Further Evidence on OE for Gas Networks at RIIO-3

Supplementary report

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Economic Insight

01 Introduction and Executive Summary

At RIIO-GD3 and T3 (hereafter RIIO-3), Ofgem will set an ongoing efficiency (OE)[1] target for all transmission and gas distribution networks. OE represents the productivity (or efficiency) improvement that even the most efficient company in an industry can achieve.

In May 2024, we provided the gas networks with a report[2] on the potential for OE at RIIO-3 (hereafter 'our May 2024 report'). In that report, we set out a recommended range for OE of 0.2% to 0.8% (with a midpoint of 0.5%). This was primarily based on a benchmarking analysis using EU KLEMS data. We did not advocate any particular point estimate within that range, but recommended that: (a) post-benchmarking adjustments to the range should be avoided; and (b) point estimates from any benchmarked range should generally be taken from values 'towards the middle' of the range.

In our May 2024 report, we also recommended that the OE target for RIIO-3 *should* reflect the wider slowdown in UK productivity growth. This is because the approach to OE should be balanced and consistent over time. As such, under a consistent benchmarking approach, one would generally expect the OE challenge to be higher during periods of high productivity growth and lower during periods of low productivity growth. This pattern may be mitigated (or accentuated) to the extent that the drivers of wider productivity performance impact gas networks by a lesser (or greater) extent than other sectors of the economy (nonetheless, the pattern should intuitively hold). Pertinent to this, we found that there was no strong evidence to suppose that gas networks are materially shielded from the main drivers of the UK productivity slowdown.[3] Only one of the driving factors – investment – might *intuitively* be mitigated by regulation, but we found that the data did not support this arising in practice.

We consider it important that the OE challenge for RIIO-3 is based on the latest and most complete evidence available. Accordingly, in this supplemental report, we present further evidence on the relevance of the wider UK productivity slowdown to the setting of OE at RIIO-3. This evidence should be considered alongside the findings presented in our May 2024 report.

- Firstly, we investigate how the historical total factor productivity (TFP) growth of gas networks compares to Ofgem's previous OE targets and the performance of the wider UK economy over the same time period. We observe that gas networks have delivered low productivity growth, reflective of the low productivity performance of the wider UK economy, and significantly below Ofgem's recent OE targets. This appears consistent with the gas networks being affected by the

[1] *Sometimes referred to as 'frontier shift.'*

[2] *'Ongoing efficiency for gas networks at RIIO-3: A report for the Energy Networks Association', Economic Insight (May 2024).*

[3] *In our May 2024 report, we found the evidence showed that the main drivers of the slowdown were: (i) investment; (ii) infrastructure quality; (iii) human capital quality; and (iv) management quality. We came to this conclusion by developing extensive evidence on the drivers of the productivity slowdown (including a comprehensive review of academic literature and a survey of the UK's leading academic experts in productivity). For more details see: 'Ongoing efficiency for gas networks at RIIO-3: A report for the Energy Networks Association', Chapter 3, Economic Insight (May 2024).*

wider UK productivity slowdown (which is in-line with intuition and the views of independent academic experts). It also implies that the industry has been materially underfunded over recent regulatory price controls.

- Secondly, we consider whether any more recent forecasts, since our May 2024 report, imply a change to our recommended range for OE at RIIO-3. We find that Government GDP growth forecasts for the UK were revised upwards following our report. However, economic performance data remains mixed and, since those updated forecasts, on September 11th, the ONS released new data showing that GDP growth was **zero** in June and July (2024). This undermines the previous upwards revision to forecast GDP. Overall, we find that the latest data does not, therefore, point to any strong or immediate improvement in productivity growth.
  - Relatedly, we highlight that previous OE targets have been set partly based on expectations (by regulators and their advisers)[4] that UK productivity growth would improve, but this improvement has not materialised. Instead, UK productivity growth has remained near-zero for over 15 years.
  - Therefore, even if productivity growth does eventually improve (which, at some point it must), this raises concerns that the gas networks may have already been materially underfunded.
  - Continuing to set OE targets based on an assumption of improved future growth will only exacerbate the above issue (in addition to raising concerns regarding regulatory consistency, if regulators do not revise their targets at times of low productivity growth, let alone in *anticipation* of possible low future productivity growth).[5]
- Finally, we investigate further evidence as to whether gas networks have been protected from the wider underinvestment problem in the UK. This is the *one* causal factor that regulation could, *in theory,* mitigate to some degree. We find that the energy sector does not appear to have been protected from underinvestment, relative to the UK overall. Similar to the wider UK economy, the UK's energy sector is underperforming in terms of investment relative to its counterparts in other comparable countries. Furthermore, investment trends in the energy sector suggest that it, like the rest of the UK, has experienced a substantial decline in investment growth since the financial crisis.
  - The analyses / data we present are good indicators of whether there has been underinvestment, over the long term. Given the strong links between investment and productivity (and wider firm performance) one would logically expect the consequences of any underinvestment to become increasingly apparent with time. It is therefore important to distinguish between this and shorter term measures of financial or operational performance (i.e. which may be relatively unaffected by underinvestment). For example, in the event of being 'underfunded', regulated companies may make 'cuts' (resulting in underinvestment) in order to both stay within their revenue allowances and generate a fair return (i.e. short-term financial performance can appear 'good', even where underinvestment is occurring). Similarly, performance on any outcomes / outputs metrics can depend on a range of factors and could improve in the short-term, even if, ultimately,

[4] For example see: 'RIIO-GD2 cost assessment – frontier shift', page 9, CEPA (June 2019); 'RIIO-GD2 and T2: Cost Assessment – Advice on Frontier Shift policy for Final Determinations', page 20, CEPA (November 2020); and 'Cadent Gas Limited and others vs the Gas and Electricity Markets Authority - Final determination Volume 2B: Joined Grounds B, C and D', paragraph 7.84, CMA (October 2021).

[5] i.e. this is the corollary of OE challenges previously being set above prevailing observed TFP growth, in part because of anticipation of improved future performance.

investment has been 'too low' to drive improvement in the long term. We therefore wish to highlight that the purpose of our analyses is to ascertain whether there has been underinvestment over time. Here, given the relationship to productivity, it is noteworthy that underinvestment has been an issue in the UK for around 30 years and that the productivity flatline has now extended to 15 years.

02 Historical TFP growth of gas networks

At previous price controls, Ofgem partially justified setting materially higher OE targets than the near-zero productivity growth observed in the wider UK economy by suggesting that gas networks may be protected from the wider productivity slowdown, and, therefore, should outperform the rest of the economy on a forward-looking basis.

To examine the validity of this argument, here we compare the historical productivity growth actually achieved by the gas networks with the low productivity growth observed in the wider UK economy, and the recent OE targets set by Ofgem.

We measure the productivity growth of the gas networks in terms of TFP, which is the productivity measure typically used by regulators for setting an OE challenge. However, it is important to highlight that TFP is not equivalent to OE. While OE is the productivity (or efficiency) improvement that even the most efficient company in an industry can achieve, TFP represents the totality of productivity gains made by an industry. This means that TFP includes other efficiency gains (for example, from catch-up efficiency) in addition to gains from OE. As such, TFP could be much higher than OE, if an industry experiences significant catch-up efficiency gains.

