costs. There remains a policy concern that companies that provide relatively high-quality services and/or environmental performance will tend to be under-remunerated. Meanwhile, those companies which provide relatively poor service quality and environmental performance may by over-remunerated, with customers paying for levels of performance that are not delivered.

In this context, we consider that progress can be made by recognising, and then assessing, four different types of implicit allowance relating to enhancement operating expenditure:

- Implicit allowances arising from forecast explanatory variables.
- Implicit allowances for catch-up to quality funded through base cost allowances.

- Implicit allowance for output or aspects of quality no longer provided.
- Implicit allowance for historical operating expenditure providing longer-term benefits.

In this working paper we elaborate on each of these types and provide practical guidance on how they might be taken into consideration.

We have not identified a quick and easy solution to the estimation of implicit allowances for enhancement operating expenditure. The suggestions we have made involve "legwork" and case-by-case review; they are not something that can be closed off in a few days' work. We have recognised that data limitations and the need for proportionality will also affect the overall approach to implicit allowances. The legwork and proportionality should be considered in the context of the money at stake (companies' forecasts for enhancement operating expenditure are around £1.5 billion for the 2020-25 period), and after recognising the conflict between the approach taken in Ofwat's IAP and Ofwat's policy objectives relating to efficiency and innovation. We hope that the material in this paper helps to make that work more manageable and better targeted at areas where it is most worthwhile.

Given the timing of the PR19 process, it may be difficult for Ofwat to fully implement the approach envisaged in this paper in time for slow-track draft determinations. But we feel that Ofwat could provide a preliminary application of it for the draft determinations, using working assumptions in some areas. There is also benefit in using draft determinations to set out a credible plan for working through implicit allowances for enhancement operating expenditure. It could then look to refine this in time for final determination's, perhaps drawing on further information requests to companies.

The nature of the guidance provided in this working paper

The extent of the development of the material presented in this working paper has been limited by the time available and the desire to provide input to Ofwat ahead of draft determinations. There are issues that would benefit from further consideration and areas of guidance that could, no doubt, be explained more clearly. Even so, we consider that this paper provides the basis for a concrete step forwards, from the position taken in the IAP towards an improved approach to cost assessment for enhancements for PR19.

There are also questions about the appropriate approach to implicit allowances and enhancement operating expenditure for future price control reviews, beyond PR19. We have not given these any attention within this paper, which is concerned with more immediate issues and recognises constraints from the structures arising from the data availability and the PR19 methodology. We suspect that the answer lies in developing a refined approach to cost assessment that takes better account of differences between companies, and over time, in various dimensions of service quality and environmental performance that are not captured by explanatory variables in the econometric models. Some of the challenging issues relating to implicit allowances that arise in the context of

this paper are a manifestation of the broader limitations of Ofwat's price control framework in terms of its treatment of quality differences between companies.

Structure of this working paper

The remainder of this working paper is structured as follows:

- Section 2 considers the definition of enhancement operating expenditure.
- Section 3 describes some simulation analysis we carried out to help investigate and illustrate implicit allowances relating to enhancement operating expenditure.
- Section 4 explains four types of implicit allowances relating to enhancement operating expenditure that we have identified. These four types are: implicit allowances arising from forecast explanatory variables; implicit allowances for catch-up to quality funded through base cost allowances; implicit allowances for outputs or aspects of quality no longer provided; and implicit allowances for historical operating expenditure providing longer-term benefits.
- Section 5 suggests how these four types of implicit allowance relating to enhancement operating expenditure can be used to organise work on implicit allowances for PR19, taking account of limitations in available data and proportionality. It also provides examples of issues that seem relevant under each of the four types, for a selection of the enhancement categories.
- Section 6 provides guidance on how Ofwat might approach the assessment of implicit allowances for catch-up to quality achieved historically, which is one of the four types identified.
- Section 7 provides guidance on how Ofwat might approach the assessment for the other three types of implicit allowances relating to enhancement operating expenditure.

2. The definition of enhancement operating expenditure

Introduction

This section considers the definition of enhancement operating expenditure and suggests that further clarification is needed. The definition adopted has implications for the approach to implicit allowances relating to enhancement operating expenditure.

Concerns with existing definitions and guidance

There is a lack of clarity about the concept of enhancement operating expenditure and, in turn, on the forecasts and other evidence provided by companies on this. This lack of clarity raises problems for Ofwat's cost assessment and for our work on implicit allowances for enhancement operating expenditure.

Ofwat's business plan guidance refers to "operating enhancement expenditure" as operating expenditure that is associated with capital enhancement expenditure. It does not provide any further explanation or clarification of this concept.[1] The PR19 business plan data tables WS2 and WWS2 require companies to report on each of enhancement capital expenditure and enhancement operating expenditure by purpose, where the purposes relate to different categories of enhancements (e.g. meeting lead standards, addressing low pressure, improvements to river flows).[2] The line definitions provided in the business plan data tables provides some further explanation on the information sought. For example, the definitions table WS2 line 41 refer to "operating expenditure to deal with invasive non-native specifies" and for line 52 refers to "operating expenditure to address raw water deterioration".

The concept of operating enhancement expenditure has been used for some time in the regulation of the water industry. Up to around 2011, Ofwat asked companies to report annually on a concept of enhancement operating expenditure in the annual June returns. For the water service, Ofwat's reporting guidance for the June returns 2011 included reporting of "enhanced operating expenditure" (Table 35a line 13), defined as "The additional operating expenditure in addition to base operating expenditure associated with the achievement of an enhanced service level." In turn, "base operating expenditure" was defined (Table 35 line 1) as "The level of operating expenditure on the water network required to maintain the quantity and quality of outputs and levels of service provided by the water service in the report year."[3] Similarly definitions were used in the guidance for the

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[1] Ofwat (2018) Delivering Water 2020 - Our methodology for the 2019 price review: Updated guidance for the final business plan data tables, page 48.

[2] Ofwat *Business plan data tables*, version of January 2019.

[3] Ofwat (2011), *June return reporting requirements and definitions manual 2011 Issue 1.0 – January 2011.*

corresponding data table (Table 36) for wastewater. The reporting approach used for the June returns, and Ofwat's approach to price controls up to PR09, recognised the relevance of a base year. Companies can be asked to distinguish between the operating expenditure to provide the "quantity and quality of outputs and levels of service" provided in that base year and any operating expenditure to provide additional outputs or improved quality and service levels compared to that provided in the base year. We do not consider the approaches used in the past to be fit for purpose today but they provide some insight.

Against this background, we have identified a number of concerns about the business plan reporting arrangements for enhancement operating expenditure:

- Ofwat's business plan guidance suggests that enhancement operating expenditure is associated with capital enhancement expenditure. This is unhelpful. In some cases, enhancement operating expenditure will be the operating expenditure needed to operate newly-commissioned capital assets. However, in other cases, a company may achieve an improvement in service quality, or an increase the scale of service provided to customers, entirely through solutions involving additional operating expenditure and no further capital expenditure. This is exactly the type of thing that Ofwat has sought to encourage companies to consider, through its totex approach to the regulation of the water industry. It does not seem appropriate to define enhancement operating expenditure by reference to capital enhancement projects or capital enhancement expenditure.

- There seems to be no clear base year or reference year from which additional services or output or improvements in the quality of service provision can be compared. Without this it is difficult to know for sure whether to include the forecast operating expenditure associated with recent or imminent quality or improvements within enhancement operating expenditure. One possible interpretation is that the reference point is the level of quality or output provided at 31 March 2020 (i.e. the end of the current control period). But the business plan data tables provided space for companies to fill in data for enhancement operating expenditure for the years 2017/18 to 2019/20 inclusive, which runs counter to this interpretation.

- Some of the line definitions for aspects of enhancement operating expenditure are drafted in a way that could suggest that the operating expenditure to be reported includes all operating expenditure on a given activity rather than operating expenditure arising from an aspect of quality improvement since a base year. For example, the definition in table WS2 line 41 refers to "operating expenditure to deal with invasive non-native specifies". Similarly, the definition for WS2 line 45 refers to "operating expenditure to meet lead standards" explaining that this "includes expenditure to deal with the conditioning of water before entering distribution to reduce plumbosolvency".

Ofwat has identified concerns about inconsistency in the reporting of enhancements operating expenditure across companies. It raised queries with companies in early April 2019, in particular in relation to the "base date (or dates)" for the enhancement operating expenditure in tables WS2 and WWS2. Ofwat's queries indicated that it was taking steps to put the company forecasts of enhancement operating expenditure on a more consistent footing.

Ambiguity and inconsistency in relation to the definition of enhancement operating expenditure will cause problems for Ofwat's overall cost assessment. It is also relevant to the consideration of implicit allowances for enhancement operating expenditure, which is the focus of this working paper. If the forecasts of enhancement operating expenditure for the 2020-25 period include forecasts of the operating expenditure needed in the period 2020-25 to maintain the level of quality achieved in 2019/20, this element of operating expenditure could give rise to double counting if combined with base cost allowances from the econometric modelling; this issue might then be seen to fall under the scope of work on implicit allowances. However, this would not be an issue if the company forecasts of enhancement operating expenditure excluded the operating expenditure needed to maintain the level of quality achieved in 2019/20.

Clearer definition of enhancement operating expenditure

We recommend that Ofwat develops a clearer definition of enhancement operating expenditure. This is partly about clarity on the base year or reference year against which quality improvements are to be compared. But this should also involve review of the line definitions for each category of enhancements (each "purpose") in the business plan data tables to ensure that these support, rather than conflict with, the intended concept of enhancement operating expenditure. The concerns identified above apply to the PR19 determinations, so we do not think that this is a matter that should be postponed to PR24.

Our suggestion is that enhancement operating expenditure for a particular year (e.g. within the 2020-25 period) is defined along the following lines at the broad level (further guidance at the level of specific categories of enhancements would also be needed):

- The operating expenditure that the company will incur in that year in order to provide a higher "quality of service in the 2019/20 base year. The concept of quality of service should be interpreted broader (see further discussion below); and/or
- The operating expenditure that the company will incur in in that year in order to supply services to a greater number of customers or to accommodate increases in demand of those customers for the water company's services, o that in the 2019/20 base year.

This definition is likely to require further testing and refinement, but could provide the basis for an improved overall approach to enhancement operating expenditure.

The reference point used in this definition for a particular company would be that company's historical levels of output or quality in 2019/20. This type of within-company historical reference point is consistent with the way that enhancements have been defined in the past.

This definition of enhancement operating expenditure would not make any reference to capital enhancement expenditure. It would make sense, however, for the definition of capital enhancement expenditure to be aligned as far as possible with that used for enhancement operating expenditure (we have not sought to consider the definition of capital enhancement expenditure in this working paper). We suggest a broad interpretation of quality of service that would encompass*: (a)* various aspects of quality of service to customers; (b) aspects of quality or performance that concern environmental outcomes; and (c) the quality of environmental inputs available to the water company. Examples of improvements falling under this broad concept of quality include:

- Reducing risk that customers suffer interruptions in water supplies compared to the level of risk in 2019/20.
- Reductions to the risk of customers experiencing water use restrictions such as hosepipe bans (e.g. company action that leads to change in expectation of such restrictions from 1 in 20 years to 1 in 50 years).
- Reducing customer health risks relating to water supplies (e.g. risks arising from conveyance of water through lead pipes) compared to the level of risk in 2019/20.
- Maintaining the quality of drinking water in a context where the quality of raw water inputs deteriorates in the years subsequent to 2019/20 (e.g. because of the effects of increased use of pesticides by farmers).
- Improved environmental outcomes, such as reducing the concentration of pollutants in effluent released from wastewater treatment works compared to the concentration achieved (or expected to be achieved) in 2019/20.

