HDD2.1 Frontier Shift Adjustment

Draft Determination representations

28 August 2024

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1. Summary

In the water sector, Ofwat seeks to emulate the productivity incentives of competitive markets by setting cost allowances which includes a 'frontier shift' and 'catch-up' efficiency challenge. Frontier shift is the opportunity for all companies (including those at the frontier) to increase the efficiency of their operations over time. This is in addition to any 'catch-up' of less efficient companies with those at the efficiency frontier today.

In our view, Ofwat's PR24 draft determination for a frontier shift of 1% p.a. overstates what is possible and credible for two mains reasons:

- CEPA's range of productivity estimates is overstated and not representative of the frontier shift potential over AMP8. Furthermore, by uplifting the lower bound from 0.5% to 0.8%, CEPA and there is a risk that this creates the impression of a balanced midpoint; and
- The wider factors Ofwat draws upon to justify 'aiming up' within this range double count benefits in some areas (e.g. innovation) whilst in others are unsubstantiated.

We find that, by making adjustments to CEPA's methodology to account for some of the shortcomings described below, the resulting range of productivity estimates falls from 0.8%-1.2% to 0.5%-0.9%. Applying the mid-point of this range (i.e., 0.7%) results in a productivity value more in line with our original analysis (i.e., 0.61%). Further recommended adjustments, which have not been reflected below due to data availability, are expected to result in a frontier shift estimate below 0.7%.

This gives further support to the analysis underpinning our original frontier shift estimate and we therefore ask that Ofwat applies a frontier shift of 0.61%.

We discuss these reasons in turn below.

2. Ofwat's approach to setting frontier shift

In PR19, Ofwat set a frontier shift efficiency challenge of 1.1% on companies' wholesale base cost expenditure allowances and certain enhancement cost categories (metering and NEP enhancement). In the PR19 redeterminations, the CMA reduced Ofwat's frontier shift to 1.0% and extended its scope to include both base and enhancement wholesale costs.

In PR24, Ofwat is proposing a frontier shift of 1.0% on all wholesale and retail base and enhancement expenditure allowances (except for costs Ofwat deems 'mostly outside of company control'). This is based on the following two-step approach:

Step 1. Establish a range of productivity values. Ofwat adopted an upper and lower bound of possible productivity values produced by CEPA. CEPA set its initial lower bound (0.5%) at the lowest frontier shift estimate from company business plans and an upper bound (1.2%) at the mid-point value from a sample of:

- A. Gross Output (GO) and Value Added (VA) productivity estimates over 1996-2019 from EU KLEMS for the 'PR19 comparator set' and an additional GO estimate for the '4 highest performing industries'; and
- B. highest frontier shift values set by Ofgem in RIIO-ED2/T2.

This results in an upper and lower bound of 0.5% and 1.2%. CEPA then uplift the lower bound to 0.8% so that the range sits symmetrically around 1% on the basis that recent regulatory precedent has 'clustered around 1%'.

Step 2. Determine where to 'aim' within this range. Ofwat then draws on a set of wider considerations to inform which value to select from within CEPA's range. Ofwat considered the following evidence may support a more stretching challenge of up to 1.2%:

- A. Benefits from new productivity opportunities – new techniques from innovation fund winners, 'learning by doing' opportunities from new enhancement programmes, and new opportunities from AI.
- B. Shortcomings in EU KLEMS data – due to not accounting for embodied technical shift through increase in quality of inputs over time (e.g., new ICT).

Ofwat considered that these wider factors support a more stretching frontier shift of up to 1.2% whilst the mid-point of this range of 1% is 'conservative'. Ofwat decided to set the frontier shift at 1% but indicates it is open to increasing this at final determinations.

In our view, Ofwat's proposal does not reflect a credible frontier shift challenge. We discuss the concerns we have with each of the two steps in turn below.

3. CEPA's range of productivity values

CEPA's range of efficiency scores has been developed through a growth accounting analysis which calculates historic levels of productivity growth from comparator industries as a benchmark for companies' frontier shift challenge in PR24.

Time period

In our view, CEPA's selected time period does not reflect average productivity performance of a representative business cycle for PR24.

CEPA concludes that the most recent business cycle period 'could be construed as' 1996-2019 based on an 'output gap' definition[1] despite recognising that this is not a robust analytical assessment. However, CEPA then go on to select this time period (excluding 2020 due to Covid-19 effects) on the basis that it makes use of as much of the available data as possible.