Historically, EU KLEMS has been the most common source of information on TFP growth utilised by regulators. However, this data may not be representative of the TFP growth historically achieved by gas networks because the most relevant sector classification – 'Electricity, gas, steam and air conditioning supply' – includes various firms beyond just the regulated gas networks, such as electricity distribution, electricity transmission, and non-regulated energy firms (e.g. energy generation).

Accordingly, for this purpose, rather than relying on the EU KLEMS data, we utilise findings from a study by the Productivity Institute (2022),[6] which specifically examines the historical TFP growth of regulated gas networks. The study provides estimates of TFP growth for:

(a) gas transmission (GT) from 2007/08 to 2018/19 based on data provided by Ofgem;[7]

(b) gas distribution (GD) from 2009/10 to 2018/19, also using data provided by Ofgem;[8] and

[6] *'Changing times: Incentive regulation, corporate reorganisations, and productivity in Great Britain's gas networks', Victor Ajayi and Michael G. Pollit, (July, 2022).*

[7] *The outputs used to estimate GT TFP growth are: actual gas flow transmitted at system entry points, actual gas NTS demand, and network length. The inputs are opex and capex.*

[8] *The outputs used to estimate GD TFP growth are: units of gas distributed, number of customers, and network length. The inputs are opex and capex.*

(c) the combined GT and GD sector from 1996/97 to 2020/21, using corporate accounting data.[9, 10]

Our first observation from the Productivity Institute's study is that the data indicates the **TFP growth of gas networks has reflected the structural break in productivity growth exhibited by the wider UK economy**. For the combined gas sector, TFP growth averaged just -0.7% pa in the post-crisis period (2010/11[11] to 2020/21). This compares to much higher estimated growth in the pre-crisis period, where the sector averaged 4.2% pa from 1996/97 to 2006/07. The data for the combined gas sector is the only series that covers a wide enough time frame to facilitate a pre- and post-crisis comparison; however, the Productivity Institute's separate analyses for the GT and GD networks provide further evidence that the gas sector has experienced poor productivity growth since the financial crisis.[12] In the context of a range of evidence we have now identified, this is clearly consistent with the gas networks being affected by the drivers of the wider UK productivity slowdown.[13] We note that the figure of 4.2% pa TFP growth in the pre-crisis period does not suggest the sector delivered OE gains of 4.2% pa during that time because, as noted above, TFP is not strictly a measure of OE, but reflects the totality of productivity gains made by an industry (including, for example, gains from catch-up efficiency and economies of scale). Rather, the salient point is merely that productivity markedly fell post-crisis, as it did for the wider UK economy, indicating it was adversely affected by the 'productivity puzzle.'

Our second observation is the **average TFP growth achieved by the gas networks has been significantly below the OE targets set at recent (post-crisis) price controls.** The Productivity Institute reports that GT TFP growth averaged -1.6% pa from 2007/8 to 2018/19, which covers TPCR4 and most of the RIIO-GT1 period. Similarly, GD TFP growth has been notably low over recent price controls, averaging -6.2% pa from 2009/10 to 2018/19 (which covers GDPCR1 and most of the RIIO-GD1 period). These figures are much lower than Ofgem's OE targets over these periods, which were set at: (a) 1.5%[14] for GT opex during TPCR4 (2007/08-2012/13); (b) 1.63%[15] for GD during GDPCR1 (2008/09-2012/13); and (c) 0.85%[16] for both GT and GD during RIIO-1 (2013/14-2020/21).[17] The TFP growth of the combined gas sector has also been significantly below Ofgem's recent OE targets, as illustrated in **Figure 1**. The figure shows the average TFP growth achieved by the combined gas sector over the post-crisis GT and GD price controls (allowing for easy comparison with the targets set by Ofgem).

[9] The outputs used to estimate TFP growth for the combined GT and GD sector are: total gas demand and number of customers. The inputs are opex and capex.

[10] We focus on the non-quality adjusted estimates of TFP growth because OE is a cost challenge.

[11] We measure the average growth rate for the post-crisis period from 2010/11 onwards so that the immediate after-effect of the crisis itself is not included.

[12] The results show the TFP growth of the GD networks averaged -6.5% pa during the post-crisis period, while the GT network averaged -10.8% pa.

[13] In our May 2024 report, we identified the main reasons for the productivity slowdown in the opinion of leading academic experts in the field of productivity. We then examined each factor in turn and found that, in principle, only one of the factors (underinvestment) might be mitigated by regulation. However, in practice, the data suggests that regulation has not mitigated underinvestment in the energy sector. Therefore, consistent with the outturn data on gas network productivity growth presented in this section, we concluded that there are limited reasons to believe that regulation mitigates against the productivity slowdown. For more details see: 'Ongoing efficiency for gas networks at RIIO-3: A report for the Energy Networks Association', Economic Insight (May 2024).

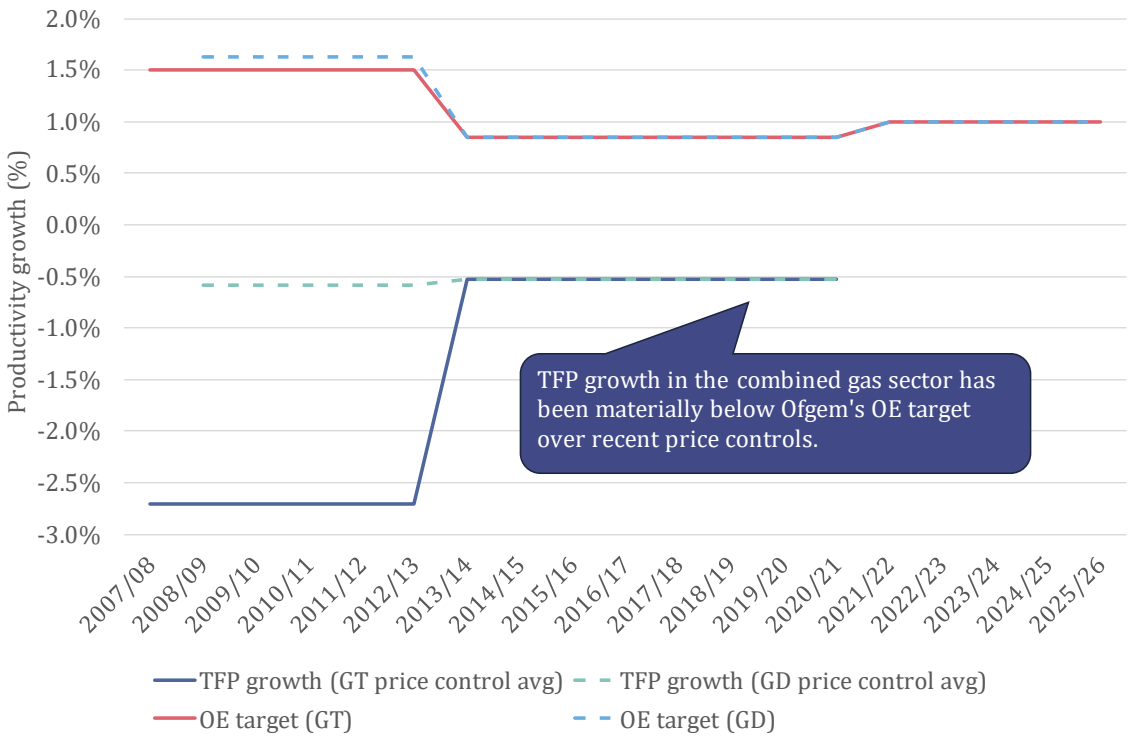
[14] 'Transmission Price Control Review: Final Proposals', paragraph 7.54, Ofgem (December 2006).