As can be seen from these examples, we treat measures to enable the water company to maintain a constant quality to customers in a context when environmental inputs and conditions are worsening (e.g. raw water deterioration) as a quality improvement. The quality improvement can be understood in terms of the company's capabilities to translate environmental inputs into outputs. By the same token, this implies that exogenous improvements in environmental conditions (e.g. improvements to the quality of raw water due to legislation), while maintaining constant service quality to customers, would be a reduction in a dimension of quality (that needs to be) provided.

Given the definitional problems we have identified above, we do not have confidence that the forecasts for enhancement operating expenditure within companies PR19 business plans are consistent with our suggested definition, and adjustments may be needed. For instance, given Ofwat's guidance and line definitions, and its approach to base cost allowances, some companies'

forecasts of enhancement operating expenditure may not include the ongoing running costs of supplying additional numbers of customers in the 2020-25 period (e.g. pumping costs and costs of chemicals and energy used in water treatment). But these costs would fall under our definition of enhancement operating expenditure.

Looking forwards, it might be sensible to complement a clearer definition of enhancement operating expenditure with developments to the data compilation on enhancement operating expenditure. For instance, it might be useful for company business plan forecasts to distinguish between enhancement operating expenditure that is needed to operate newly-commissioned capital assets and enhancement operating expenditure that delivers quality improvements without capital expenditure. It may also be worthwhile for companies to report outturn enhancement operating expenditure for specific enhancement categories against a defined base year. We have not sought to consider the regulatory reporting of enhancement operating expenditure further in this paper but there seem opportunities for improvement in this area, building on review of the definition of enhancement operating expenditure.

Approach adopted for this working paper

For the purposes of this working paper, we proceed on the basis that our suggested definition of enhancement operating expenditure is used, and that companies' forecasts are, if necessary, adjusted to fit this definition.

On this basis, companies' forecasts of enhancement operating expenditure should not include any of the operating expenditure that is needed simply to maintain levels of service or quality performance provided at 31 March 2020 (i.e. just before the 2020-25 price control period starts).

Suggestions for Ofwat's draft determination

For the purposes of its draft determinations, we suggest that Ofwat:

1. Adopts a clearer definition of enhancement operating expenditure, as suggested above. For the draft determination, it may not be proportionate to review and revise all of the individual line definitions in business plan data tables WS2 and WWS2, but these line definitions could be made subordinate to a broader definition which clarifies the base year and avoids implying that enhancement operating expenditure is necessarily associated with enhancement capital expenditure.

2. Makes any adjustments that it considers appropriate, given the information and time it has available, to bring company forecasts into line with this definition.

3. Adopts an approach to cost assessment, including the approach to implicit allowances for enhancement operating expenditure, which is compatible with the revised definition.

4. Makes its draft determinations conditional on the assumption that the data provided by companies on enhancement operating expenditure are not materially inconsistent with the revised definition of enhancement operating expenditure.

5. Asks each company to provide assurance, as part of responses to draft determinations, that the forecasts and other evidence that it has submitted to Ofwat on enhancement operating are not materially inconsistent with the revised definition and to provide justified revisions to its forecasts and other evidence if necessary to address any inconsistencies.

3. Simulation analysis

This section describes some simulation analysis that we carried out to help inform the approach to implicit allowances relating to enhancement operating expenditure for PR19. We start by providing an overview of our approach to the simulation analysis and then discuss some of the outputs.

Overview of simulation analysis

A feature of our simulation approach is that it allows us to investigate and illustrate ways in which a company's actual base costs and modelled base costs (i.e. those estimated from an econometric model applied to historical data on base costs) may differ in a context where quality is a driver of companies' costs but quality is not taken into account through the explanatory variables in the econometric model used to produce modelled base costs. This context is highly relevant to implicit allowances relating to enhancement operating expenditure because enhancement expenditure is, in many cases, driven by quality improvements that are not captured through the explanatory variables that are included in the econometric models of base costs.

Our simulation analysis involves six main steps:

1. **Creation of hypothetical dataset**. We created a dataset of hypothetical water companies. We specified the dataset to include 17 companies, and to cover a 25-year period running from the financial years ending 31 March 2000 to 31 March 2025. The last five years of the dataset therefore correspond to the 2020-25 control period under consideration for PR19. Within the dataset, companies differ in three dimensions: a measure of scale, a measure of complexity, and a measure of quality. We controlled how scale, complexity and quality varied across companies and over time.

2. **Determination of costs using hypothetical cost function**. We specified a hypothetical cost function that calculated each a hypothetical company's expenditure in a given year. To align with the type of approach that Ofwat uses for its PR19 cost assessment, a company's total expenditure in a given year is made up of three elements: operating expenditure, capital maintenance expenditure and capital enhancement expenditure. The cost function specifies how each of these three elements relate to a company's scale, complexity and quality as well as to expenditure (e.g. capital maintenance expenditure is dependent on the level of capital enhancement expenditure in the more distant past). Expenditure to increase quality compared to levels in the previous year is treated as enhancement expenditure, and our approach provides flexibility for the enhancement expenditure to be entirely operating expenditure, entirely capital expenditure or a mix of the two. The cost function specifies that base costs (operating expenditure plus capital maintenance expenditure) in a given year includes a random noise element.

3. **Econometric regression of base costs**. We run an econometric regression in which the dependent variable is base costs (operating expenditure plus capital maintenance expenditure) and the explanatory variables are scale and complexity. The explanatory variables do not take account of quality. The econometric regression is estimated over the period 2009/10 to 2018/19 (inclusive) within the hypothetical dataset: we refer to this as the historical data period.

4. **Comparison of actual and modelled base costs**. From the cost function from step 2, and the specification of data from step 1, we can calculate each hypothetical company's "actual base costs" over each year of the 2020-25 data period (i.e. those determined by the cost function and the input data for those years). We can then compare this to the company's "modelled base costs" which are the level of costs predicted for the company over the period 2020-25 by the econometric regression from step 4. We use a concept of modelled costs based on the predicted values from the regression before any adjustment for upper quartile efficiency.

5. **Averaging results across large number of simulation runs**. We repeated steps 2 to 4 a large number of times (e.g. 500 times). In each run, the costs calculated for a given company were different due to differences in the random noise term for that run. This, in turn, affects both the actual and modelled costs for that run. Having produced estimates of the actual and modelled costs for a large number of simulation runs, we could take an average of each of these across the simulation runs. This helps to average out the effects of the random noise term in the cost function to help provide a clearer picture of underlying factors that may lead to differences between actual and modelled costs.

6. **Replication for different scenarios for quality.** We repeated the process in steps 1 to 5 for different scenarios for the input data (step 1) and the cost function (step 2). In particular, we specified scenarios for how quality varies between companies and over time, distinguishing between the profile of quality over the historical data period used for the econometric regression and the profile of quality over the 2020-25 forecast period. We also considered scenarios involving different parameters for the cost function.

Our modelling approach is built on the premise that it costs each company more money to provide a higher level of quality than a lower level of quality. This is the situation that seems most relevant to work on implicit allowances relating to enhancement operating expenditure.

We considered a number of scenarios, distinguishable with respect to the assumption on how quality varies across companies and over time. In each of these scenarios, companies achieve quality improvements through a combination of capital enhancement expenditure (which then supports a higher level of quality in subsequent years) and additional operating expenditure (which is treated as the additional annual running costs to enable and sustain the higher levels of quality).

The remainder of this section presents and discusses results from a number of scenarios (S1, S2 etc) which we have used for the simulation analysis.

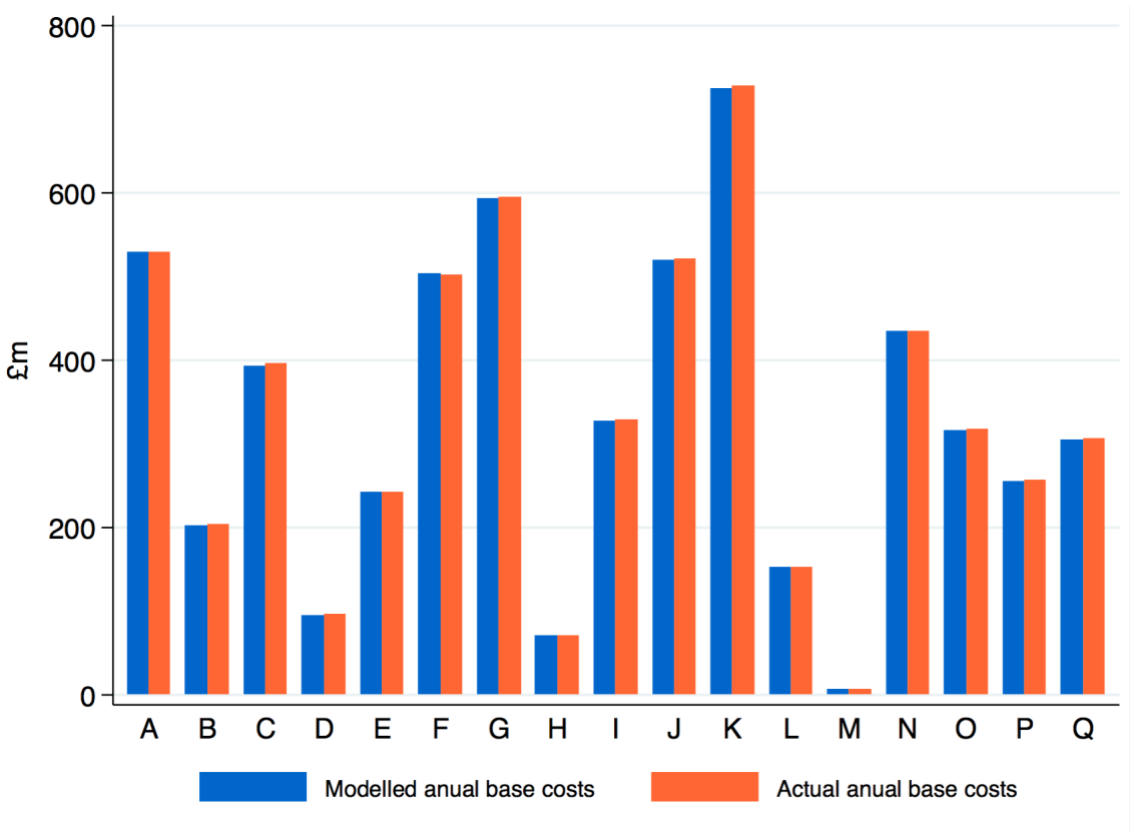
S1: No differences in quality across companies or over time

The first scenario we consider is one where:

- All companies within the industry have the same level of quality.
- This level of quality is constant over the historical data period used for the econometric estimation.
- The level of quality is the same for the 2020-25 forecast period as for the historical data period used for the econometric regression.

We show results from our simulation analysis for this scenario in Figure 1. This chart shows, for each hypothetical company the modelled base cost and the actual base cost for the 2020-25 period calculated from the simulation process outlined above.

