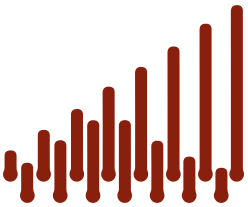

National Institute of Economic and Social Research

Productivity and Investment

Time to Manage the Project of Renewal

Paul Fisher

March 2024

THE PRODUCTIVITY INSTITUTE

PRODUCTIVITY COMMISSION

The UK Productivity Commission (The Commission) was established by the National Institute of Economic and Social Research (NIESR) as part of The Productivity Institute (TPI), which is funded by the Economic and Social Research Council (ESRC). The Commission's main purpose is to examine the UK's poor productivity performance and provide policy solutions to address the shortfall.

The objectives of The Commission are:

- to help understand and communicate the policy implications of new academic research related to UK productivity;
- to collect evidence from key stakeholders and provide summaries of research and evidence with an emphasis on regions and the devolved nations;
- to examine the implication of planned policies, respond to policy initiatives in Whitehall, elsewhere and overseas, provide policy advice and develop policy proposals.

National Institute of Economic and Social Research

NIESR is Britain's longest established independent research institute. We operate as a charity, independent of all party-political interests and receive no core funding from government or other sources. Its mission is to "carry out research into the economic and social forces that affect people's lives, to improve the understanding of these forces, and the ways in which policy can bring about change".

THE PRODUCTIVITY INSTITUTE

TPI is a UK-wide academic research organisation exploring what productivity means for business, for workers and for communities – how it is measured and how it truly contributes to increased living standards and well-being.

UKRI Economic and Social Research Council

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Contents

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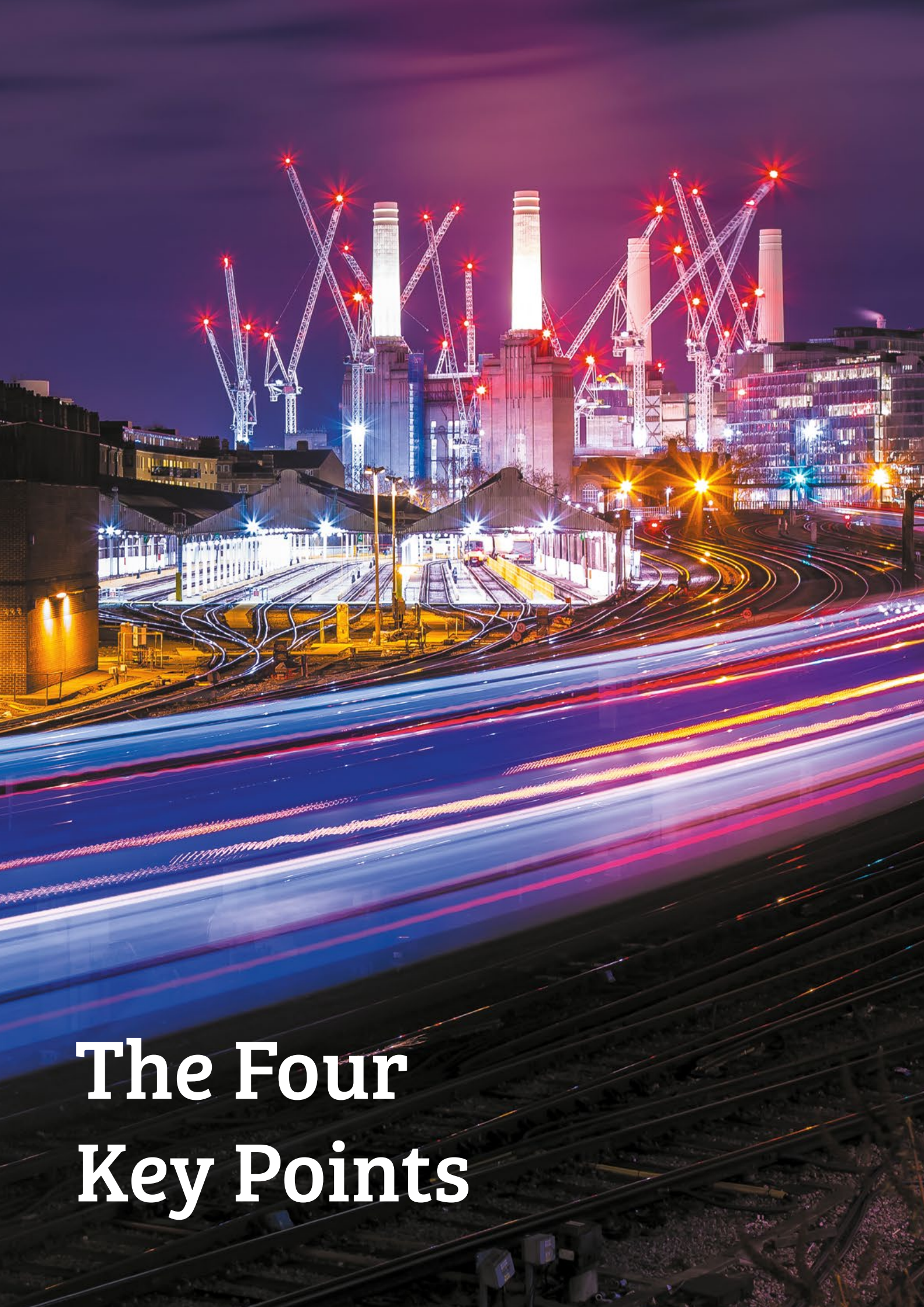


The Four Key Points

1

The underlying slowdown in growth and productivity is affecting all developed economies and has been happening in the UK for much longer than usually appreciated. Most likely this slowdown is the natural consequence of the changing economic structure as mature economies de-industrialise.