[15] 'Gas Distribution Price Control Review Final Proposals', paragraphs 3.84, 4.47 & 4.74, Ofgem (December 2007). We exclude the comparative competition effect from this target because this was a one-off for GDPCR1.

[16] 'RIIO-T1/GD1: Real price effects and ongoing efficiency appendix', paragraph 3.3, Ofgem (December 2012).

[17] Where different OE challenges are set for different cost categories, we have used a simple average across all cost categories for presentational purposes.

Figure 1: Gas sector TFP growth (%) is materially lower than recent OE targets.



Source: Economic Insight analysis of Productivity Institute (2022) data.

Note: the chart presents the average TFP growth for the combined gas sector over the two post-crisis GD and GT price controls for which data is available. The average TFP growth for the GT and GD price control is the same over RIIO-1 (2013/14 to 2020/21), because these price controls take place simultaneously. For presentational purposes, where different OE challenges are set for different cost categories (e.g. capex and opex), the chart presents a simple average across all cost categories.

The significant difference between outturn productivity growth and the OE targets suggests that the targets have been set too high at previous price controls and, as a result, suggests that the gas sector has likely been underfunded.[18] The data will also underestimate the discrepancy between the efficiency challenge and outturn industry productivity growth for GD because it is comparing: (a) Ofgem's OE target only (which excludes Ofgem's catch-up efficiency challenge); with (b) outturn TFP data which, as noted above, reflects the total efficiency gains made by the industry (inclusive of both catch-up and OE).

It is important to clarify that, in presenting the above, we are not suggesting Ofgem should use actual gas network productivity performance data to set the forward-looking OE target. This should be cautioned against, to avoid creating any perverse incentives or circularity. However, the gap between the OE targets and the realised productivity growth actually achieved by gas networks themselves has become increasingly striking (especially given that the sector has historically been heavily

[18] *As highlighted in Section 01, it is important to distinguish between underfunding and shorter term measures of financial or operational performance, which may be relatively unaffected by underfunding in the short term. For example, if a regulated firm is 'underfunded', it may make 'cuts' (resulting in underinvestment) to both stay within its revenue allowance and generate a fair return (i.e. short-term financial performance can appear 'good', even where underinvestment is occurring). Similarly, performance on any outcome or output metrics is dependent on a number of factors and may improve in the short term, even if, ultimately, investment has been 'too low' to drive improvement in the long term.*

incentivised to achieve the strongest productivity performance possible). At some point, outturn data on productivity should become a relevant source of information; and it now seems to point strongly towards the need for a recalibration of OE targets.

03 Expectations of future productivity growth

Updated forecasts since our May 2024 report do not provide strong evidence that the productivity slowdown will fully, or rapidly, unwind

At the time of our May 2024 report, we considered a range of evidence and found that the latest forecasts indicated that UK productivity growth was unlikely to improve in the near future.[19] For example, the Bank of England forecasted that TFP growth would average just 0.3% pa from 2024 to 2026 as part of its February 2024 Monetary Policy Report.[20] The latest ONS GDP data (at the time) showed the UK had just entered a recession, with negative growth in the last two quarters of 2023.[21] Additionally, forecasting agencies remained pessimistic about the UK's economic outlook. For example, the Institute for Fiscal Studies warned that the *"[t]he economic experience of the last three years is a harbinger of the kinds of supply shocks that are likely to come"*[22] in its October 2023 report.

Since our May 2024 report, GDP growth forecasts have been revised upwards due to stronger than expected growth in the first two quarters of 2024, but economic performance data remains mixed. ONS data shows that GDP growth was 0.72% in Q1 and 0.57% in Q2 of 2024.[23] As a result, forecasting agencies proceeded to raise their GDP growth forecasts. For example, the Bank of England raised its 2024 GDP growth forecast to 1.25%[24] – a significant increase from the 0.25%[25] it forecasted in the February 2024 release (which we referenced in our May 2024 report). Similarly, the HM Treasury's September 2024 summary of independent forecasts provides an average GDP growth forecast of 1.1% for 2024 and 1.3% for 2025[26] (up from 0.4% and 1.2% in its February 2024 release).[27]

However, notwithstanding the above upward revisions, forecasting agencies warned that the headline GDP growth figures may overstate the true strength of the economy. For example, the Bank of England notes that *"[u]nderlying momentum in activity is judged to be somewhat weaker than the headline figures suggest"*[28] and PwC considers the recent improvements in growth to be "*somewhat of a one-off"*.[29]

Pertinently, since those revisions, the ONS has released more up-to-date data. Its latest release of economic performance data (from September 11th) shows that UK GDP growth was **zero** in June and

[19] *'Ongoing efficiency for gas networks at RIIO-3: A report for the Energy Networks Association', page 37, Economic Insight (May 2024).*
[20] *'Section 3 – In focus – The supply side of the economy', Bank of England (February 2024).*
[21] *'GDP in chained volume measures – real-time database (AMBI)', ONS (March 2024).*
[22] *'UK Outlook: Fallout', page 3, IFS (October 2023).*
[23] *'GDP in chained volume measures – real-time database (AMBI)', ONS (August 2024).*
[24] *'Monetary Policy Report', page 19, Bank of England (August 2024).*
[25] *'Monetary Policy Report', page 22, Bank of England (February 2024).*
[26] *'Forecasts for the UK economy: a comparison of independent forecasts', pages 4 & 7, HM Treasury (September 2024).*
[27] *'Forecasts for the UK economy: a comparison of independent forecasts', pages 4 & 7, HM Treasury (February 2024).*
[28] *'Monetary Policy Report', page 30, Bank of England (August 2024).*
[29] *'UK Economic Outlook', page 7, PwC (July 2024).*

July.[30] This new data therefore already calls into question the plausibility of some of the more optimistic recent forecasts, and is aligned with the Bank of England's warning above.

Furthermore, productivity growth, although typically correlated with GDP, is a more complex issue and the latest productivity data does not point to any strong or immediate improvement. For example, the increase in outturn GDP growth does not appear to have been accompanied by a significant rise in output per hour (labour productivity) growth. This has been just -0.2% and 0.3% in the first two quarters of 2024, according to the ONS's latest flash estimates.[31] Consistent with this, forecasts of future output per hour growth are more pessimistic than they were at the time of our May 2024 report. Specifically, the HM Treasury reports that independent output per hour growth forecasts average 0.5% and 1.0% for 2024 and 2025 respectively (in its September 2024 release).[32] This is **down** from 0.8% and 1.7% in its February 2024 release.[33]

In the context of the UK's structural break in productivity growth since the financial crisis, which has been near-zero for over 15 years, the latest available data and forecasts do not provide any strong basis to suppose that productivity growth will materially or rapidly improve in the short-term.