Figure 1 Results for scenario 1



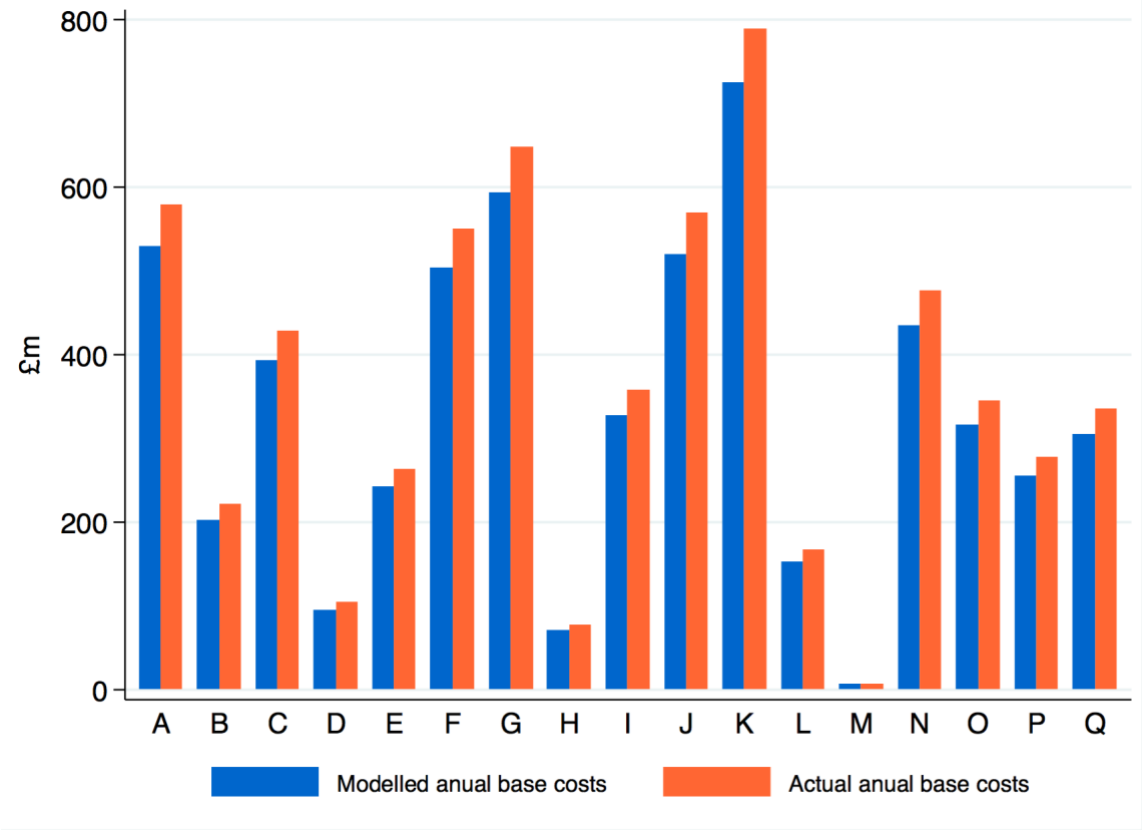
We can see that, for this scenario, modelled cost equals (or is very similar to) actual cost for all companies. The figures for modelled and actual base cost are averaged over a large number of simulation runs, which helps to average out the effects of random noise in the cost function and, in

turn, estimation error from the econometric regression. If we had just shown the results from a single simulation run, there would be significant differences between the modelled and actual base cost for each company.

S2: No differences in quality across companies with step-change in quality over time

We now consider a variation on the first scenario above. As with scenario S1, we assume that all companies have the same level of quality as each other. However, here, we assume a 10% step-change improvement in quality between the level of quality in the historical data period used for the econometric estimation and the 2020-25 forecast period. Figure 2 shows the modelled base cost and the actual base cost for the 2020-25 period for this scenario (as before the figures in the charts are calculated from a large number of simulation runs).

Figure 2 Main results for scenario 2



In this scenario we find that, across all companies, the modelled base cost estimates are significantly below actual costs.

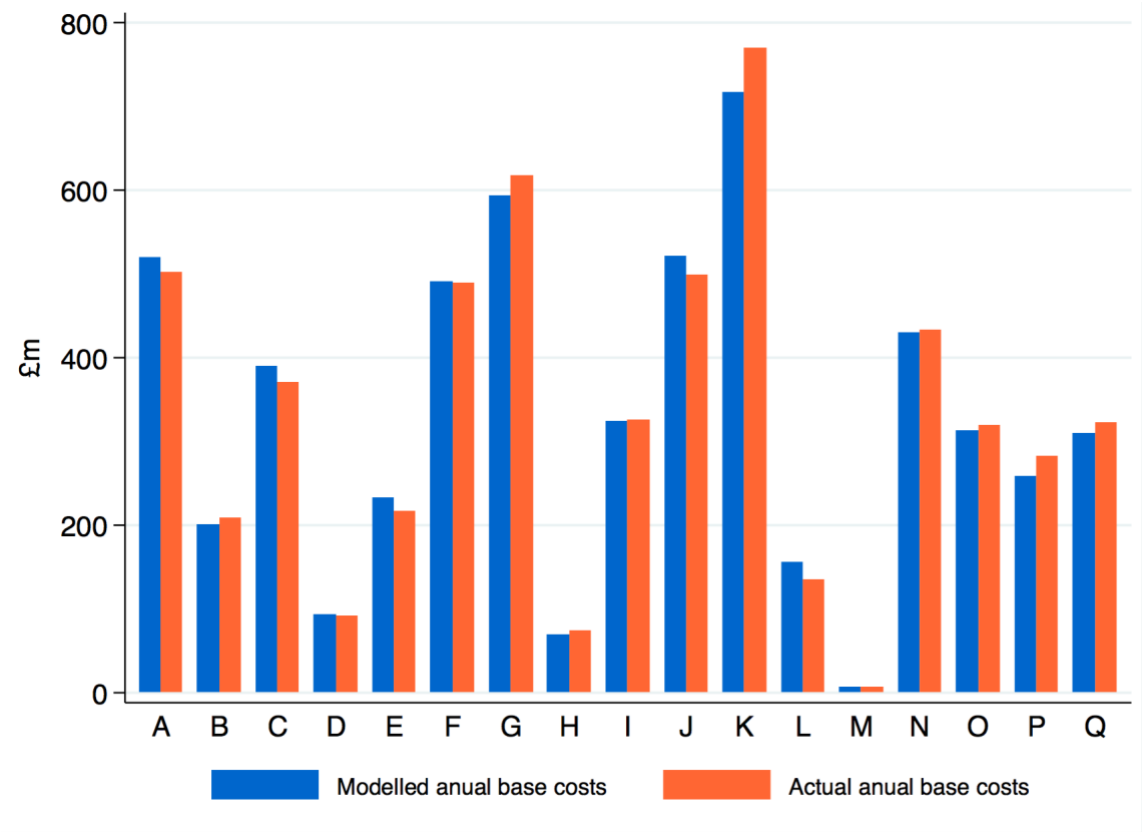
By comparing the results with the previous scenario, it seems reasonable to say that the modelled base cost is sufficient to cover the base costs for providing the level of quality that companies have provided in the historical data period used for the econometric estimation, but not sufficient to cover

the step-change increase in quality between the historical data period and the 2020-25 forecast period.

S3: Differences in quality across companies but quality constant over time

We now turn to scenarios in which the level of quality provided in the historical data period varies across companies. We start with the case where there is variation across companies in the level of quality in the first year of the historical data period and, after that, each company's quality remains constant over the historical data period and is also the same level for the 2020-25 forecast period. Figure 3 provides the results, from the simulation process, for actual base costs and modelled base costs the 2020-25 forecast period in this scenario. That figure shows that for some companies the modelled based costs are above actual base costs, and for other companies the modelled based costs are below actual base costs.

Figure 3 Main results for scenario 3



We investigate this variation in results across companies further using Figure 4. In this chart we plot that ratio of actual costs to modelled costs on the y-axis and the level of quality provided by companies in the 2020-25 forecast period on the y-axis. If actual costs exceed modelled costs for a given company, its position on the vertical axis would be above 1. The vertical red line shows the point where the quality provided by a company in the 2020-25 forecast matches the average level of

quality achieved on average across companies in the historical data period used for the econometric modelling.

Figure 4 Results for scenario 3: relationship between quality and ratio of modelled to actual cost

The pattern we see in Figure 4 is that, at an approximate level:

- The greater is the quality provided by companies in the 2020-25 forecast period, the higher is the ratio of actual costs to modelled costs. This makes intuitive sense. If higher levels of quality carry a cost to the company, but quality differences between companies are not taken into account through explanatory variables in the econometric model, the cost predictions from the econometric will tend to under-estimate base costs for higher-quality companies and over-estimate base costs for lower-quality companies.
- The relationship between the ratio of actual cost to modelled cost and quality is not a straight line, which possibly reflects noise in the data and the limitations of the econometric modelling in its ability to capture underlying costs.
- The companies that provide quality in the 2020-25 forecast period at around the level of the average quality across companies in the historical data period tend to have a ratio of actual cost to modelled cost of around 1.

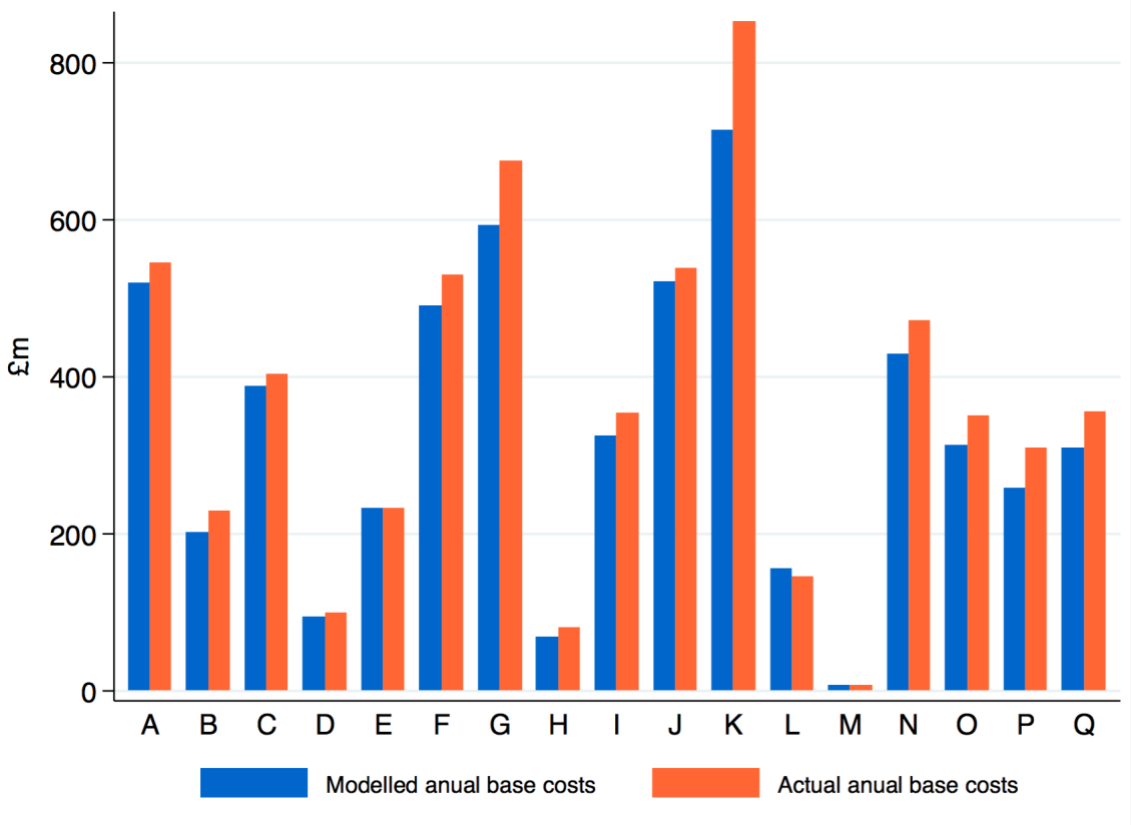
The results are compatible with the idea that (in the circumstances of this scenario) the modelled cost provides funding for a historical industry average level of quality.