2

The under-performance of the UK could be addressed in part by improving the governance and strategy associated with significant investment projects.

3

Policy should now focus on maximising welfare rather than GDP growth, taking into account the changing structure of the economy as it continues to evolve. That means supporting much broader concepts of investment than just physical plant and machinery, and reflecting the positive externalities associated with investment, particularly in people.

4

To maximise the sustainable rate of welfare growth going forwards, policy should focus on facilitating the digital transformation. And investment needs to be boosted specifically in health, education and in the transition to net zero greenhouse gas emissions. That could be private or public sector led, but a more activist and rational policy approach is needed either way.

1. Introduction

This paper was commissioned by the UK Productivity Commission (The Commission) to address the policy question of how to raise UK investment in order to meet the long-standing challenge of a slowing in productivity growth. The paper first reflects on the evidence and analysis previously submitted to The Commission and then proposes some areas for policy to address in order to enhance investment in the UK economy.

The UK productivity slowdown has been a focus of economic analysis for at least 15 years and a common conception of the problem has developed, some of which this paper seeks to challenge. On 28 September 2023, the BBC carried a report[1] by its economics editor Faisal Islam, under the title[2] 'Productivity Puzzle. The deep-rooted problem holding back the UK Economy.' That report nicely summarises the issues from a popular perspective:

> *"The future of the economy and prosperity depends on investment spending. The UK has an underinvestment crisis, and it affects both the private and the public sector…*
>
> *"British business does not now invest as much as other major economies either. The UK was in second place in the G7 for private investment, as a share of the economy in the mid 1990s, but has now fallen behind them all. The long-term impact of this is low productivity – we take more time to produce less than our rivals – which results in low growth, low real wages, and then problems raising money for public services."*

These comments are broadly consistent with much of the large volume of evidence submitted to The Commission. Despite that analysis, and an extensive academic literature elsewhere, there is not yet any agreed understanding of why productivity growth has slowed internationally, nor why the UK has underperformed (Goldin et al., 2022).

There does seem to be evidence that the UK is investing less than other countries, but no consensus on why that is happening either. Given that, this paper takes a step back to look at some of the underlying issues afresh.

Section 2 addresses the issue of when the productivity slowdown starts. Many studies submitted to The Commission naturally focus on the visible UK slowdown in output growth and productivity since 2007/8, with some linking it implicitly or explicitly to the Global Financial Crisis (GFC) of that time. In contrast, this paper argues that the previous period from around 2002-2007, saw a strong, demand-driven upturn in the UK which means that 2007/8 is not an appropriate mid-cycle reference point.

Interpreting the data in a longer historical context suggests that the international slowdown in developed economies, including the UK, is evident from at least as far back as the year 2000 and that one can identify a much longer and smoother trend going back much further which has no fixed starting point. If correct, that would challenge some of the evidence and conclusions of existing research.

1 https://www.bbc.co.uk/news/business-66937239
2 On the BBC home page the link was titled 'big' rather than 'deep rooted'.

Sections 3 and 4 address deeper issues about the slowdown – what caused it, and does it really mean slower growth in living standards? First, the nature of exponential growth is examined. Why should the default assumption be that output can grow exponentially into the infinite future?

After reviewing the evidence submitted to The Commission, this paper supports the hypothesis that the observed slowdown in productivity and hence GDP growth observed in many developed countries is consistent with the fundamental pattern of development of all advanced economies as they fully mature. In particular as economies de-industrialise and move towards being services based, productivity growth naturally slows. The difference between productivity growth in manufacturing and services has been well documented in economic theory with the Baumol effect explaining that higher prices and wages in productive sectors tend to drive up wages and prices in less productive sectors, and the Balassa-Samuelson effect explaining large international differences in non-tradeable prices.

Productivity growth in manufacturing may also naturally slow as the sector matures. Production processes become increasingly automated, leaving less scope for further productivity improvements, while a greater share of value-added within manufacturing firms comes in the contribution of services such as design, marketing, sales, finance and logistics. One might compare what is happening in manufacturing industry with what historically happened to agriculture – which became highly mechanised but a very small share of UK GDP.

The proposition that the developed economy productivity slowdown is a consequence of economic maturity has been made by Vollrath (2020) amongst others, but in the UK that process may have been obscured by a demand boom before the GFC.

Section 4 asks how the slowdown can have happened at the same time as the internet/smart phone revolution has transformed how we all live and work. The paper supports the view that as an economy shifts towards digital services, GDP is diminishing not only in its growth rate but also in its value as a proxy for welfare. Vollrath expresses it more positively in arguing that the slowing down is a sign of a successful economy, in which there is a growing focus on non-production related welfare.

Concepts of investment and productivity are more complex in a services-dominated economy, and even more so in a digital economy. This is also a conclusion from studies such as Brynjolfsson et al., (2019), which goes as far as to suggest a new measure to reflect the welfare from digital services. But many experienced observers naturally think in terms of the volume of output, as represented by the BBC article which includes the following statement about the UK:

> *"…we take more time to produce less than our rivals …".*

That observation may be relevant to UK manufacturing processes but not to many services (consider personal services such as restaurant meals, haircuts etc). Many of our normal economic indicators – including price indices – are unable to capture the improvements in welfare generated by the newly evolving structure of output and income. In economic terms one might suggest that the economic rent of consumers must have risen much faster than their measured real incomes.[3]

3 Abstracting from the effects of the pandemic and the recent cost-of-living crisis which unfortunately serve to obscure the longer-term trends.