Previous expectations of improvements in growth that regulators relied upon in setting OE targets have not materialised

Related to the above, Ofgem (and the CMA) have previously justified setting higher OE targets based on expectations that productivity growth would improve over said price controls. For instance, CEPA, as part of its advice to Ofgem for setting the RIIO-2 OE target, suggested that *"[i]t might not be unreasonable to expect that productivity could rise back to its pre-recession levels during RIIO-2"*[34] (emphasis added) and that "*as yet there is no firm consensus view amongst macroeconomists on the primary causes, or indeed the extent to which the current weaker trend amounts to a structural break*"[35] (emphasis added). The CMA reached similar conclusions at the RIIO-GD2 and T2 appeal, where it stated that "*BoE and OBR data do not conclusively show that productivity growth will continue to be low*" [36] (emphasis added).

However, the expectations of improvements in productivity growth that the regulators and their advisers relied upon in setting previous OE targets have not materialised, as illustrated in **Figure 2**.[37] Instead, the UK has experienced near-zero productivity growth for over 15 years and the CMA now recognises the productivity puzzle, listing it as one of its research interests.[38] This strongly suggests that regulators should not continue to set higher OE targets based on expectations that improved productivity growth will occur in the short-term.

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[30] 'GDP monthly estimate UK: July 2024', ONS (September 2024).

[31] 'Productivity flash estimate and overview, UK: April to June 2024 and January to March 2024', Table 1, ONS (August 2024).

[32] 'Forecasts for the UK economy: a comparison of independent forecasts', pages 6 & 9, HM Treasury (September 2024).

[33] 'Forecasts for the UK economy: a comparison of independent forecasts', pages 6 & 9, HM Treasury (February 2024).

[34] 'RIIO-GD2 cost assessment – frontier shift', page 9, CEPA (June 2019).

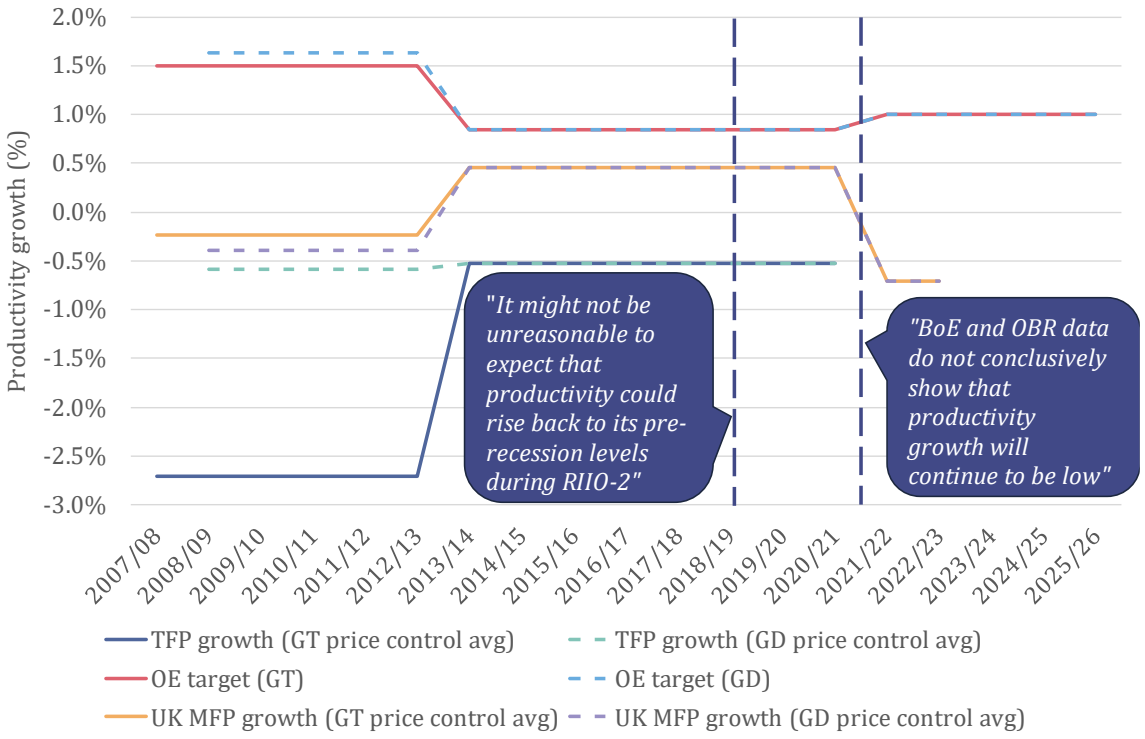
[35] 'RIIO-GD2 and T2: Cost Assessment – Advice on Frontier Shift policy for Final Determinations', page 20, CEPA (November 2020).

[36] 'Cadent Gas Limited, National Grid Electricity Transmission plc, National Grid Gas plc, Northern Gas Networks Limited, Scottish Hydro Electric Transmission plc, Southern Gas Networks plc and Scotland Gas Networks plc, SP Transmission plc, Wales & West Utilities Limited vs the Gas and Electricity Markets Authority - Final determination Volume 2B: Joined Grounds B, C and D', paragraph 7.84, CMA (October 2021).

[37] We present the productivity growth for the UK in terms of multifactor productivity (MFP), rather than gross output TFP because it provides more recent estimates of productivity growth. However, as set out in our May 2024 report, gross output TFP remains our preferred measure for setting the OE challenge. See: 'Ongoing efficiency for gas networks at RIIO-3: A report for the Energy Networks Association', Chapter 2, Economic Insight (May 2024).

[38] 'Strategy: Economic research', CMA (March 2023).

Figure 2: Expectations of improved productivity growth have not materialised.



Source: Economic Insight analysis of Productivity Institute (2022) and ONS data.

Note: the chart presents the average productivity growth for the UK and the combined gas sector over the two post-crisis GD and GT price controls for which data is available. The average productivity growth across the GD price control and the GT price control is the same for RIIO-1 (2013/14 to 2020/21) because the GT and GD price controls take place simultaneously over this period. For presentational purposes, where different OE challenges are set for different cost categories (e.g. capex and opex), the chart presents a simple average across all cost categories.

Even if productivity growth does eventually improve (which, at some point it must), this raises concerns that the gas networks may have already been materially underfunded, because OE targets have been set too high at previous price controls. Continuing to set OE targets based on the assumption of improved future growth will only exacerbate the issue. There is also a question of consistency of approach that must be considered if future improvements are 'banked', but significant downturns (such as the post-2008 period) are ignored.

Further to this, since investment is a key driver of productivity growth, any past underfunding has likely already impeded the historical productivity growth of the gas networks and will likely continue to be an impediment to future efficiency growth over RIIO-3. This provides further reason to consider recalibrating the OE target.

We also note that our recommended OE range for RIIO-3 (as set out in Section 01 and our May 2024 report) already embeds a material improvement in productivity from the current levels exhibited by the wider UK economy (which is reflected in the outturn data for gas networks).

04 Investment trends in the energy sector

In our May 2024 report, we set out that underinvestment was one of the main factors driving the productivity slowdown in the UK (based on a range of evidence and the view of independent academic experts on productivity).[39] We further explained that, of the main factors driving the slowdown, this was the *only* factor whereby (intuitively) the regulatory framework that applies to gas networks *might* have some mitigating effect. However, we found that, on the data, the mitigation appeared limited.

In this section, we investigate this issue in more detail and find further evidence suggesting that regulation has not mitigated underinvestment in gas networks. Below, we examine the evidence relating to two key questions in turn:

(a) **Does the UK have an underinvestment problem?** We set out below that the UK has a widely accepted underinvestment problem. The UK has materially lower investment than comparable economies, and its investment growth has slowed significantly since the 2008 financial crisis.