These results help to illustrate a wider concern with Ofwat's approach to cost assessment and wholesale price controls more generally. Ofwat builds up wholesale controls based on allowances derived from econometric models of base costs which overlook the way that differences in service quality and environmental performance may affect companies' costs. This leads to a policy concern that companies that provide relatively high-quality services and/or relatively good environmental performance will tend to be under-remunerated. Meanwhile, those companies which provide relatively poor service quality and relatively poor environmental performance may by over-remunerated, with customers of these companies paying for levels of performance that are not delivered.

S4: Differences in quality across companies and quality increase in forecast period

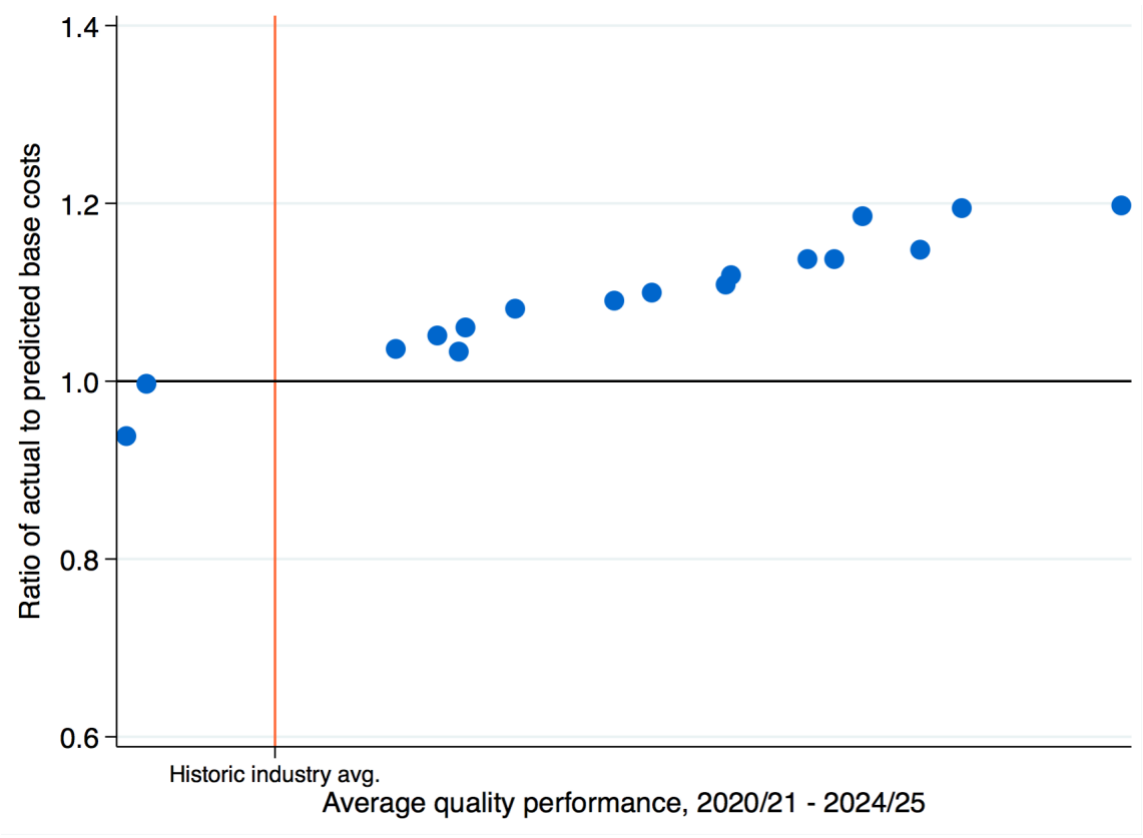
The next scenario we consider involves a specification for quality over the historical data period that is the same as scenario 3: variation across companies but quality constant for each company over that period. However, in this scenario all companies achieve a step-change in quality of 10% between the historical data period and the 2020-25 forecast data period. We show corresponding charts to those shown earlier from scenario 3.

Figure 5 Main results for scenario 4



We see from Figure 5 relating to scenario 4, and in contrast to that for scenario 3, that most companies have actual costs higher than modelled cost. This is further explained in Figure 6. In scenario 4, with the 10% increase in quality in the 2020-25 forecast period, most companies have a level of quality above the historical industry average and these companies also have actual costs that exceed modelled costs.

Figure 6 Results for scenario 4: relationship between quality and ratio of modelled to actual cost



The results are compatible with the idea that (in the circumstances of this scenario) the modelled cost provides funding for a historical industry average level of quality.

Other scenarios not considered in this phase of simulation analysis

This working paper presents results from our initial simulation analysis. The extent and depth of analysis has been limited by an aim to provide input to Ofwat ahead of its slow-track draft determinations. The simulation approach we have developed is capable of being extended to cover other types of scenarios that might be of interest.

4. Implicit allowances relating to enhancement operating expenditure

Introduction

Our interest in this working paper is in a specific type of implicit allowance: implicit allowances within the base cost allowances that are relevant to the cost assessment for enhancement operating expenditure. We have not sought to consider implicit allowances in general or to consider aspects of the PR19 price control approach that lie beyond the treatment of enhancement operating expenditure.

Ofwat developed the concept of an implicit allowance as part of PR14 and has used it again for PR19. We have criticisms of the way that implicit allowances were analysed and assessed at PR14 and in the PR19 IAP. But we feel that the concept of implicit allowances is a useful one.

We now try to clarify further what we mean by implicit allowances relating to enhancement operating expenditure. The implicit allowances that we are concerned with form part of the base cost allowances for the 2020-25 period, which Ofwat calculates using results from econometric modelling of historical base costs. They represent an element (in £m) of the base cost allowance which can be considered "available" for funding enhancement operating expenditure in that forecast period.

There could be double counting if the totex allowance for a company were to be calculated by adding a reasonable estimate of the company's efficient level of enhancement operating expenditure for the 2020-25 period to the base cost allowance for that company, without taking account of implicit allowances relating to enhancement operating expenditure.[4] We see two possible sources of double counting: *(a)* double counting the operating expenditure for the company to meet additional demand or provide higher quality in a specific area; and *(b)* making allowances for the additional operating expenditure associated with increases in demand or improvements in quality without taking account of the reductions to operating expenditure associated with decreases in demand or reductions to quality.

To help structure work on implicit allowances relating to enhancement operating expenditure, we have identified four types of implicit allowance, which reflect different ways in which implicit allowances relating to enhancement operating expenditure may arise. These are:

[4] The possibility of double-counting depends on the definition of enhancement operating expenditure used. For the purposes of this paper we have used the definition we suggested in section 2. Double counting may not apply in practice if the estimates or forecasts of enhancement operating expenditure are made on a different basis (e.g. if companies have provided forecasts of enhancement operating that already exclude the implicit allowance).

- Implicit allowances arising from forecast explanatory variables.
- Implicit allowances for catch-up to quality funded through base cost allowances.
- Implicit allowance for output or aspects of quality no longer provided.
- Implicit allowance for historical operating expenditure providing longer-term benefits.

We briefly introduce each of these types below, and provide further information and guidance on each in sections 6 and 7. These are the types of implicit allowance relating to enhancement operating expenditure that we have identified in our work on implicit allowances so far. There may be other types, and there may be other ways to categorise them.

The final part of this section provides a discussion of issues that may be relevant to the overall assessment of enhancement allowances but which we consider fall outside the scope of implicit allowances relating to enhancement operating expenditure.

Implicit allowances arising from forecast explanatory variables

As set out in our report from March 2019, identifying implicit allowances for enhancement operating expenditure is more straightforward when the drivers of (or benefits from) enhancement expenditure are captured through explanatory variables in the econometric models of base costs.

This is the case, in particular, for enhancements relating to growth in the number of customers supplied with water and wastewater services. Some of Ofwat's econometric models include the number of customers as an explanatory variable, while others use measures of scale (e.g. length of water or sewerage mains or sewage load) that are strongly correlated with growth in the number of customers supplied.

If the econometric models have explanatory variables that capture the driver of enhancements, and if the forecasts for these variables used to calculate base cost allowances exceed the levels in the base year (2019/20), this can give rise to an implicit allowance for enhancement operating expenditure. It is possible to estimate the scale of the implicit allowance through calculations involving the results from the econometric model and estimates for explanatory variables in 2019/20. We provide further information on the estimation of this type of implicit allowance in section 6.

This is one source of implicit allowance relating to enhancement operating expenditure, but it is not the only source.

Implicit allowances for catch-up to quality achieved historically within the industry

Implicit allowances for enhancement operating expenditure can also arise if the drivers of (or benefits from) enhancement expenditure are not captured through explanatory variables in the econometric models of base costs. These implicit allowances are more difficult to fathom. The simulation analysis we set out in section 3 is directed at this type of situation.

We have identified a type of implicit allowances for catch-up to quality achieved historically within the industry. We explain below what we mean by this, with reference to the simulation analysis.

We think the simulation analysis we have carried out so far supports the view that, if a dimension of quality affects companies' base costs, but quality is not captured by the explanatory variables used in the econometric model of base costs:

- The modelled base costs for each company can be understood to include an implicit allowance for that company to provide a certain level of quality. The exclusion of quality from the set of explanatory variables used for the econometric models does not mean that the modelled base costs fund zero quality. Quality is taken into account in the results of the econometric models indirectly, through its effects on companies' costs.
- For any given company, the level of quality funded through the implicit allowance within the modelled base costs will be determined by the historical data for all companies in the dataset used for the econometric estimation, rather than simply by the historical data relating to that company.
- In some circumstances – such as those reflecting the specifications and assumptions used for our simulation analysis – the implicit allowances within modelled base costs fund a level of quality that represents the average quality across companies, and over time, across the historical data period covered by the econometric estimation.

We identified the historical industry-average level of quality as a reasonable starting point for the assessment of implicit allowances in our report from March 2019. We feel that the simulation analysis presented in section 3 supports this. The findings from our simulation analysis are, of course, dependant on the various modelling specifications and assumptions used. But the specifications and assumptions we have used seem reasonable for the purposes of providing the basis for a starting point. This is especially so in a context where the current state of understanding – by Ofwat and water companies – of what implicit allowances there might be for quality and enhancement operating expenditure within base cost allowances is quite limited. A starting point is better than nothing.

For our report from March 2019 we had identified the relevance of the historical industry-average level of quality based on theoretical analysis of the properties of estimates derived from the types of

econometric models of base costs that Ofwat uses. We are familiar with these types of models from extensive project work on econometric benchmarking analysis of water companies' costs. The simulation analysis in section 3 complements this theoretical analysis. It provides a way to test, investigate and illustrate circumstances in which the implicit allowance derived from econometric models of base costs provide for a level of quality that is consistent with the historical industry-average level of quality.