Taking these analyses together, a 'slowdown' in measured productivity would be an inevitable consequence of structural change and would not necessarily indicate a slowdown in the growth of living standards. Even so, slowing growth does cause public policy problems, including the unfulfilled expectations of rising monetary incomes and difficulties in managing the public finances. In addition, inequalities in income and wealth seem to be becoming at least more visible, potentially more pronounced, and certainly more politically sensitive.

As part of these considerations, the paper suggests that the under-performance of the UK may not be quite as great as some of the submissions to The Commission assert. There is certainly a measured gap to the 'frontier' as represented by the US economy, and that gap could doubtless be at least partially closed. But slowing measured GDP/productivity/investment growth is likely to continue to be the future long-term trend for every developed country.

Rather than policies emulating King Cnut, policy should be focussed constructively on examining the consequences of the changing economic tides and how to make the best out of the new and evolving economic structure. That may require different measures of welfare, rather than solely focussing on GDP.

Looking forwards, we require a much broader view of investment, beyond physical assets such as plant and machinery. In a services-dominated, digital economy, the nature of the economic investment required is changing. There will still need to be investment in infrastructure and sustainable production processes. But investment in people is the key for many service-sector businesses. And infrastructure investment should prioritise the digital economy through the rapid development of digital networks.

That suggested focus of policy, and of research to support policy, should not be taken as undermining the arguments, evidence and proposals presented to The Commission for investing in health, education, the regions and in a green economy, all of which are desirable for the direct benefits they bring, regardless of their measured impact on macro productivity data.

Given its prevalence in submissions to The Commission, the issue of regional differences in productivity is specifically reviewed in Section 5. Many of the submissions to The Commission argue for greater investment in or via the regions. This paper agrees that a good social, political and economic case can be made for addressing regional inequalities. Similarly, one can make the case for investing in health, education, and the net zero transition and at least some of that investment may be most effective if driven through proactive regional policies.

And yet, the paper notes that there is no evidence or analysis to suggest that regional differences are the root cause of the national slowdown, nor that they are responsible for the UK's relative underperformance. And although the scale and nature of regional differences are very well documented, the explanations for them are less convincing. Without causal analysis, it is difficult to be sure that policy proposals are always addressing the right problems. A simple model is used to demonstrate that point.

In Section 6, this paper then addresses the general approach to implementing strategies to improve productivity and investment, arguing for a clearer, more activist strategy and more formal organisation than currently exists. Applying normal project disciplines to a portfolio of national projects would help, as would a politically bi-partisan approach.

In order to make constructive proposals for investment policy going forward, the paper proposes that government and regional authorities should focus on where the social and economic benefits of change are greatest, in the context of the new and evolving economy, rather than trying to turn back the clock.

Section 7 directly addresses the politically contentious issues of investment in health and education. The analysis acknowledges that there are different party-political views on whether such investment spending should be led by the private sector, public sector or different balances in a mixed approach. But the paper argues that no positive strategy of any kind is being clearly pursued, resulting in a squeeze on investment in these key sectors. A more activist approach would be warranted, whatever one's preferences over public spending.

Section 8 of the paper makes specific arguments for investment in the transition to net zero. The largest share of the stock of Greenhouse Gases (GHGs) in the atmosphere have come from the developed world, especially the US, the UK and the rest of Europe. The UK, as the first to embrace an Industrial Revolution, has a major historical responsibility for the current stock of GHGs in the atmosphere. UK emissions have been falling for many years but are still high and positive and therefore a significant ongoing contribution to climate change. In many developing countries the flow of GHG emissions is still rising and developing Asia is now the largest geographical source. That is in part because western economies have effectively outsourced a lot of their manufacturing and its associated emissions to Asian economies, where manufacturing processes are more emissions intensive.

If the UK doesn't invest in global climate change mitigation as a matter of urgency, including in its overseas supply chains, then most likely much of the developing world will not either. That outcome would generate a significant risk of eventual global economic collapse. Achieving net-zero in the UK may or may not boost growth relative to the past, but failure to achieve net zero globally could be disastrous for growth everywhere in the long term.

Again there are public and private sector strategies, and a spectrum to choose from in-between, but current UK policy does not seem to be delivering the decisive, comprehensive and galvanising approach that this country – and the world – needs.