We find that this approach is flawed:

- Firstly, not all identified business cycles are equally representative of future macroeconomic conditions and therefore should be weighted appropriately.
- Secondly, evidence supports that the two most recent business cycles took place between 1992-2009 and 2010-2020.[2]

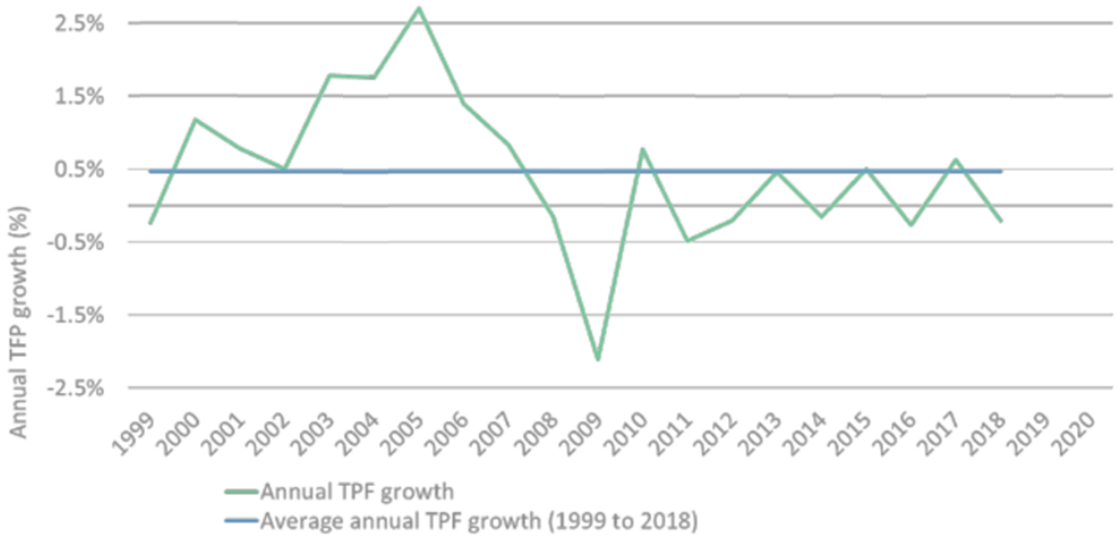
We therefore consider that the years 1992-2009 and 2010-2020 provide the most appropriate comparison, and that greater weight should be given to the latter to reflect fact that there has been lower productivity growth since 2007.

Weighting the 2010-2020 period more heavily than 1992-2009 reflects the fact that the financial crisis represents a structural break in productivity growth for all industries in the UK, marking an ongoing period of falling and persistently low productivity yet to return to pre-crisis levels, as illustrated in ***Figure 1***.

[1] A period where the output gap equals zero three times, where that period includes periods where the output gap is both negative and positive.

[2] Based on a 'trough to trough analysis as presented in Section 4B of 'Productivity and Frontier Shift at PR24' (Economic Insights).

- ***Figure 1: UK TFP, before and after the 2008 financial crisis***



Source: Adapted from an analysis of EU KLEMs presented in 'Response to Ofwat draft methodology' (Economic Insight

Whilst we agree that some weight should be applied to pre-crisis years, this should not be disproportionate to the expected prevailing conditions that water companies will be operating in over AMP8. By constructing a series which runs from 1996 to 2019, CEPA puts equal weight on pre-crisis years relative to post-crisis years.

We also disagree with claims by Europe Economics that the reasons for low expected economy-wide productivity growth do not apply in the water sector.[3] Europe Economics hypothesise a number of mechanisms through which recent shocks (i.e., Brexit, the Covid-19 pandemic and the energy price crisis) affect economic productivity and conclude that none of these apply to the water sector. Firstly, we believe that this set of recent shocks are a narrow representation of total possible drivers for low productivity growth in the UK post-2008. Secondly, these recent shocks are also relevant to the water sector which draws from the same factors of production (i.e., capital, labour, innovation) as the rest of the UK economy.

Industry comparators

CEPA's selected comparator group includes the set of industries which were selected by Ofwat for the frontier shift approach in PR19.[4] However, CEPA also constructs a GO productivity estimate based on a new comparator group: '4 highest performing industries'[5] without providing any supporting justification for doing so.