We make no claim that the historical industry-average quality will be the best estimate of the implicit allowance in any given set of circumstances – this is not our position at all. It is not therefore necessary for us to use the simulation analysis to show that the link between the historical industry-average quality and the implicit allowance is "robust" or insensitive to a wider set of circumstances than those we have considered (this is not the case). Furthermore, we recognise that in some circumstances it may not be meaningful or practical to measure quality in a way that can give effect to the idea of a historical industry-average. A starting point is a starting point.

One implication of the starting point above is the idea that there may be an implicit allowance for enhancement operating expenditure that is relevant if a company which has provided a level of quality below the historical industry average quality in all years up to the 2019/20 base year plans to incur additional operating expenditure to improve its quality in the 2020-25 period. This operating expenditure would qualify as enhancement operating expenditure under the definition of enhancement operating expenditure we use for this paper (see section 2).

If Ofwat's cost assessment were to add together an allowance for base costs derived from econometric modelling of historical data with the company's forecast of enhancement operating expenditure there would be a concern about double-counting costs. The implicit allowance for quality from the base cost allowances may overlap with the forecast enhancement operating expenditure. This is a type of implicit allowance that should be considered as part of work on enhancement operating expenditure.

We have drawn on this idea but made it more flexible. We treat the historical industry-average quality as a useful starting point for consideration of implicit allowances (in cases where quality is not captured through explanatory variables in the model). But we recognise that there may be cases where the best estimate of the level of quality funded through the base cost allowances is greater than, or less than, the historical industry average level of quality. To allow for this, we have defined our second type of implicit allowances as relating to "catch-up to quality achieved historically within the industry". This terminology leaves open whether the relevant reference point for the implicit allowance is the historical industry average or some other level of quality relevant to the historical data.

Implicit allowance for output or aspects of quality no longer provided

Another type of implicit allowance that is relevant to Ofwat's cost assessment for enhancements is an implicit allowance for outputs or aspects of quality that will no longer be provided.

Drawing again on the simulation analysis, there could be circumstances in which the base cost allowances for the 2020-25 period implicitly fund a level of quality consistent with that achieved by companies, on average, over the historical data period used for the econometric models. If the level of quality that a company (or all companies) plans to achieve in the 2020-25 period is lower than the industry average quality, then the base cost allowance for the 2020-25 period can be seen to include an element of operating expenditure that is no longer needed as a result of the quality reduction. This element of operating expenditure is then available to offset some of the costs of output increases or quality improvements elsewhere.

The water industry in England and Wales is generally characterised by ongoing increases in demand (e.g. increases to the number of properties supplied arising from population growth) and increases in quality. Improvements in quality can be driven by factors such as: Ofwat-led or company-led initiatives to improve quality of service to customers or environmental performance; worsening of the environmental conditions which companies need to be able to cope with (e.g. probability of extreme weather events); or environmental improvements driven by legislation and regulations. We consider that, in this context, it is unlikely that the costs that a water company faces as a consequence of areas of additional demand or improvements in quality will tend to be cancelled out by cost savings from areas of decreased demand or reductions in service quality.

However, it seems plausible that there are some instances of demand or quality reduction that provide savings to companies that help offset some of the additional costs arising from areas of demand increase or quality improvements.

We think that it would make sense if Ofwat's approach to enhancement expenditure were directed towards the setting of allowances for net enhancement expenditure rather than for gross enhancement expenditure. This would involve:

- Using a definition of enhancement operating expenditure that applies on a gross basis. The definition suggested in section 2 is on a gross basis.
- Making deductions against the overall enhancement allowance for any estimates of implicit allowances for outputs or aspects of quality implicitly funded by the base cost allowances but not expected to be provided over the 2020-25 forecast period.

Implicit allowance for historical operating expenditure providing longer-term benefits

Another factor that is relevant to the understanding of implicit allowances is that, in some cases, operating expenditure that is incurred in a particular year may enable an improvement in quality to be achieved and sustained over multiple future years. This type of operating expenditure has similar properties to capital enhancement expenditure, in the sense that once incurred in cash terms it produces a longer-term benefit rather than a benefit only in the year it is incurred. We see this as a special type of operating expenditure which is somewhat uncommon but is nonetheless relevant to consider as part of work on implicit allowances for enhancement operating expenditure.

One example relates to lead standards. A company might reduce the level of risk to customers arising from the conveyance of water through lead pipes by engaging in the replacement of lead supply pipes which are owned by customers. The company might record the pipe replacement costs as operating expenditure, as the company does not own the replacement pipe: it is not a company asset. But this operating expenditure would enable a reduction in the absolute value of lead pipe risk to be sustained for a long period of time (e.g. until the pipe needs replacement or perhaps permanently since we would not expect lead pipes to be reinstalled in the future).

If, across companies, the historical data used for the econometric modelling of base costs include a significant amount of this type of operating expenditure, then we would expect the base cost allowances derived from the econometric modelling to include some implicit allowance for the costs of the companies making further improvements to quality beyond that in the base year.

In the lead pipe replacement example, we might estimate that the base cost allowances include an implicit allowance consisting of a certain amount of operating expenditure to enable companies to reduce pipe risk below the level of risk in 2019/20. If this is the case, the practical implication might be that:

- It could be appropriate to deduct this estimated implicit allowance for operating expenditure from companies' forecasts for the costs of the companies' enhancement plans for lead standards (e.g. to deduct the estimated implicit allowance from the company's forecast costs for its lead pipe replacement over the 2020-25 period).
- For any company that is proposing to maintain lead pipe risk at the 2019/20 level (e.g. no further pipe replacement planned for 2020-25) it might be appropriate to deduct this estimated implicit allowance as part of the overall cost assessment. It would not make sense, we think, to make a deduction for those companies that have forecast cost enhancement expenditure for lead pipe risk reduction but not to apply a corresponding deduction for those companies that have not.

This type of implicit allowance would arise from the nature of the operating expenditure incurred in the historical data period. It is not caused in any way by the nature of the operating expenditure

planned for the 2020-25 forecast period. We describe this type of implicit allowance as an implicit allowance for historical operating expenditure providing longer-term benefits.

This type of implicit allowance is distinguished from the catch-up type because the implicit allowance here is for operating expenditure within the base cost allowance that provides for improvements in quality beyond the levels achieved within the industry in the historical period, rather than for operating expenditure to catch-up to levels of quality achieved within the industry in the historical period.

Things that do not fall under the scope of these implicit allowances

We now briefly highlight a number of issues that, while relevant to the overall cost assessment for enhancements, do not, in our view, fall under implicit allowances relating to enhancement operating expenditure.

One issue is the potential concern that enhancement operating expenditure forecasts include operating expenditure that is needed to maintain, rather than improve upon, levels of quality that a company has provided historically. We do not consider that this is an issue to be tackled through estimation of implicit allowances relating to enhancement operating expenditure. In section 2, we suggested a definition of enhancement operating expenditure, which we have used for the purposes of this working paper. If this definition is adopted, companies' forecasts of enhancement operating expenditure should not include any of the operating expenditure that is needed simply to maintain levels of service or quality performance that will be achieved at 31 March 2020 (i.e. just before the 2020-25 price control period starts). So the potential concern would be tackled as part of the assessment of the (efficient level) of enhancement operating expenditure for a company, rather than through any deduction for an implicit allowance.

Another potential issue concerns the case where a company might be able to increase quality without requiring additional expenditure. Our simulation analysis in section 3 was focused on circumstances in which it costs each company more money to provide a higher level of quality than a lower level of quality. These seem plausible circumstances, but might not apply in all cases. It is possible that a company would – if acting efficiently – be able to increase quality without incurring additional operating expenditure. We would see this as something that should be taken into account as part of the cost assessment for enhancement operating expenditure, but not part of the analysis of estimation of implicit allowances.

Similarly, it is possible that a programme of quality improvements by a company would lead to cost increases in some areas and cost reductions in other areas. This is something that would be relevant to consider as part of the cost assessment for enhancement operating expenditure. But it does not seem relevant to the analysis of implicit allowances relating to enhancement operating expenditure. The concern in these circumstances is not double-counting between the base cost

allowance and the enhancement allowance, but over-estimation of the appropriate enhancement allowance.

The more general point here is as follows. The concept of implicit allowances relating to enhancement operating expenditure is a meaningful and useful one. We have sought to elaborate on what this means through identification of the four types above. This concept should not be treated as a catch-all term for any factor that might mean that the appropriate PR19 allowance for a company's enhancement operating expenditure is less than the forecast of enhancement operating expenditure that it submitted as part of its business plan.

5. Organising work on implicit allowances

Introduction

This section suggests how the identification of the four types of implicit allowance relating to enhancement operating expenditure can be used to organise work on implicit allowances for PR19, taking account of limitations in available data and proportionality. It also provides examples of issues that seem relevant under each of the four types of implicit allowance, for a selection of the enhancement categories used by Ofwat.

Using the four types of implicit allowance to organise analysis

We consider that the explanation and categorisation of implicit allowances relating to enhancement operating expenditure set out in the previous section is useful for organising analysis to take account of implicit allowances as part of the cost assessment approach for enhancements.

From a practical perspective, it also seems important to keep in mind the following considerations:

- **Limitations in the evidence available**. There are major limitations in the evidence that is available to inform on the nature and extent of implicit allowances relating to enhancement operating expenditure. The available data on historical operating expenditure do not identify the operating expenditure relating to historical enhancements separately, either at the level of individual enhancement categories or overall. There are data on quality differences between companies and over time, but these does not cover all enhancement categories and even where data are available there may be data constancy and interpretation issues.
- **Limitations in analytical approaches**. We are not aware of established analytical approaches for the estimation of implicit allowances relating to enhancement operating expenditure. Any methods applied are likely to be relatively new and untested.
- **Proportionality**. Ofwat will be seeking to take a proportionate approach to its PR19 work and this will have implications for the analysis of implicit allowances. The limitations in evidence available and analytical approaches has implications for what might be proportionate. Various types of implicit allowance may exist hypothetically but it may not be proportionate to investigate the existence of these in all cases. Where estimates of implicit allowances are to be made, a proportionate approach might involve estimates being quite approximate, without examining every detail that could theoretically be relevant.

Against this background, we set out in Figure 7 a suggested process for organising work on implicit allowances relating to enhancement operating expenditure. This covers each of the four different categories of implicit allowance that we have identified.

Figure 7 Process for organising work on implicit allowances for operating expenditure

We can see from Figure 7 that the analysis of implicit allowances starts from two different places. One strand of analysis examines the econometric models of base costs and uses these to make estimates of the implicit allowances that arise from forecast explanatory variables. Another strand of analysis considers individual enhancement categories in turn, and considers the implicit allowances that arise from sources other than the forecast explanatory variables. The type of assessment under the second strand is more complicated and the evidence may be more limited. So the approach suggested in Figure 7 involves consideration of whether it would be proportionate to make an estimate of implicit allowances in a specific case, rather than proceeding directly to estimation.

The approach in Figure 7 is focused exclusively on implicit allowances relating to enhancement operating expenditure and does not cover other aspects of the cost assessment for enhancement expenditure. This is important when it comes to proportionality. An initial review of evidence might indicate that it is not proportionate to estimate or identify any implicit allowances for a specific category of enhancements. But this does not mean that the enhancement operating expenditure forecasts for this category should be overlooked or left aside, especially if there is evidence to support these.