(b) **Does the energy sector exhibit the same problem?** We find that the energy sector in the UK has suffered from lower investment relative to its counterparts in other economies, reflecting the same underinvestment seen across the UK as a whole. We also find evidence that investment in the energy sector has followed a similar trend to the UK overall (under a range of metrics). Therefore, given that the UK as a whole has suffered from underinvestment, it is likely that the energy sector has experienced the same problem. Although it is challenging to determine what the 'right' level of investment in the UK's energy sector should be, and the data covers the broader energy sector (rather than just the gas networks), these metrics provide evidence that regulation has not materially mitigated the underinvestment problem observed in the rest of the UK.

    – It is important to highlight that the metrics we present are good indicators of whether there is underinvestment in the long term, which should be distinguished from shorter term measures of financial or operational performance. These shorter term measures may be relatively unaffected by whether or not there has been underinvestment in the short-term. For example, if a regulated firm is 'underfunded', it may make 'cuts' (resulting in underinvestment) to both stay within its revenue allowance and generate a fair return (i.e. short-term financial performance can appear 'good', even where underinvestment is occurring). Similarly, performance on any outcome or output metrics is dependent on a number of factors and may improve in the short-term, even if, ultimately, investment has been 'too low' to drive improvement in the long term.

Finally, we consider, on a forward-looking basis, how investment in gas networks could evolve in the future. We find that gas networks may face unique challenges, relative to other regulated sectors, in attracting investment.

Does the UK have an underinvestment problem?

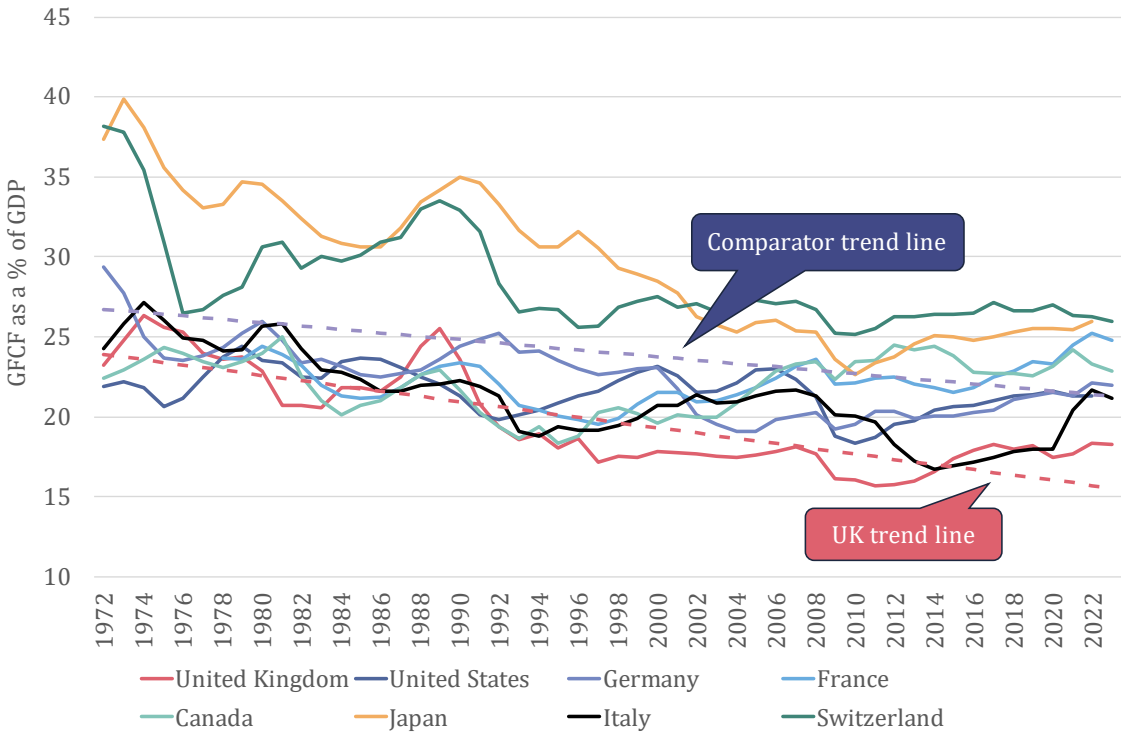
As set out in our May 2024 report, it is widely accepted that the UK economy has a longstanding underinvestment problem and that this problem is broad-based across industries.[40] For example, the

[39] *'Ongoing efficiency for gas networks at RIIO-3: A report for the Energy Networks Association', Chapter 3, Economic Insight (May 2024).*

[40] *'The Productivity Agenda', page 9, The Productivity Institute (2023).*

problem has been highlighted by both the OECD (2015)[41] and in the House of Commons Infrastructure policies and investment report (2021).[42] The severity of the UK's investment problem is evident in **Figure 3** below, which demonstrates that the UK is investing substantially less, as a share of GDP, than other comparable economies[43] (with investment measured by gross fixed capital formation – GFCF). It is also notable that UK investment (as a proportion of GDP) is trending down at a faster rate than the comparators – i.e. the UK's relative position is only getting worse over time.

Figure 3: Investment (measured by GFCF) as a proportion of output (measured by GDP).



Source: Economic Insight analysis of World Bank data.

Note: the comparator trend line represents the average trend of the comparator countries included in the chart.

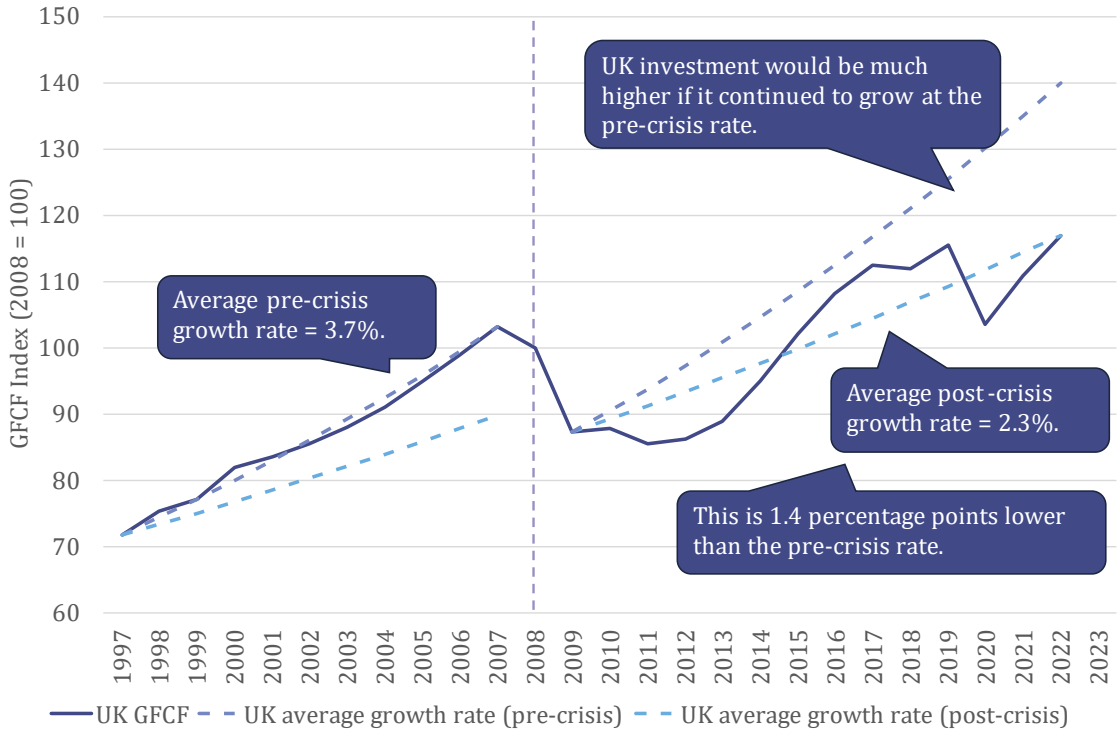
[41] *'Improving Infrastructure in the United Kingdom', page 8, OECD Economics Working Papers No. 1244 (2015).*