This arbitrary comparator group results in a significantly higher productivity value (1.7% vs. 0.6%) which is then included in the sample from which CEPA derives the upper bound for their range. We find that this approach leads to a systematic misrepresentation of the wider set of cost activities in

[3] Frontier Shift and Outcomes Stretch at PR24, Europe Economics (17 March 2023), Section 4
[4] Chemicals and chemical products; Construction; Machinery and equipment n.e.c; Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment; Professional, Scientific, Technical, Administrative and Support Service Activities; Total manufacturing; Transportation and storage.
[5] Chemicals and chemical products; Machinery and equipment n.e.c, Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment, Total manufacturing

the water and wastewater sector. At the PR19 redeterminations, the CMA also found that *"there was not strong evidence to weight any one comparator more than the others"*.[6]

Aside from this material issue, we generally agree that the 'PR19 comparator' group contains a reasonable set of comparator industries to our wholesale activities. However, we do not think it's appropriate to apply this same comparator set to our retail activities which differ significantly in their factors of production. Instead, we consider that a more balanced approach is to define a comparator group for wholesale and retail costs separately. Within retail costs, we find that the following industries are suitable comparators: 'Information and communication', 'Financial and insurance activities', 'Real estate activities', 'Administrative and support service activities' and 'Other service activities.'

Productivity measure

We do not consider it appropriate to include a VA measure of TFP explicitly within the range of productivity values. VA TFP is systematically higher in magnitude than GO TFP because it omits the effects of intermediate inputs.

In the PR19 redeterminations, the CMA also found VA TFP to be a less appropriate measure for estimating frontier shift given that is applied to a cost base which includes intermediate inputs. The CMA therefore removed VA TFP from the sample of values which formed the productivity range[7] and instead considered this as qualitative evidence when making an in-the-round judgement on where to aim within the range.[8]

In our view, the CMA's approach remains valid in PR24 and the CEPA range should exclude estimates based on a VA TFP basis.

Weight placed on Ofgem's frontier shift estimates

The upper bound of CEPA's range seems to have been calculated taking into account both evidence from the water sector and from the energy sector:

- The average of a selected sample of EU KLEMS TFP estimates (i.e., 1.2%)
- Ofgem's frontier shift for opex and capex/repex in RIIO-T2/GD2 (i.e., 1.25% and 1.15%, respectively).

In our view, CEPA's choice of evidence from the energy sector is not appropriate, for three reasons:

- CEPA has chosen the highest frontier shift estimate that Ofgem has set for the gas and energy sector of the past 10 years – as shown by CEPA's own analysis of regulatory precedent.[9]
- At the RIIO-GD2/T2 appeals, the CMA has removed the 0.2% uplift for innovation funding from Ofgem's estimate of frontier shift, which resulted in a lower frontier shift of 0.95%-1.05% p.a.
- Ofgem's most recent estimate of frontier shift is 1% for the electricity distribution networks.

[6] Para 4.522 of CMA's PR19 redetermination final report. https://assets.publishing.service.gov.uk/media/60702370e90e076f5589bb8f/Final_Report_---_web_version_-_CMA.pdf

[7] CMA price determinations (March 2021) paragraph 4.544

[8] CMA price determinations (March 2021) paragraph 4.616

[9] See Table 4.8 of CEPA (June 2024), Frontier shift, real price effects and the energy crisis cost adjustment mechanism.

CEPA's adjustments

Having set a range of productivity values of 0.5% to 1.2%, CEPA then makes an asymmetric adjustment by raising the lower bound to 0.8%. CEPA justifies this on the basis that UK regulators 'cluster around 1%' in recent decisions.

We consider this to be arbitrary (both in its justification and the degree of 'narrowing') and unbalanced (in its asymmetric application). Notably, CEPA's resulting lower bound of 0.8% is lower than the CMA's starting point of 0.7% without any clear justification for this.

Conclusions on CEPA's range

We have made a number of adjustments to CEPA's analysis to address some (but not all) the shortcoming identified above. We find that the incremental impact of the following adjustments results in a reduction in the upper bound from 1.2% to 0.9%:

- Removing the comparator group '4 highest performing industries'; and
- Removing the VA measure of TFP.

These adjustments are shown in ***Table 1*** below. Amending the comparator point from the energy sector would also lower the upper bound of the range.

Further, if we do not apply CEPA's arbitrary 'narrowing' of the range around 1%, the impact of these amendments results in a productivity range between 0.5% and 0.9%. The mid-point of this estimate is 0.7% which is in line with our original estimate of 0.61%.

We note that we have not been able to apply an adjustment to the weightings which CEPA applies to the two time periods (i.e., 1996-2008, 2009-2019) as CEPA's underlying estimated time series of productivity values is not available. However, we expect that the impact of making this adjustment would further bring central productivity estimate down towards our value of 0.61%.