An approach which decomposes the implicit allowances relating to enhancement operating expenditure into various strands, as suggested here, carries some risk of double-counting across strands. We have tried to define and describe the types of implicit allowance considered under each strand in a way that limits this risk, but it seems possible that double counting could arise in practice. We suggest that there is an overall sense check that looks across strands of analyses and types of implicit allowance to help avoid double counting.

Need for care in use of estimates of implicit allowances

The estimation of implicit allowances is a useful part of the evidence base for the assessment of enhancement allowances. Care is needed as to how to use these estimates. It would not make sense to simply deduct these estimates from companies' forecasts of enhancement operating expenditure. It could make sense to do so if this removed double counting that would otherwise apply. But that depends on what costs are covered in the enhancement operating expenditure figures for the relevant enhancement categories. As discussed in section 2 of this paper, we are concerned about the lack of clarity on the definition of enhancement operating expenditure which will affect what costs are covered by the enhancement operating expenditure forecasts submitted as part of the PR19 business plans. In some cases, companies may have sought to remove perceived double counting from the forecasts they have provided for enhancement operating expenditure. These issues need to be resolved, and the enhancement operating expenditure forecasts provided by companies properly understood, before deciding how to take account of estimates of implicit allowances.

Illustration of the applicability of this type of approach

The approach in Figure 7 is based around the possibility of four different types of implicit allowance relating to enhancement operating expenditure arising. To help bring this to life, we have identified in Table 1 a series of issues that seem relevant under each of the four types of implicit allowance, for a selection of the enhancement categories used by Ofwat. Our primary purpose is to show how these types have practical relevance for PR19 and how the approach we have suggested can be used to organise work across different issues. The table is not intended to be comprehensive and no meaning should be attached to areas of the table left blank.

Table 1 Examples of issues falling under each type of implicit allowance

Ofwat enhancement category	Potential implicit allowance from forecast explanatory variables (based on IAP modelling)	Potential implicit allowance for catch-up to quality achieved historically	Potential implicit allowance for outputs or aspects of quality no longer provided	Potential implicit allowance for historical operating expenditure that provides long-term benefit
Water and wastewater growth This encompasses several enhancement categories that concern expenditure aimed at accommodating new connections and growth in customer demand	Base cost models include explanatory variables on number of connected properties or on other measures of companies' size			
Drinking Water Protected Areas (DWPA) This category of enhancement expenditure targets improvements in the levels of pesticides and nutrients in raw water used for abstraction.	Does not seem to be captured by forecast explanatory variables in base cost models	Some data may be available on historical levels of pesticides and nutrients in raw water sources	The recent announcement from DEFRA that metaldehyde use would be banned from April 2020 onwards could mean that– once stocks of metaldehyde have been used up – there may no longer be a need for initiatives targeting metaldehyde reduction which have affected historical operating expenditure (though need to target other pesticides remains)	Initiatives that focus on farmer education and training may deliver benefits in terms of reduced pesticide/nutrient use for several years, leading to improvements in raw water quality that could be sustained over that period.
Resilience (water and wastewater) This category of expenditure is aimed at managing the risk of supply disruptions caused by extreme events outside the companies' control.	Does not seem to be captured by forecast explanatory variables in base cost models			Companies may provide funding to third parties to undertake work that supports resilience in their areas. This funding may be classified as operating expenditure, but provide long term benefits. For example, partnership funding for flood risk management.
WINEP (WFD) This category covers expenditure on WFD-driven measures to improve, protect or ensure no deterioration in the status or potential of surface water or	Does not seem to be captured by forecast explanatory variables in base cost models			Expenditure classified as operating expenditure for reporting purposes may have longer term benefits, e.g. expenditure on river support and restoration, and expenditure to

Ofwat enhancement category	Potential implicit allowance from forecast explanatory variables (based on IAP modelling)	Potential implicit allowance for catch-up to quality achieved historically	Potential implicit allowance for outputs or aspects of quality no longer provided	Potential implicit allowance for historical operating expenditure that provides long-term benefit
ground water where the measures arise from PR14 investigations or sustainable abstraction work.				address invasive non-native species.
Security (SEMD and Cyber) This category covers expenditure to enhance the physical (SEMD) and cyber security of critical national infrastructure assets.	Does not seem to be captured by forecast explanatory variables in base cost models	Cyber security requirements are relatively new and arise from the NIS Directive and consequent DEFRA guidance. May be evidence of an industry-wide improvement in quality rather than company-level catch-up.		
WINEP (Investigations) This category covers expenditure on investigations and options appraisal covered by the NEP/WINEP.	Does not seem to be captured by forecast explanatory variables in base cost models			Possible that investigations are reported as operating expenditure but provide longer-term benefits
Metering This category covers the cost of providing new meters for customers who opt for them (optants), selective metering (e.g. upon change of ownership) and new meters for businesses, and meters.	Does not seem to be captured by forecast explanatory variables in base cost models	Historical data on meter coverage seems more relevant to level of quality provided than data on meter installation rates		Some operating expenditure associated with the metering programme might provide longer-term benefits
Meeting lead standards This category covers expenditure on meeting lead standards, including expenditure on chemical dosing, replacement of customer-side lead pipes.	Does not seem to be captured by forecast explanatory variables in base cost models			Customer-side lead pipe replacement may deliver long term improvements in lead pipe risk, but be classified as operating expenditure

Ofwat enhancement category	Potential implicit allowance from forecast explanatory variables (based on IAP modelling)	Potential implicit allowance for catch-up to quality achieved historically	Potential implicit allowance for outputs or aspects of quality no longer provided	Potential implicit allowance for historical operating expenditure that provides long-term benefit
Leakage This covers expenditure on reducing leakage levels, which Ofwat assessed within its broader analysis of expenditure on enhancements relating to supply-demand balance.	Does not seem to be captured by forecast explanatory variables in base cost models	Some data are available on leakage across companies, but no single metric applies (e.g. leakage per customer, leakage per km of pipe).	Ofwat expectation of significant improvement in performance across all companies for 2020-25 period	
Raw water deterioration This category covers expenditure on enhancements to address raw water deterioration (associated with nitrates, trihalomethanes, crypto, pesticides and other).	For the IAP, this does not seem to be captured by forecast explanatory variables in base cost models. If Ofwat were to forecast increases over time to its treatment complexity variable, this might give rise to an implicit allowance that is be relevant to this category.			

6. Guidance on catch-up to quality achieved historically

Introduction

In this section we provide further guidance on how Ofwat might approach the assessment of implicit allowance for catch-up to quality achieved historically. This guidance applies in cases where, following an initial review of evidence available and proportionality, Ofwat decides to make an approximate estimate for this type of implicit allowance for a specific enhancement category.

We set out below one possible approach. This was developed in the light of a review of circumstances or features that could be important for determining the implicit allowance for catch-up to quality achieved historically for a specific enhancement category. This in turn drew on an understanding of the statistical properties of the type of econometric models used for base costs, our simulation analysis and a review of some of the enhancement categories that feature relatively high forecasts of enhancement operating expenditure.

Overview of approach

Figure 8 provides an overview of a possible process to use to estimate an implicit allowance for catch-up to quality achieved historically.

The first step in the process is to identify the dimension(s) of quality performance that are targeted by the enhancement spend under consideration. At this point the focus is on the conceptual nature of quality (or perhaps output) that the enhancement spend is intended to contribute towards.

The next step involves a review of what data or qualitative evidence is available (or could reasonably be made available following further data collection or analysis) relating to the dimensions(s) of quality identified as relevant in the first step. The main interest is on data or other evidence that informs on quality differences between companies and over time. The extent and nature of the evidence available then determines which of two estimation routes are followed:

- Make an estimate of the implicit allowance based on analysis of the level of quality performance funded though the allowances from the base cost models. This analysis can be used to attribute a company's (efficient level of) enhancement operating between: *(a)* an implicit allowance for catch up to that level of quality performance; and *(b)* the operating expenditure needed to achieve levels of quality beyond that level of quality performance.
- Drawing on the weight of the evidence in either direction, make an estimate of the implicit allowance that takes one of two extreme positions: estimating an implicit allowance of zero or estimating an implicit allowance that is sufficient to cancel out the totality of the company's (efficient level of) enhancement operating expenditure.

We discuss each of these routes in turn in the remainder of this section. The attribution route can be seen as providing for an intermediate point between those available under the second approach.

Figure 8 Process to estimate implicit allowance for catch-up to quality achieved historically

The implicit allowance for catch-up to quality achieved historically will vary by company (e.g. depending on its quality in the base year) and across different dimensions of quality. We would expect the assessment to be done by taking specific dimensions of quality, or specific categories of enhancements, in turn. It would not make sense to try to estimate a single implicit allowance for each company covering all aspects of its quality.

Implicit level of quality performance funded through base cost allowances

This approach rests on there being some evidence that can be used to distinguish the level of quality (in particular dimension) between companies. This could be:

- Quantitative data that can be used as a measure (or approximate indicator) of quality differences between companies.

- Qualitative evidence that supports a comparative view on quality differences between companies.

At the minimum, the aim would be to gather evidence on the industry-average level of quality over the historical data period used for the econometric models, and compare this against evidence on the quality improvement that a company is seeking to achieve as part of its enhancement programme for the 2020-25 period. As explained in section 4, we treat the historical industry average level of quality as a starting point for the level of quality performance funded through base cost models.

There are several factors that might lead to the implicit level of quality performance funded through base cost models to be higher or lower than the historical industry average.

One type of factor concerns the relationship between cost efficiency and the relevant dimension of quality. For its IAP, Ofwat's base cost allowances were calculated for an estimated upper quartile level of cost efficiency. The use of the upper quartile level of cost efficiency could have implications for the implicit level of quality funded through the base cost allowances. In particular:

- It is possible that there are relationships between a dimension of quality and the underlying efficiency differences between companies such that the relatively efficient companies in terms of costs are also those which perform relatively well in terms of quality (e.g. service quality to customers or environmental performance). This might fit with a view that there are differences between companies in terms of the quality of management and organisational performance, and that these are the primary drivers of both quality differences and cost efficiency differences between companies, with the two moving in the same direction. If so, the implicit level of quality funded through the base cost allowances might be significantly higher than the historical industry average level of quality.
- It is possible that limitations in the specifications of the econometric models of base costs mean that part of the explanation for observed "efficiency" differences between companies is driven by failure of the models to take account of historical quality differences between companies. This might be the case if an aspect of quality varies significantly across companies and has a significant effect on costs (i.e. if higher quality entails higher costs) and this aspect of quality is not captured in the explanatory variables used for the base cost models. The estimates relating to upper quartile levels of cost efficiency may reflect the lower costs of companies that provide a lower quality service (or worse environmental outcomes). In these circumstances implicit level of quality funded through the base cost allowances might be significantly lower than the historical industry average level of quality.

Both of these factors seem realistic. We would expect the quality and effectiveness of a company's organisational performance to affect its cost efficiency and at least some aspects of its quality. Similarly, the econometric models used for base costs do not take account of numerous aspects of

service quality and environmental performance that are recognised by Ofwat as giving rise to material costs (e.g. recognised through Ofwat's approach to capital enhancement).

In this context, our suggested approach is that if there is strong evidence of one of these factors dominating the other, this could form a reasonable basis for moving away from the historical industry average starting point and adopting a more refined position, informed by this evidence, on the implicit level of quality funded through the base cost allowance.

We do not consider it reasonable to assume, without evidence, that one of the two factors above dominates the other.