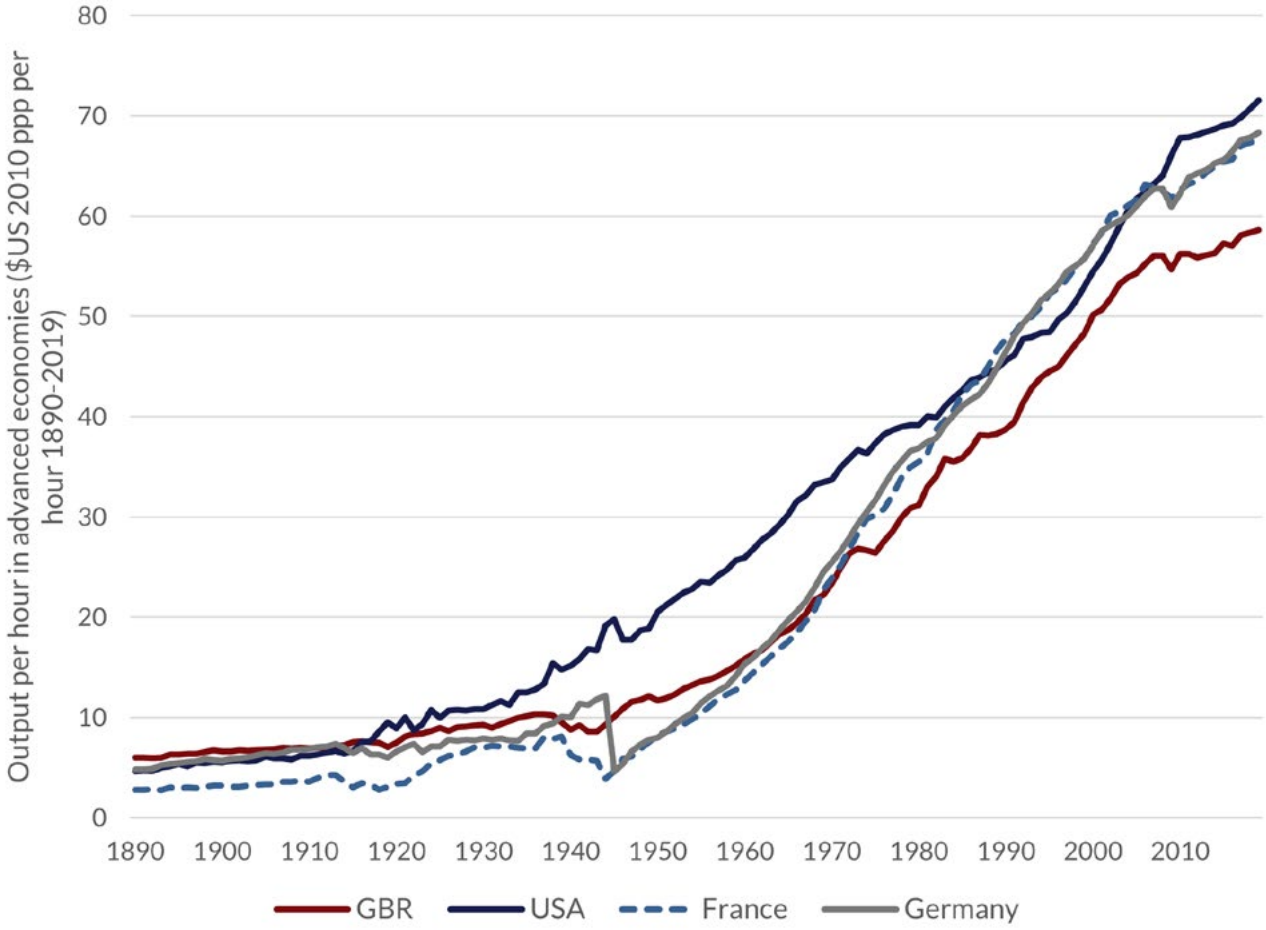
Finally, we note that this paper is not anti-growth, nor is it intended as a counsel of despair. The constructive recommendation is that policy needs to focus on the maximum sustainable rate of growth going forwards, not trying to recreate or even compare with the past. We need to consider the ever-changing nature of the modern economy and encourage broader concepts of investment to support that: more reliance on safe digital technologies, and more sustainable and healthy economic growth, focussed on improving welfare rather than the production of 'things'.

2. When Does the (UK) Slowdown Start?

2.1 The Slowdown is Global

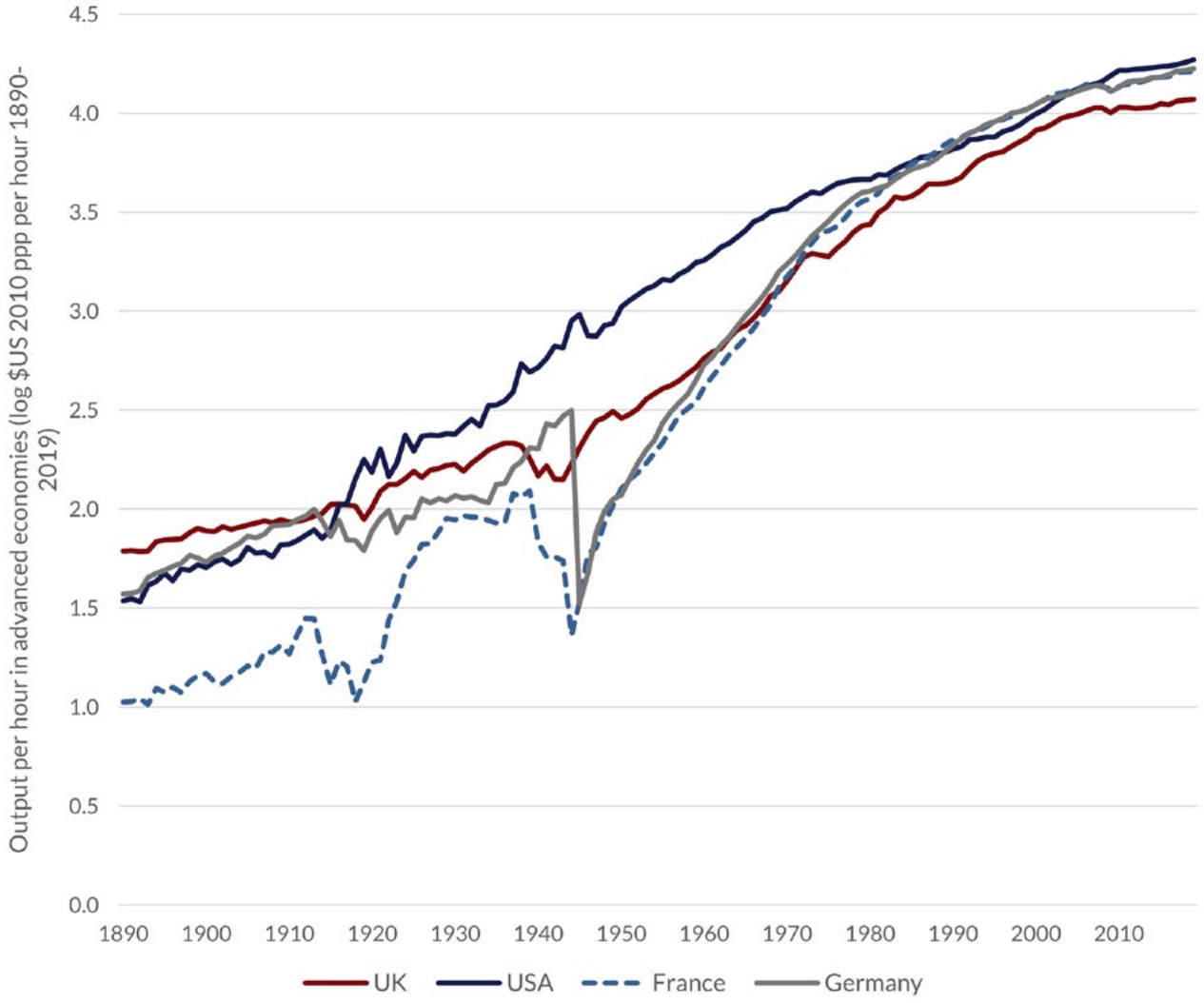
The analyses submitted to The Commission do not all agree on every detail, but there are some broad conclusions one can draw. It is an agreed, observed fact that there has been a slowdown in productivity growth amongst the world's most developed countries over a period of at least 25 years or so.