[42] *'Infrastructure policies and investment: House of Commons Briefing Paper', House of Commons (March 2021).*

[43] *We include the G7 countries (and Switzerland because it was included in the OECD's 2015 report).*

We also observe that the UK has experienced a marked slowdown in investment growth since the financial crisis. This is illustrated by **Figure 4** below, which highlights that investment growth (measured in terms of GFCF) in the UK was significantly higher before the 2008 financial crisis than it has been since. The average pre-crisis growth rate was 3.7% pa, but this has decreased by 1.4 percentage points to just 2.3% pa post-crisis.[44] As demonstrated by the figure, investment levels in the UK would be substantially greater today if investment had continued to grow at its pre-crisis rate (notwithstanding the fact that, as shown in **Figure 3** above, even the UK's pre-crisis investment would seem to imply an underinvestment problem).

Figure 4: UK investment (measured by GFCF) index (2008=100).



Source: Economic Insight analysis of ONS data.

Note: the GFCF series has been inflated into 2023/24 financial year average (FYA) prices using the ONS CPIH index. The average post-crisis growth rate is estimated from 2010 onwards to exclude the immediate after-effect of the financial crisis in 2008 and 2009. The average pre-crisis growth rate is estimated from 1998 to 2007.

Does the energy sector experience the same problem?

The evidence we have considered above indicates that the UK has an underinvestment problem, which is broadly accepted. We now investigate whether the data indicates that this problem also applies to the gas networks and, if so, whether it applies to the same, or similar, degree.

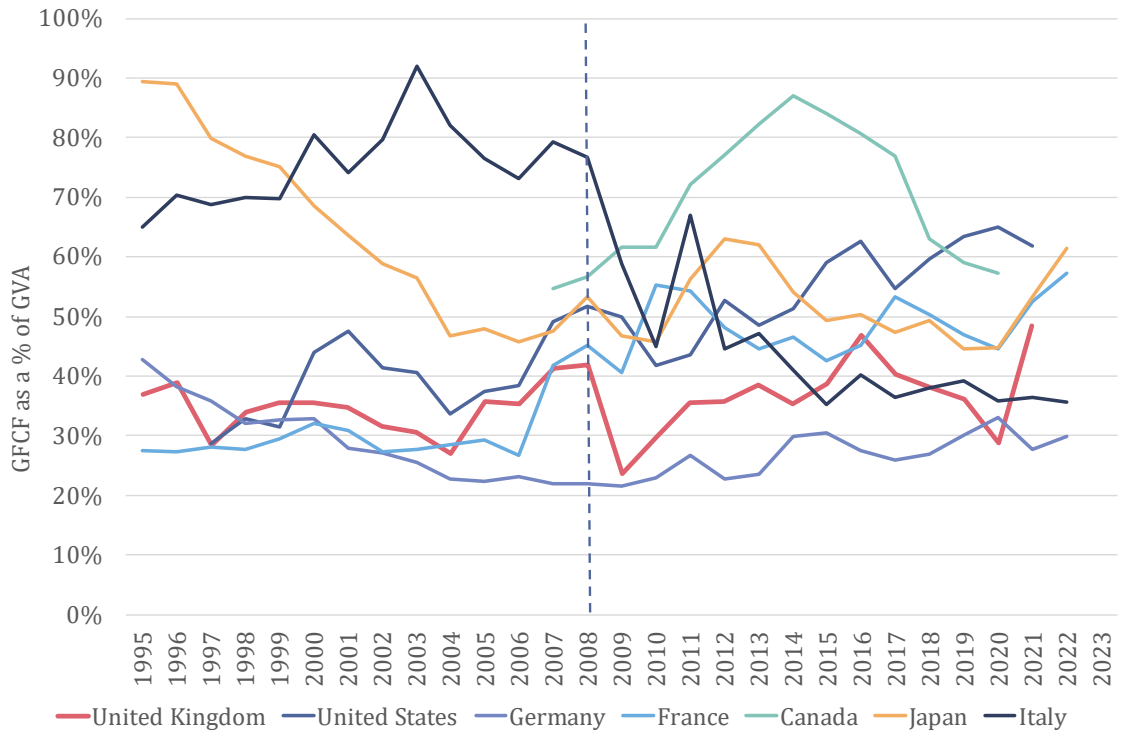
To do so, we draw on data for the 'Electricity, gas, steam and air conditioning supply' sector (hereafter referred to as 'the energy sector'). We acknowledge that this sector classification contains a number of firms beyond the regulated gas networks, such as the regulated electricity distribution networks, the regulated electricity transmission networks, and non-(economic) regulated parts of the energy

[44] *We measure the average post-crisis growth rate from 2010 onwards to exclude the immediate after-effect of the crisis itself in 2008 and 2009. The average pre-crisis growth rate is the average growth rate from 1998 to 2007.*

network (e.g. energy generation firms). We use it because it is the most granular industry classification within the OECD and ONS data that contains the regulated gas networks. Therefore, it allows us to draw comparisons between the UK's energy sector, the energy sectors in other countries, and the UK economy as a whole. Comparable data for gas networks does not seem to be publicly available.

In **Figure 3** above, we present the ratio of investment (GFCF) to GDP for the UK and highlight that this ratio was much lower than other comparable economies. As identified by the OECD, this evidence is consistent with an underinvestment problem. To investigate whether this problem is also observed for gas networks, we now make the equivalent comparison between the UK's energy sector and the energy sectors of comparable economies in **Figure 5**.[45] We observe that the UK's energy sector is, similar to the UK overall, investing much less than its counterparts in most comparable countries, as a proportion of gross value added (GVA). This provides evidence that the energy sector has not escaped the underinvestment problem observed for the UK overall.

Figure 5: Investment (measured by GFCF) as a proportion of GVA for the UK energy sector compared to other countries.