Also, we do not consider it reasonable to simply extrapolate findings based on evidence for one dimension of quality and apply these to other dimensions of quality, without some evidential basis for this extrapolation. For instance, if there was strong evidence to support the view that a particular aspect of service quality has an underlying positive relationship with cost efficiency – which would justify estimating the implicit level of quality performance as higher than the historical industry average – this does not by itself justify assuming that the implicit level of quality performance for other dimensions of quality are also above the historical industry average.

With the limited time available to develop this working paper, we have not sought to assess the available evidence on the factors above or to examine what type of evidence and analysis might be most informative. The one caveat that we do wish to highlight is that any analysis of the links between cost efficiency and quality performance should recognise a distinction between underlying causality and the correlations that might be observed in a historical dataset (especially where the sample size is small). Finding that quality is positively or negatively correlated with cost efficiency within the historical dataset is not by itself evidence that either of the two factors above applies or has a material effect. This is especially so given that the approach to base cost allowances involves using econometric analysis of a historical data period to make projections for a future time period.

Another factor that may affect the implicit level of quality funded through base cost allowances is any underlying relationship between the dimension of quality under consideration and the explanatory variables that are included in the base cost model. This could lead to implicit allowances that fund performance that is above or below the historical industry average. The level of quality funded through the implicit allowance would depend on the forecasts of that explanatory variable over the 2020-25 period. If quality differences over the historical data period are indirectly picked up through an explanatory variable used in the base cost modelling, then the level of implicit allowance for quality of the 2020-25 period could vary across companies according to the forecast for 2020-25 for that variable for each company.

While these considerations about relationships between quality and explanatory variables are theoretically relevant, the evidence available and need for proportionality may limit their practical

application. We would expect it to be quite a complicated exercise to examine the relationship between quality and the explanatory variables used in the modelling of base costs and then estimate the implicit level of quality for each company based on that (especially given the triangulation across a series of base cost models which use different variables). There is also a risk of double-counting with the estimates of the implicit allowances arising from forecast explanatory variables (which are discussed further in section 7).

Our suggestion is to only depart from the use of the historical industry average level of quality if there is strong evidence on the relationship between quality and explanatory variables that calls for a different estimate, for each company, of the implicit level of quality funded through base cost allowances, within the context of the overall approach to implicit allowances.

Once a view is taken on the implicit level of quality funded through base cost allowances, the next step would be to compare this to the level of quality provided by the company under consideration in the base year (2019/20) and the level of quality that that company proposes to achieve over the 2020-25 period.

Such comparisons can be used to estimate the implicit allowance for catch-up to quality achieved historically by attributing an estimate of the company's (efficient level of) enhancement operating expenditure for the 2020-25 period between *(a)* catch up to the estimated implicit level of quality in the base cost allowances and *(b)* quality improvement beyond that level. A rough approximation might be done on a pro rata basis, but it is possible that better methods are identified in the circumstances of each case. For instance, it might be possible to use industry-wide data to estimate the enhancement operating expenditure that the company would incur if it provided the implicit level of quality rather than its base year quality and to use this to estimate the implicit allowance for the company.

One qualification to the attribution above is that the implicit allowance for catch-up to quality achieved historically, being derived from industry-wide data, may not represent the enhancement operating expenditure for catch-up by a company that has quite a different opex-capex mix to other companies. Some form of adjustment may be appropriate if there is evidence that the company under consideration would be improving quality in a way that involves a different opex-capex mix to that reflected in the historical data.

Alternative approach to implicit allowance for quality catch-up

We reviewed a number of the enhancement categories for which companies have submitted significant forecasts of enhancement operating expenditure. We found that in a number of cases there may not be sufficient data or other evidence on historical quality differences across companies to adopt the approach set out above (even if the level of ambition is limited to obtaining an approximate figure).

Where it does not seem feasible to try to gauge the implicit level of quality funded through the base cost allowances, we suggest that an approximation for the implicit allowance relating to catch-up to quality achieved historically is made by considering two extreme positions:

- Zero implicit allowance for catch-up to quality achieved historically.
- An implicit allowance for catch-up to quality achieved historically that is sufficient to cancel out the totality of the company's (efficient level of) enhancement operating expenditure.

We suggest that a choice is made between these two approximations according to the weight of evidence in favour of each of these extreme positions. The relevant evidence might include, for example, an overall view on the type of issues below:

- If there is evidence that a company's enhancements are part of an industry-wide improvement in quality between the historical data period and the 2020-25 period, then this might point towards the first approximation above.
- If there is evidence to indicate that, even after its proposed enhancements over the 2020-25 period, a company would be achieving lower quality than that achieved in the past by most other companies in the industry, this could point towards the second approximation above.

Even if the available evidence on quality differences across companies and over time seems quite limited, we would expect there to be at least some relevant evidence. In order to support forecasts for enhancement operating expenditure, water companies will provide information on the nature of the improvement and the drivers of changes over time. The submissions across companies may help provide a broader picture of how one company's enhancements fit into the wider industry context. There may be further information available from other sources that might be worth exploring.

7. Guidance on other categories of implicit allowance

Introduction

The previous section provided guidance on an approach for implicit allowances for catch-up to quality achieved historically. In this section, we provide some guidance on the three other types of implicit allowance relating to enhancement operating expenditure that we identified in section 4. This guidance applies in cases where, following an initial review of evidence available and proportionality as suggested in section 5, Ofwat decides to make approximate estimates for each type of implicit allowance for a specific enhancement category. We take the following types of implicit allowance in turn:

- Implicit allowances arising from forecast explanatory variables.
- Implicit allowance for output or aspects of quality no longer provided.
- Implicit allowance for historical operating expenditure providing longer-term benefits.

The material presented below is intended to help improve the approach to implicit allowances relating to enhancement operating expenditure for PR19. It is not intended to offer a fully-developed methodology for these implicit allowances.

Implicit allowances arising from forecast explanatory variables

The starting point for the analysis of this type of implicit allowance is the base cost allowances, which are derived from econometric models of historical base costs.

This type of implicit allowance may arise where the forecasts for the explanatory variables for the 2020-25 period for a specific company differ from the historical data on those explanatory variables for that company. For example, for the type of base cost models used for Ofwat's IAP such forecasts might imply:

- Forecasts of increases in the number of properties supplied, or other scale variables such as sewage load or water mains length, which are driven by increases in the outputs of the water company (e.g. supplying water to a larger number of customers).
- Forecasts of changes in other explanatory variables which relate to quality, such as forecasts of increases in the tightness of ammonia consents for wastewater treatment works.

Even where an explanatory variable used in the modelling does not relate directly to output or quality it is possible that it captures enhancements indirectly, if there is some underlying relationship between the explanatory variable and increases in output or quality. For this reason, our suggestion is to start by considering all explanatory variables used for the base cost models and go through

each of these to identify if forecasts for a company differ from historical data for that company and whether this may be relevant for work on enhancements.

Having completed that exercise, an estimate of the implicit allowances arising from forecast explanatory variables can be made for each company by comparing *(a)* the base cost allowances calculated for that company for 2020-25 against *(b)* what those base cost allowances would be if all forecast explanatory variables relating to outputs or quality (even indirectly) were "frozen" at the levels they took for that company for the 2019/20 base year.

This comparison will produce an estimate of an implicit allowance for base costs, covering operating expenditure and capital maintenance expenditure. An estimate of the implicit allowance relating to enhancement operating expenditure can then be made by allocating the implicit allowance for base costs between operating expenditure and capital expenditure. One method for doing so would be a pro rata allocation based on industry-wide ratio of operating expenditure to capital maintenance expenditure over the historical data period.

The estimation of implicit allowances arising from forecast explanatory variables should take account of the triangulation process used to combine figures derived from individual econometric models into a single overall allowance for each company.

We provide an illustrative example of this type of approach in our report from March 2019. This was focused on implicit allowances that arose from forecasts relating to wastewater growth. We have included a version of this illustrative example in Figure 9.

Figure 9 Illustrative calculation of implicit allowance based on Ofwat's IAP

Calculation of implicit allowances for operating expenditure associated with wastewater growth

For wholesale wastewater services, Ofwat set allowances for base service for 2020-25 by calculating a weighted-average of the modelled costs derived from a set of eight different econometric models. In turn, for each of those models, modelled costs are obtained by applying the set of estimated coefficients to the forecast of the cost drivers in the models for the period 2020-25.

All eight models include drivers that control for, and vary with, the scale of companies. These drivers cover length of sewers, load treated and sludge produced. Our illustrative calculation of implicit allowances is based on estimating the allowances for operating expenditure relating to changes in these scale variables.

We did this as follows:

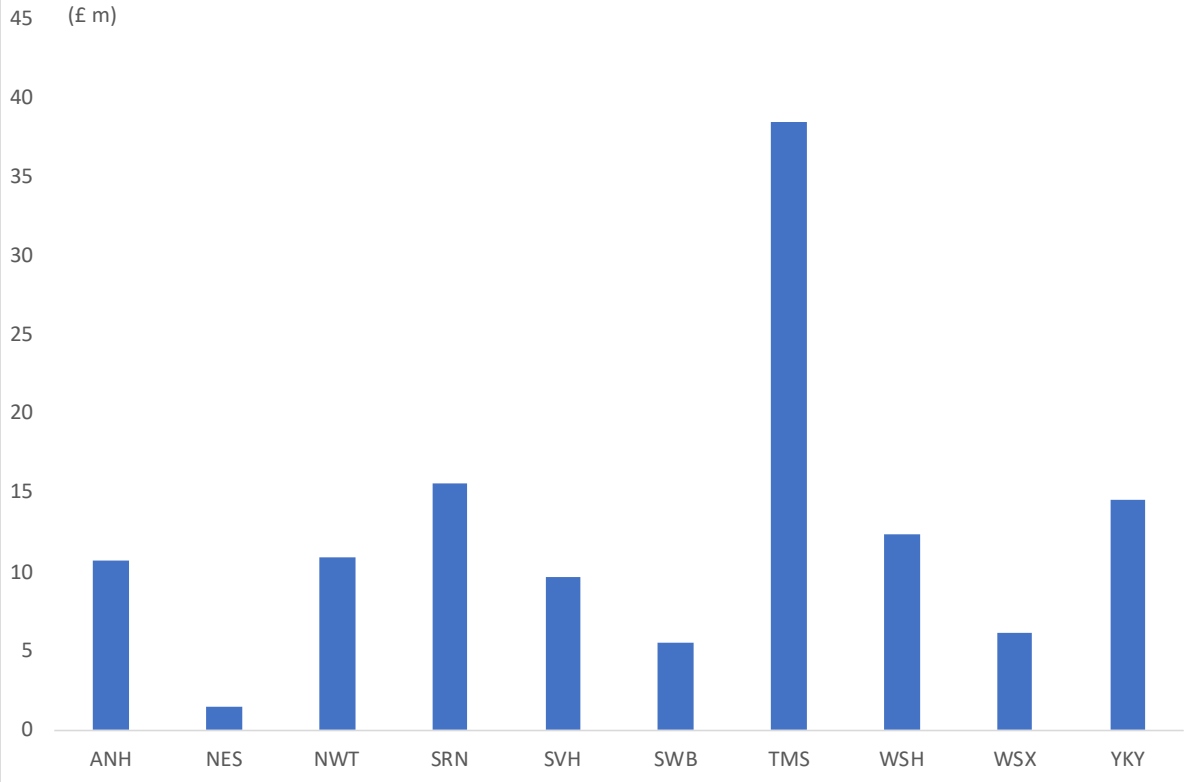
a) For each of the eight models, we calculated the modelled base costs for 2020-25 under the assumption that, for those cost drivers relating to scale – and only for those cost drivers – the values over that period were "frozen" at the levels forecast for 2019/20.

b) We took the weighted-average of these modelled costs and subtracted the result from the allowance for base costs made by Ofwat. The difference can be interpreted as the implicit allowance for base costs attributable to growth in the scale of each company.

c) Some of that difference will reflect allowances for capital maintenance and some to operating expenditure, as both are part of the base costs modelled through the econometric models. We allocated the difference between these two using the industry-average split of these two measures from 2011-18.