Figure 1 Productivity slowdown from The Commission 2022 summary of evidence



Source: Bergeaud et al., (2016).

Figure 2 Comparison of productivity in logs



Source: Bergeaud et al., (2016).
Figure 2 transforms the data using a log scale.

Figure 1 recreates a chart from The Commission's first evidence review (PC 2022).[1] The UK's relative productivity slowdown looks very severe and marked, most obviously since the start of the GFC in 2007. But such charts need to be interpreted cautiously. Figure 2 in this paper shows the same data transformed using logs, to compare the long-term trends more appropriately.[2]

In Figure 1, the use of levels places visual emphasis on absolute differences and recent developments. Figure 2 places emphasis on percentage differences and in that sense treats each point in time equally. The slowdown in the US, often seen as operating closest to the 'frontier' of productivity, looks quite different. The peak in productivity growth now seems to occur in the late 60s.

In both figures, some of the underlying trends are complicated by significant historical events. The trends in Germany and France are severely affected by both the First and the Second World Wars (WWI, WWII), but Figure 2 shows a cleaner picture of the changing growth rate across

1 Chart recreated here using data from the current version of the database published online by Bergeaud et al. which has been updated since the PC 2022 report.
2 So that 1pp difference is the same scale everywhere on the chart.

those events. In particular, both France and Germany enter a catch-up phase after WWII and slowdown begins as they get close to the frontier represented by the US. The UK trend is a version of that although with a levels gap persisting.

It is quite plausible to deduce from this chart that the underlying global slowdown has been a continuous process since the 1960s with no specific break point.

2.2 The UK Under-Performance

It would appear that a productivity gap first opened up between the UK and its European neighbours in the 1970s at the time of the OPEC-induced oil price crises. Those shocks certainly seemed to hit the UK harder than peers. The subsequent exploitation of North Sea oil, whilst it made the UK richer, also helped catalyse the UK's de-industrialisation, partly through the 'Dutch Disease' mechanism.

Despite those challenges and the UK being described by the media as 'the sick man of Europe' in the 1970s, the percentage difference from 1970 to 2000 was relatively constant and small by longer-term historic standards, to the extent that the data are truly comparable.

There should be large confidence intervals around all of these productivity estimates, not least because they are based on estimated Purchasing Power Parity exchange rates and use constant 2010 prices, as well as the usual problems of measuring economic statistics over a very long period of structural change.