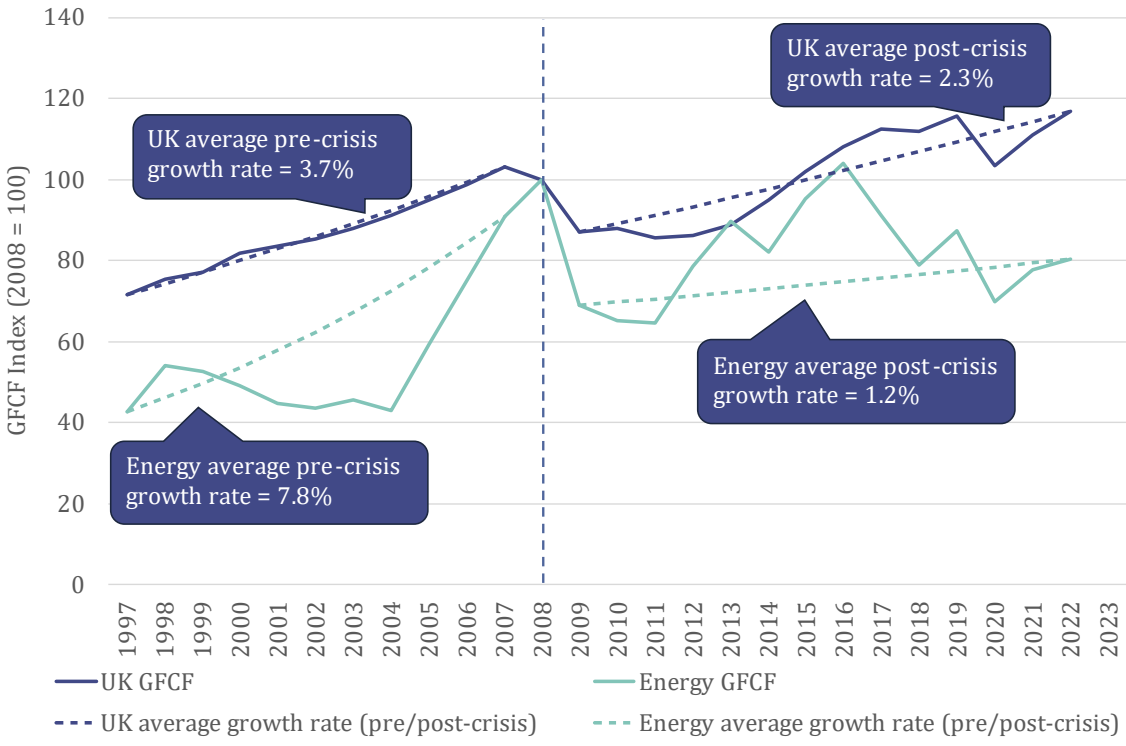


Source: Economic Insight analysis of OECD data.

[45] *We include the G7 economies as in **Figure 3**, but exclude Switzerland because the OECD does not have data available for its energy sector.*

Consistent with the above analysis, we find that the *trend* in investment in the UK's energy sector mirrors the decline observed across the wider UK economy since 2008. **Figure 6** below compares investment (measured by GFCF) for the energy sector to the UK as a whole. Both series are presented as index numbers with 2008 as the base year, to allow for an easy comparison of the growth rate since the financial crisis. The figure demonstrates that investment for the energy sector (represented by the green line) follows a similar trend to the UK overall (represented by the dark blue line) over the period. As for the wider UK economy, average investment growth for the energy sector decreases significantly (by 6.6 percentage points) when comparing the post-crisis period (2010 to 2022) to the pre-crisis period (1998 to 2007). This further suggests that the energy sector has not been protected from the underinvestment (or post-financial crisis productivity slowdown) observed in the rest of the UK.

Figure 6: Investment (measured by GFCF) index for the UK and the UK energy sector (2008=100).

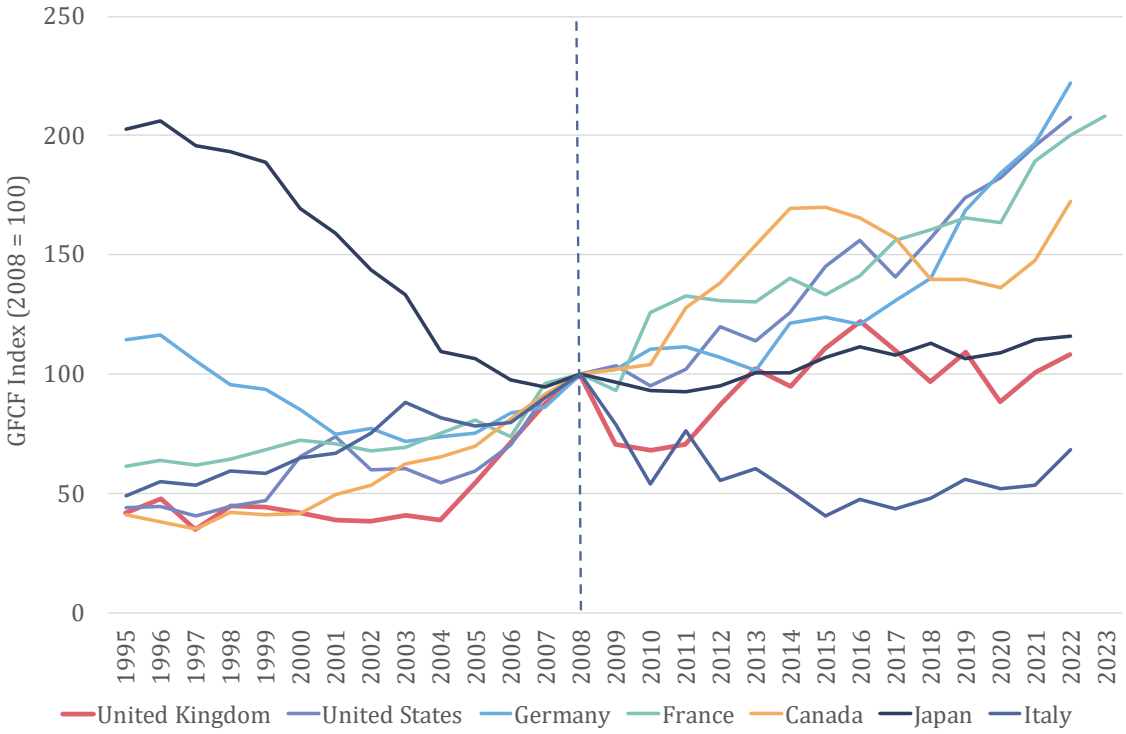


Source: Economic Insight analysis of ONS data.

Note: the GFCF series have been inflated into 2023/24 FYA prices using the ONS CPIH index. The average post-crisis growth rates are estimated from 2010 onwards to exclude the immediate after-effect of the financial crisis. The average pre-crisis growth rates are estimated from 1997 to 2007.

Further to this, we find that energy sector investment in most comparable countries (with the exception of Italy) has grown much more than in the UK since the 2008 financial crisis, as illustrated in **Figure 7**. For instance, energy sector investment in the US and France has grown by over 100% from 2010 to 2022. In contrast, energy sector investment in the UK grew by just 54% in the same period. Prior to 2008, the UK energy sector experienced stronger investment growth, relative to these countries. For example, energy sector investment in the UK grew by 111% from 1996 to 2007 (with particularly sharp investment growth after 2004). Over the same period, energy sector investment in the US and France grew by 107% and 57% respectively.