Table 1 Impact of adjustments to CEPA's methodology on upper bound

Frontier shift value	CEPA	Remove '4 highest performing industries'	Remove VA measure
[1] Average of [1i] [1ii] [1iii]	1.20%	1.15%	0.60%
[1i] GO TFP, total	0.60%	0.60%	0.60%
[1ii] GO TFP, top 4	1.30%	N/A	N/A
[1iii] VA TFP, total	1.70%	1.70%	N/A
[2] Average of [2i] [2ii]	1.20%	1.20%	1.20%
[2i] Ofgem RIIO-2 capex	1.15%	1.15%	1.15%
[2iii] Ofgem RIIO-2 opex	1.25%	1.25%	1.25%
[3] Average of [1] [2]	1.20%	1.18%	0.90%

Source: 1i and 1ii are presented in Table 4.6 and 1iii is presented in Table 4.7 of CEPA's report.

4. Ofwat's support for 'aiming up' within CEPA's range

Taking the range of productivity estimates provided by CEPA, Ofwat then consider that wider factors support applying a more stretching challenge within this range. These wider factors include:

- **Benefits from new productivity opportunities** – including new techniques from innovation fund winners, 'learning by doing' opportunities from new enhancement programmes and new opportunities from AI.
- **Shortcomings in EU KLEMS data** – due to not accounting for embodied technical shift through increase in quality of inputs over time (e.g., new ICT).

Firstly, on principle, we do not agree that weight should be placed on anecdotal and unverifiable claims when taking aim within a productivity range. Secondly, we find that the specific arguments Ofwat have made are either flawed or unbalanced. We discuss these in further detail below.

Benefits from new productivity opportunities

We find that Ofwat has double-counted sources of productivity in its assessment that it should 'aim up' within the productivity range. This is because the productivity range derived from the EU KLEMS data already reflect those sources of productivity.

Firstly, TFP estimates from EU KLEMS already proxies the expected productivity gains realised through innovation fund winners in the water sector. In competitive industries, companies invest in innovation to gain a cost or revenue advantage over their competitors. Ofwat's innovation fund aims to emulate this incentive and outcome through a ringfenced funding process. This means that the effects of the innovation fund are already captured in comparator industries within the EU KLEMS data. Ofwat is therefore double counting this evidence when determining where to aim within CEPA's productivity range. This finding is consistent with CMA final determination on the RIIO-2 appeals in which it agreed with appellants that the impact of innovation funding on future expenditure was (a) already embedded in companies' business plans, and: (b) already reflected in comparator groups from which Ofgem derived its core frontier shift target. [10]

Secondly, opportunities for productivity via 'learning by doing' are realised by iterating on repeated, discrete activities over the medium to long-term as production capacity increases.[11] As with innovation, this general effect is already captured within the EU KLEMS data comparator set and we do not consider that the opportunities to the sector in AMP8 should be systematically higher than the comparator set. Indeed, the majority of our enhancement funding covers a small number of large schemes and so have intrinsically fewer stages for learning in the near term.

Aside from issues of double-counting, we also find that Ofwat places disproportionate weight on speculative evidence. In particular, Ofwat cites Europe Economics study to support that AI has 'now reached a stage of development at which it can be widely applied across the economy, raising the potential for an AI driven acceleration in productivity growth over the coming years in wholesale and retail services. However, the Europe Economic study presents no evidence to substantiate this claim

[10] Competition and Markets Authority (2021), 'Final determination Volume 2B: Joined Grounds B, C and D', paragraph 7.608 and 7.552.
[11] In manufacturing and industry, this process is measured through the estimation of 'learning curves' which show the expected reduction in unit costs as processes expand over time.

and goes on to say that it is outside the scope of its work to assess potential AI benefits to companies via innovation fund.

In our view, the technological readiness level of AI applications to the water and wastewater sectors has not yet reached the point of scalable systems proven in the operational environment. We therefore consider this evidence to be too speculative to place any weight on when setting a frontier shift value in AMP8 but note that such evidence may be available when considering appropriate frontier shift for AMP9.

Shortcomings in EU KLEMS data

We agree that EU KLEMS TFP data does not seek to measure changes in embodied technical change but that the there are limitations in evidence available to adjust for its impact.[12] However, we note that the range of productivity values proposed by CEPA already includes an adjustment for this. By considering this evidence twice (i.e., in the range itself and in where to aim within the range) Ofwat is double counting.