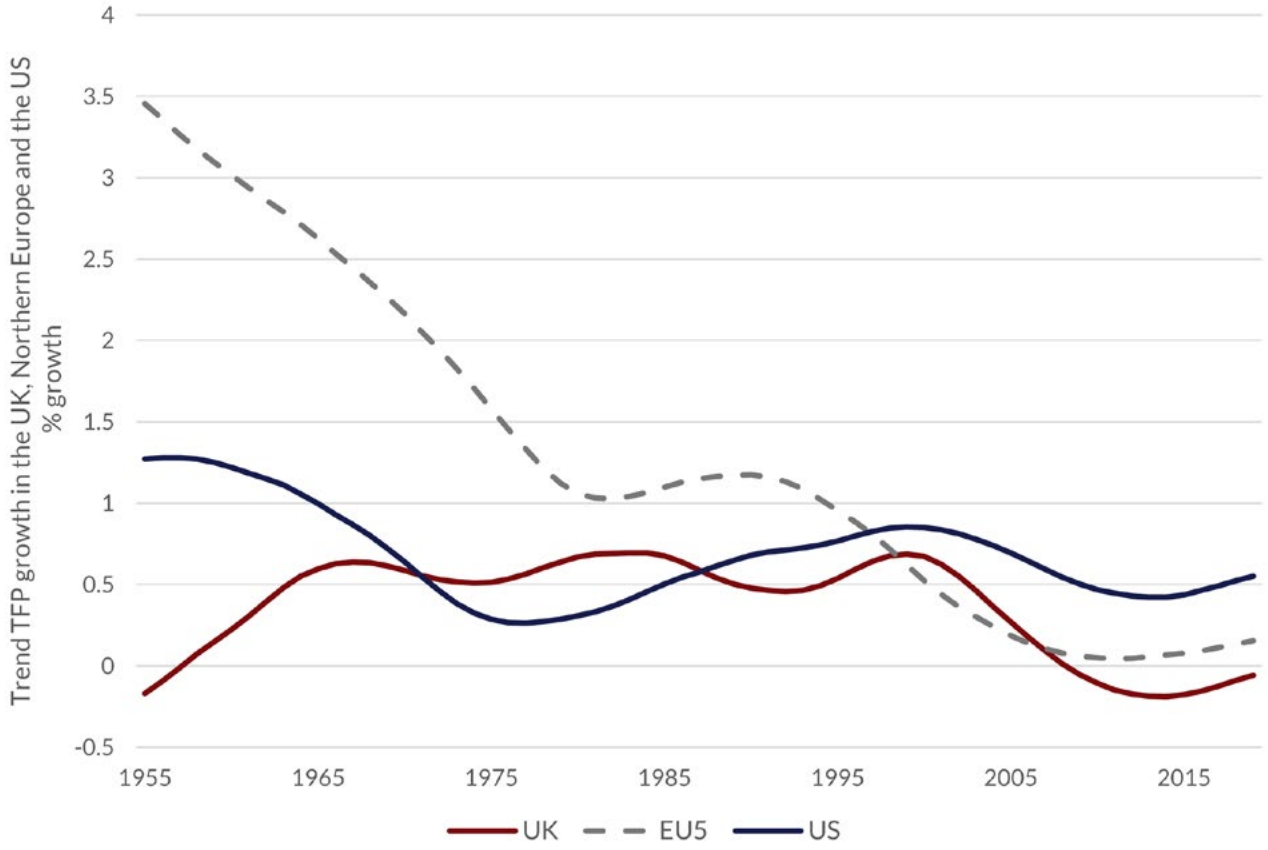
Figure 2 does confirm a widening gap between the UK and other countries since 2000, especially in just the past few years. In part this overall productivity slowdown can be accounted for by a slowdown in total factor productivity growth (TFP).

Figure 3, taken from Figure 1 in Fernald and Inklaar (2022),[3] shows the comparative slowdown in TFP trends. Although not altogether clear just from visual inspection, that slowdown is evident from at least as early as 2000 in the UK and US, and perhaps from around 1990 in the top 5 EU countries as a group. This seems to be consistent with the hypothesis that the slowdown started further back than most UK studies consider.

To the extent that the numbers shown in Figures 1, 2 and 3 are the best central estimates, then the differences recorded between the UK and the most advanced western economies are quantitatively and qualitatively important. But they might not be quite as historically significant as people (want to) believe.

3 Data for Figure 3 was kindly made available by the authors.

Figure 3 TFP relativities as shown by Fernald and Inklaar (2022)



Original notes: Source is PWT 10.0 (Feenstra, Inklaar and Timmer, 2015). EU-5 covers Germany, France, Netherlands, Belgium and Finland (ordered by size of GDP in 2010). EU-5 TFP is defined as a Törnquist index of TFP, variable RTPNA, weighted by nominal PPP-adjusted GDP, variable CGDPo. Trends are calculated with a biweight filter with bandwidth of 12 years.

2.3 Changing the Point of Comparison

The problem of low productivity and UK under-performance has certainly been recognised as an issue for policy for many years. From the author's personal experience as a member of the Bank of England's Monetary Policy Committee (MPC) 2009-14, monetary policy was made much more complicated by the unexpectedly slow recovery in output and productivity growth after the GFC. The evidence of these discussions can be found in published minutes of MPC meetings.

From an early date after the GFC, fractions of the apparent undershoot – in both output and productivity – could be attributed to many different factors.

UK economic performance from 2002 to 2007 had been considered at the time, perhaps wrongly, to be exceptionally and historically strong and was believed to reflect improved supply-side performance. But in hindsight it was almost certainly reflecting excess demand expansion and, if so, early 2007 represents a peak-cycle point not a mid-cycle point. Arguably, the GDP growth rate from 2002-2007 was never sustainable. It was a (fiscal) demand-induced boom which boosted output and measured productivity temporarily, with the inflation consequences kept in check by the newly independent MPC.

The MPC took action to keep inflation under control by maintaining relatively high interest rates. The UK had the highest nominal interest rates in the G7 for much of that period. That delivered a strong exchange rate driven by the "carry trade".[4] Rather than inflation, excess demand resulted in a deteriorating external account and corresponding imbalances in the financial sector resulting from capital inflows. From 1994-1998, the UK current account was roughly in balance, a very small negative. By 2008 it was -3.9 per cent of GDP. By 2016 it was -5.4 per cent.[5]

Part of the policy problem in 2002-7 was a misinterpretation of the UK's performance as stemming from an improved supply-side. The government and many independent commentators at the time certainly thought there had been, but it can be hard to distinguish between a demand-led boom and a supply-side improvement. In both cases, the fiscal position can appear to improve: the government of the day thought it had plenty of room to boost public expenditure. But if the underlying productivity trend was continuing to slow, obscured by the success in introducing an independent monetary policy with an inflation target, that demand expansion probably contributed to the build-up in imbalances which in turn amplified the GFC.

Many of the historical events noted in this paper, including the GFC itself, may well have been (partly) caused by an underlying slowdown in the sustainable rate of growth rather than being responsible for it.

Alternative counter-factual paths for GDP can be created by smoothing through the business cycle from a reasonable mid-cycle point, say 2002. The post-GFC undershoot is then much smaller, even for the same trend. Figure 4 shows alternative paths for GDP (a) using the trend rate from 1997-2007 projected from 2007 and (b) the same trend starting from 2002.