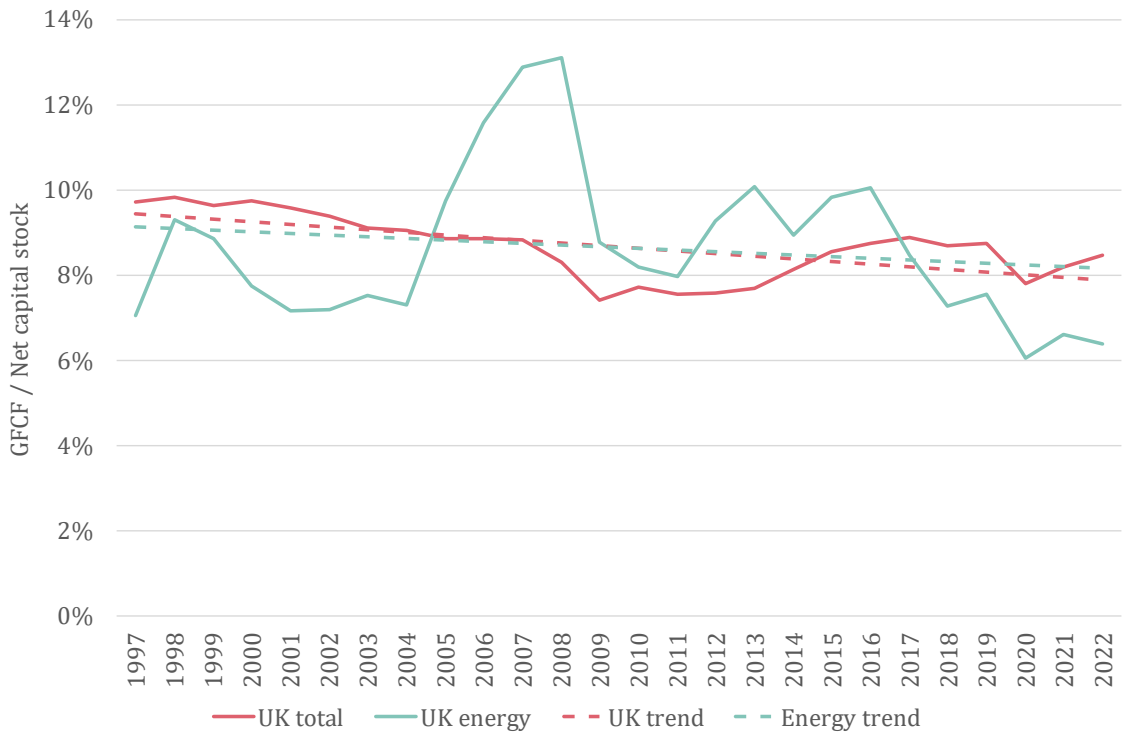
Figure 7: Investment (measured by GFCF) index for the UK energy sector compared to other countries (2008=100).



Source: Economic Insight analysis of OECD data.

We again find evidence that the energy sector is experiencing a similar underinvestment problem to the wider UK economy, when we measure investment as a proportion of net capital stock. The net capital stock is the value (accounting for depreciation[46]) of all fixed assets in use at a point in time, minus the consumption of fixed capital accrued up to that point. **Figure 8** illustrates that the ratio of investment (measured by GFCF) to net capital stock in the energy sector has followed a similar downward trend to (albeit somewhat more volatile than) the UK overall. Therefore, since the trend in UK investment is consistent with an underinvestment problem, this suggests that the energy sector has also been affected. It is also notable that, since around 2017, the energy sector has actually been investing less than the wider UK economy, relative to its capital stock. This further suggests that the energy sector has not been immune to the broader underinvestment problem affecting the rest of the UK.

Figure 8: Investment (measured by GFCF) to net capital stock ratio.



Source: Economic Insight analysis of ONS data.

In summary, there is a significant body of evidence suggesting that the energy sector has not been protected from the underinvestment problem observed more broadly in the UK. Similar to the UK economy as a whole, the energy sector is performing worse in relation to investment than its counterparts in other comparable countries. Investment trends in the energy sector also show that it, like the UK as a whole, has experienced a significant decline in investment growth since 2008.

We consider it important that the above evidence is seen in the context of: (a) the literature, wider evidence, and leading academic experts on productivity all point to underinvestment as one of the drivers of the UK's productivity slowdown; (b) realised data for the gas networks indicates that their productivity growth (like the wider UK economy) has declined significantly since the 2008 financial

[46] *It takes into account the depreciation of the assets over time as a result of physical deterioration, foreseeable obsolescence, or normal accidental damage. See: 'Capital stocks and fixed capital consumption, UK: 2023', ONS (2023).*

crisis; and (c) underinvestment is just one of a number of contributing factors to the productivity slowdown and it is unclear, even in principle, how regulation can materially mitigate the other factors.

Investment in gas networks on a forward-looking basis

As we have set out above, the evidence indicates that the energy sector has historically been affected by the wider underinvestment problem exhibited by the UK economy overall. It is also important to highlight that, on a forward-looking basis, gas networks may face unique challenges in attracting investment relative to other regulated sectors.

Firstly, there is significant uncertainty surrounding the future of the gas networks, which is likely to make it more difficult for gas networks to secure and make investments more generally compared to other regulated industries. This uncertainty has been recognised by Ofgem:

"*We're honest about the uncertainties on the future of the gas network. It's right that government takes the time needed to weigh up big strategic policy calls on the future of the gas grid – but time is of the essence as the status quo is not sustainable. We must nail down in the next 18 months how we regulate network assets amidst these strategic uncertainties, particularly around potential repurposing or decommissioning the grid, while protecting the interests of consumers and investors both now and in the future.*"[47]

Related to this, it may specifically be challenging for gas networks to make 'riskier' and 'innovative' investments (of the type most aligned to driving productivity) given this lack of certainty. For instance, in conditions of declining demand, productivity improvements become more difficult to achieve because investments aimed at boosting improve productivity need to have a faster payback.

Further to this, other regulated sectors have more scope to improve efficiency and benefit from economies of scale related gains because there is more certainty over future demand for their products. These economies of scale related gains may materialise through expansion to meet increased demand (reducing average costs), or due to large investment programmes that may be more cost efficient as a result of their scale. It is important to highlight that the future of the gas sector could be different (i.e. the extent to which demand will fall is unknown) but it is difficult to predict at this stage. For example, it is unknown the extent to which the gas network may be maintained, decommissioned or repurposed for hydrogen (or indeed how hydrogen may be regulated). At this point in time, it is the uncertainty surrounding the sector that limits expected future OE gains.

[47] *'Ofgem kickstarts conversation on future energy price controls funding to pave the way for net zero', Ofgem (Dec 2023).*

05 Conclusions

It is critical that the approach to OE is balanced and consistent over time. Therefore, the OE challenge at RIIO-3 should reflect (to some extent) the low, near-zero productivity growth of the wider UK economy, especially given the evidence that: (a) the factors driving the wider productivity slowdown also apply to gas networks; (b) the TFP growth of the gas networks has been significantly below Ofgem's OE targets and reflective of the poor overall productivity growth observed for the UK; and (c) the most up-to-date forecasts do not indicate that the 15 year long structural break in productivity growth will come to an end in the near future.

Even if productivity does start to improve, we should be mindful of the fact that: (a) regulators have relied on the assumption productivity will improve multiple times and it has not, meaning there is a historical underfunding problem; (b) productivity is unlikely to revert back to pre-2008 levels rapidly; and (c) investment in regulated infrastructure is a key driver of wider UK productivity performance, so the consequences of setting the OE too high may be harmful to the UK in a broader sense.

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