Specifically, CEPA's upper bound uses the values of 1.15% and 1.25% selected from Ofgem RIIO-2 final determinations. However, in arriving at these values, Ofgem already reflected (amongst other considerations) that EU KLEMS does not capture cost savings from quality improvements that are embodied in inputs.[13]

Wider evidence on performance stretch in PR24

In addition to the arguments which Ofwat introduces (above), we also note that Ofwat's PR24 performance stretch represents an additional layer of productivity challenge on top of Ofwat's explicit 'frontier shift' which it has not justified as achievable.

In particular, we note that Ofwat's frontier shift estimate already reflects the level of productivity that comparator sectors were able to achieve by a combination of reducing costs, increasing outputs, or *increasing the quality of the outputs*. This is because the outputs in the EU KLEMS data are adjusted for quality, as set out in the Office for National Statistics (2016) Productivity Handbook[14] and supported by the CMA in its price determinations.[15]

By applying its frontier shift estimate to costs, Ofwat is requiring companies to achieve the level of productivity it has estimated from the EU KLEMS *data entirely through a reduction in costs.* However, Ofwat have also set a separate 'quality challenge' in PR24 through its approach to 'what base buys' and new and more stretching performance commitments. This means that the productivity challenge effectively applied by Ofwat to water companies is higher than its estimate from the EU KLEMS data.

Specifically, in the PR24 final methodology, Ofwat stated its expectation for companies to challenge themselves to improve performance (i.e., quality) by identifying opportunities to deliver stretching

[12] CMA Paragraph 4.555

[13] See para 5.28 of Ofgem's Decision – RIIO-2 Final Determinations – Core Document (Ofgem, December 2020). *"Our final decision is consistent with both regulatory precedent and expectations set out by the companies themselves. The CMA has made a provisional determination that OE (ongoing efficiency) in the water sector for PR19 should be 1.0%; this is reflective of a greater weighting being placed on productivity growth before 2007 than after, and an acknowledgment that savings from quality improvements that are embodied in the inputs used by the water network companies. This is equally relevant for the energy sector."*

[14] Chapter 12, p69

[15] CMA Paragraph 4.554

levels of performance from their base expenditure allowances.[16] This expectation was formally reflected in the data table reporting requirements ('OUT2') in companies' business plans. Ofwat stated that it will assess companies' proposals to determine whether submitted costs are stretching but achievable by considering (amongst other things) the 'opportunity for transformational performance improvements (e.g., digitising sewer networks)'.

In addition, at PR24, companies will also face a number of new performance commitments, more stretching performance commitment levels and new statutory obligations than in previous price controls.

On the other hand, Ofwat has only allowed the sector a 3% increase in base allowances at PR24 relative to actual spend between 2018-19 to 2022-23 before frontier shift and real price effects.[17] In other words, Ofwat is already challenging companies to do more with less before applying a frontier shift challenge. These facts should therefore also be reflected in determining where to aim within the productivity range.

Conclusions on aiming up

We find that there is not support for 'aiming up' within the range of productivity estimates set by CEPA. Firstly, Ofwat double counts evidence and also draws inferences from speculative evidence when justifying its approach. Further, Ofwat discounts other sources of evidence which we think supports 'aiming down' within the range.

Overall, on the balance of evidence, we do not find compelling reason for aiming up within the range.

[16] IN 23/07 Assessing the influence of enhancement expenditure on historical performance trends for PR24 (Ofwat, July 2023)

[17] PR24 draft determinations, Expenditure Allowances, Table 53 (Ofwat July 2024).

5. Our proposal

In our PR24 business plan, we estimated a stretching and achievable frontier shift efficiency challenge of 0.61% against our totex plan. This is based on a growth accounting analysis of EU KLEMS data which (a) places greater weight on post-financial crisis productivity growth data, (b) adopts a 80:20 weighting in favour of 'Gross Output' relative to 'Value Added' measure of productivity, and (c) triangulates across a set of 3 different comparator group specifications.[18]

Our review of Ofwat's approach finds a range of shortcomings and unsupported assumptions which, once adjusted for, reduces the central frontier shift value from 1.0% to 0.7%. However, due to data availability we have not been able to make all of the necessary adjustments (i.e., time period weighting). We consider that this assessment of Ofwat's approach lends greater support to our original frontier shift analysis and resulting value of 0.61%. We therefore consider that Ofwat should adopt 0.61% as the frontier shift assumption.

[18] Annex 4a 'Costs, stretch and efficiency', PR24 Business Plan