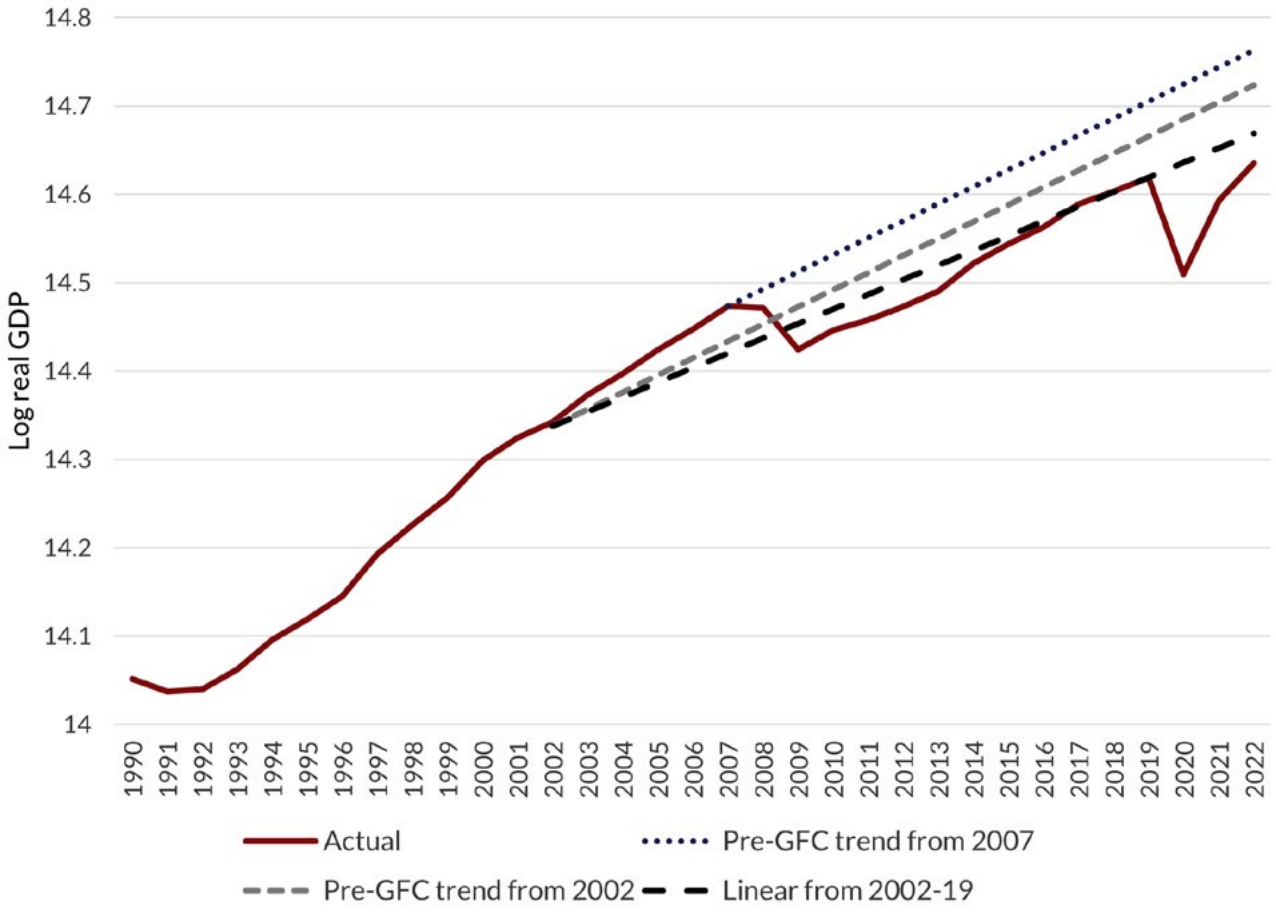
And if the trend was also slower, then that could account for all the undershoot. Line (c) in Figure 4 adds a linear trend that runs from 2000 to the 2019, pre-pandemic out-turn. But all these lines are arbitrary. All they do is suggest that more attention needs to be placed on what the underlying sustainable growth rate was (and is), and perhaps less on the perceived undershoot of historical trends.

The choice of a break point can clearly affect the interpretation. Coyle and Mei (2022) conclude that the UK productivity growth slowdown was post-GFC and can be mainly attributed to transport equipment and pharmaceuticals within the manufacturing sector and computer software and telecommunications within the information and communication sector.

4 With no immediate prospect of inflation or fiscal default, higher short-term interest rates can deliver a strengthening exchange rate as short term investors seek higher returns, in apparent contradiction of uncovered interest parity which would imply a depreciation.

5 https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/timeseries/aa6h/ukea .