The chart below shows our calculation of the implicit allowance for each company. Our method here is illustrative of the broader concept and not intended to be applied directly without further review.

In this exercise, we have calculated the implicit allowance for the combined company SVH and not sought to allocate this between Severn Trent England and Hafren Dyfrdwy.



Having estimated the implicit allowance for each company, it will then be useful to map that allowance to the various enhancement categories, to understand to what categories of enhancement expenditure the implicit allowance makes a contribution towards. For instance, the implicit allowances calculated from freezing the various scale measures in the wholesale water base cost models could be relevant across enhancement categories relating to: (a) growth affecting new connections costs and network infrastructure costs; and (b) supply-demand balance. It might not be important to try to allocate the allowance across these categories but it seems useful to recognise the relevance of the overall implicit allowance to each of them.

If different enhancement categories are captured by distinct explanatory variables in the models then it might be quite possible to identify how much of the implicit allowance relates to each variable, which can be used to allocate the overall implicit allowance between enhancement categories.

One benefit of this mapping exercise is that it could help reduce risks of double-counting implicit allowances – or overlooking implicit allowances – when estimates of implicit allowances arising from forecast explanatory variables are combined with estimates for the other three types of implicit allowance introduced in section 4.

As highlighted in section 5, the estimation of implicit allowances is a useful part of the evidence base for the assessment of enhancement allowances but care is needed as to how to use these estimates. For instance, it would not make sense to deduct these estimates from companies' forecasts of enhancement operating expenditure, without establishing first what costs are covered by those forecasts.

Implicit allowance for output or aspects of quality no longer provided

In this section we provide suggestions on how Ofwat might estimate implicit allowances for output or aspects of quality no longer provided.

Our first suggestion is that Ofwat considers asking companies for further information and clarification relating to their business plan forecasts. Information on any cost savings arising from output or aspects of quality no longer provided over the 2020-25 period might be reflected in companies' business plan submissions but not, at present, separately identifiable. For instance:

- Some companies may have taken account of cost savings arising from output or aspects of quality no longer provided as part of their forecasts of operating expenditure (but not enhancement operating) over the 2020-25 period. Since Ofwat's base cost allowances are derived from econometric models estimated on historical expenditure data, forecast cost savings over the 2020-25 period would not feed directly through to the base cost allowances.
- Some companies may have taken account of cost savings arising from output or aspects of quality no longer provided as part of their forecasts of enhancement operating expenditure over the 2020-25 period, providing a forecast of enhancement operating expenditure that is net of these savings. Deduction for these cost savings is not consistent with the definition of enhancement operating expenditure we have suggested in section 2, but is a possibility given the lack of clarity on enhancement operating expenditure.

Drawing on the definition for enhancement operating expenditure we proposed in section 2, companies could be asked to provide forecasts and information on:

- Reductions to the operating expenditure that the company will incur in the 2020-25 period arising from any aspects of "quality of service" that are expected to be lower relative to the 2019/20 base year. The concept of quality of service should be interpreted broadly (see section 2) and should include expenditure reductions where legislative changes improve the quality of environmental inputs used by the water company.

- Reductions to the operating expenditure that the company will incur in the 2020-25 period due to any decreases in the number of customers supplied or decrease in demand of those customers relative to the 2019/20 base year.

Apart from direct queries to companies, there may be relevant information on outputs or aspects of quality no longer provided within companies' business plans or from other sources.

It would be useful to consider factors that might bring about quality reductions. For instance, the Government announced in December 2018 that it plans to introduce a ban on the outdoor use of metaldehyde to protect wildlife;[5] this may enable lower operating expenditure by improving the quality of raw water available to water companies. Since companies forecast enhancement operating expenditure for cost increases associated with raw water deterioration, it seems reasonable to also consider potential for cost savings associated with improvements in the quality of raw water.

We suggest that some consideration of the possible of reductions to outputs or quality no longer provided is carried out across *all* of Ofwat's enhancement categories. It would not make sense to focus this part of the work on enhancement operating expenditure on those categories with non-zero or significant forecast expenditure over the 2020-25 period. Some initial consideration across all categories could then feed into a decision on which categories, if any, to make an estimate of the implicit allowance for, taking account of the evidence available and proportionality of the work.

When it comes to the estimation of potential implicit allowances for outputs or quality no longer provided, the essential point to keep in mind is that our interest is in the implicit allowance within the figures derived from econometric models of historical expenditure:

- For a particular company, the primary interest is not in the changes over time in the output or quality provided by that company (though such changes across companies can provide relevant evidence). Instead the primary interest is in how the output or quality provided by that company over the 2020-25 period compares to the output or quality funded through the base cost allowances calculated for that company.
- It would be wrong to treat the forecast expenditure reduction achievable by a particular company over the period 2020-25 from aspects of quality reduction as an estimate of the implicit allowance for that company. The implicit allowance will reflect the historical expenditure data for all companies in the dataset used for the econometric models of base costs.

The estimation approaches for implicit allowances for outputs or quality no longer provided could draw on some of the ideas set out in section 6, for implicit allowance for catch-up to quality achieved

[5] See https://www.gov.uk/government/news/restrictions-on-the-use-of-metaldehyde-to-protect-wildlife

historically. In particular, we suggest that a reasonable starting point is that the implicit allowances derived from the econometric models of historical base costs are taken to fund a level of quality reflecting the historical industry-average quality. A different view of the implicit level of quality could be used if there is evidence to support this (e.g. evidence on the relationship between quality and perceived efficiency).

Implicit allowance for historical operating expenditure providing longer-term benefits

The final type of implicit allowance relating to enhancement operating expenditure that we consider is an implicit allowance for historical operating expenditure providing longer-term benefits. This type of implicit allowance is explained in section 4.

The starting point for work on this type of implicit allowance would be evidence on where there is operating expenditure providing longer-term benefits. By longer-term benefits, we mean significant economic benefits from the expenditure beyond the year in which this was incurred.

We identified several cases where a water company has incurred, or plans to incur, operating expenditure that provides benefits in a dimension of quality that extend significantly beyond the year in which the operating expenditure is incurred. For example:

- **Customer-side lead pipe replacement**. As part of a water company's approach to reducing risks to customers from water supplies being conveyed though lead pipes, it may replace lead communication pipes which it owns as well as lead supply pipes which are owned by customers. If the company replaces a lead supply pipe that is owned by a customer, with a non-lead pipe, this would provide benefits over a long period of time (e.g. reduced risk to the customer over the full asset life of the new pipe or perhaps a permanent risk reduction). However, despite the long-term benefits, the company's accounting policy may mean that it records the expenditure on the pipe replacement as operating expenditure, since the new pipe would not constitute an asset owned by the company. Similarly, companies might engage in customer-side pipe replacement as part of their leakage reduction strategy and treat the costs of these pipe replacements as operating expenditure.
- **Engagement with farmers**. A water company's efforts to improve raw water quality might involve engagement with farmers to reduce the impact of pesticides on the raw water used by the company. In some cases, this might involve educational and persuasive means which involve a cost in a given year but achieve benefits to water quality that last a number of future years. This would be operating expenditure that provides longer-term benefits. In contrast, if the engagement with farmers involved making an annual payment or subsidy to the farmer to refrain from using a certain type of pesticide, the benefits may not be sustained if the payments were stopped.

- **Partnership delivery of capital projects**. A water company might decide to adopt a partnership approach in some areas, which enables improvements to its quality to be achieved (e.g. greater resilience to flooding risk) through contributions to projects of third parties (e.g. the Environment Agency or district council). Even if the project involves capital expenditure bringing long-term solutions, the water company's contribution might be treated as operating expenditure as the company would not own the asset created.

- **Investigations linked to future quality enhancements**. If a water company incurs operating expenditure as part of work on investigations to support quality enhancements in the future, these might give rise to long-term benefits.

Our impression is that a review of enhancement elements of companies' current and past business plans, possibly combined with follow-up questions, could provide relevant evidence for this type of implicit allowance, and help identify enhancement categories or issues to investigate in more detail, depending on the evidence available and proportionality.

In terms of the estimation of implicit allowances for historical operating expenditure providing longer-term benefits, the following points are important to keep in mind:

- What matters for the implicit allowance is the extent of longer-term benefit operating expenditure within the historical data period used for the econometric models of base costs. Information on the existence and prevalence of such operating expenditure within PR19 business plans, covering the 2020-25 period, might be relevant evidence but could be misleading if taken out of context. The extent of longer-term benefit operating expenditure in the historical data period running from 2011/12 to 2017/18 may be quite different to that in the 2020-25 period. This is especially so given that Ofwat has adapted its price control framework over time to encourage an efficient totex approach and to address concerns of a capex bias. The PR09 and PR14 business plans might also provide relevant information on the historical data period (though the scale and nature of outturn expenditure may differ to that in the plans).

- It would be wrong to treat the estimated amount of longer-term benefit operating expenditure incurred by a particular company over the historical data period as an estimate of the implicit allowance for that company. The implicit allowance will reflect the historical expenditure data for all companies in the dataset used for the econometric models of base costs. Following on from the point above, if only one company out of the industry has incurred longer-term benefit operating expenditure in the historical data period, we would expect this to affect the base cost allowances for all companies, in a diluted way. The extent of implicit allowances for longer-term benefit operating expenditure will depend on the scale of this type of expenditure historically and its prevalence across companies.

The main way that we see to approach the estimation of this type of implicit allowance is to make an estimate of how much longer-term benefit operating expenditure there is in the base cost

allowances, based on estimates of the scale of longer-term benefit operating expenditure incurred historically. In a very simple case, an estimate could be made as follows:

1. Take an estimate of the level of longer-term benefit operating expenditure incurred by each company, on average over each year of the historical data period, and divide by the average number of properties that the company has supplied over that period.
2. Take the simple average across companies of the cost per customer metric from (1).
3. Estimate an implicit allowance for longer-term benefit operating expenditure for each company, for each year, by multiplying the average across companies from (2) with the forecast number of customers supplied by that company in each year of the 2020-25 period.

This is just an illustrative example. We are not proposing that the simple calculation above is appropriate to apply directly for the assessment of implicit allowances for PR19, but it provides a basis for more refined approaches to be identified and developed depending on the circumstances of each case.

It might also be possible to make an estimate of implicit allowance by looking at the scale of quality improvement achieved over the historical data period from longer-term benefit operating expenditure and comparing this to the scale of quality improvement forecast from companies' enhancement expenditure over the 2020-25 period. For instance, in the case of customer-side lead pipe replacement, an alternative to making an estimate in £m would be to estimate an implicit allowance based on an estimate of the average, across companies, in the annual rate of customer-side lead-pipe replacement per property supplied, over the historical period (but only where companies treat this replacement as operating expenditure rather than capital expenditure).