Figure 4 Extrapolating GDP from a different starting point



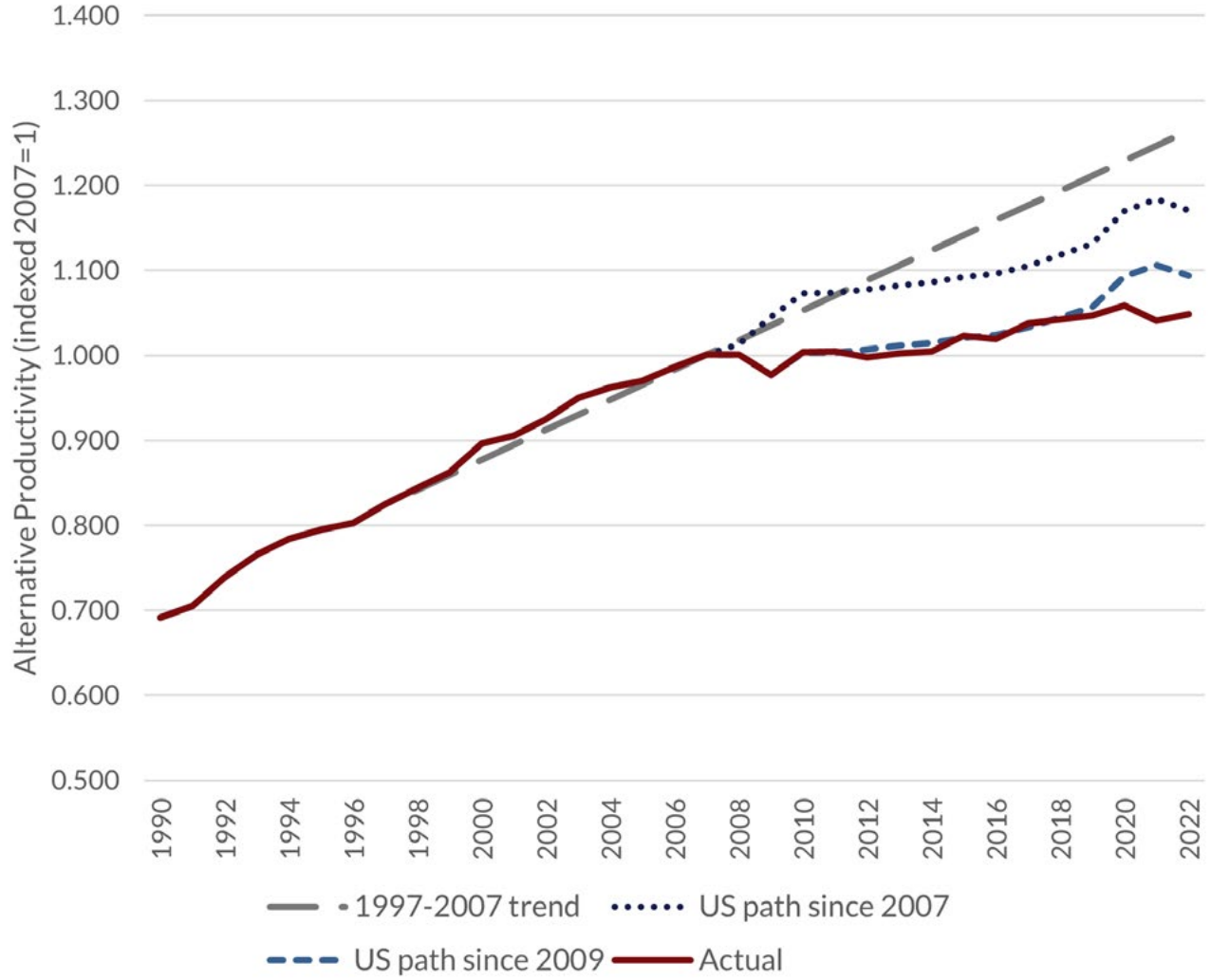
Source: ONS and author calculations

Using Coyle and Mei's own results but looking at the whole period from 2000, one could alternatively reach the conclusion that the weakness in productivity growth was longer-term and more widespread, although the overall growth of productivity in a few sectors such as finance, manufacturing and information dominates the comparisons.

Similarly, one can deduce that perhaps much of what happened to the productivity trend post-GFC was common internationally, not UK specific.

Barnett et al., (2014), is taken as a representative piece of Bank of England research on productivity from the period. That paper calculates the pre-crisis trend growth in labour productivity between 1997 and 2008 Q1, and projects forward from 2008 Q1. This exercise is repeated in Figure 5 using the same annual data set as in Figures 1 and 2. The problem with this extrapolation is that the underlying trend will have been biased upwards by both its dating, and the assumption of a constant trend.

Figure 5 Extrapolating UK productivity using the US trend



Source: Bergeaud et al., (2016) and author calculations

This paper does not propose an alternative estimate of underlying productivity growth, but Figure 5 shows two additional alternatives using the US path for productivity adjusted to fit the UK level so that a comparison of the dynamics can be made. The first line starts that profile from the UK out-turn for 2007. One can see that for the first two years during and after the GFC, the US had a big shake-out of labour whereas the UK seemed to hoard it, so there was a very noticeable productivity divergence. But, curiously, the productivity paths from 2009/19 then moved in parallel until the pandemic, when a similar divergence occurred. Imposing the US path only from 2009 puts it almost on top of the UK experience until 2019.

These alternative paths are all arbitrary and prove nothing. But they are suggestive that there could be a lot of commonalities in the UK and US productivity experience over that decade. The opposing employment reactions of the US and UK in the two crises – one shaking out labour and the other hoarding it – may also be a phenomenon worth further research.

The conclusion from this section is that comparisons of UK output or productivity growth with an unsustainable growth period immediately pre-GFC are best avoided, and longer-run analysis is to be preferred. More of the explanation probably lies in common international experience,

rather than in UK specifics. And we should not assume that there is a single year that we can identify as a break point: the GFC in the UK was not an entirely exogenous shock: it was the result of a cumulation of previous imbalances.

Of course, there are events and short-run influences that do matter. In addition to the GFC, one of the causes of low UK investment by 2023 may well be UK exit from the European Union: the uncertainty caused by the referendum in 2016, the subsequent chaotic negotiation process, the relocation of some activity to within the EU or elsewhere, and the inevitable disruptions to trade after exit, all would have weighed on private sector investment and planning. Similarly the Covid Pandemic. But whilst Brexit may have exacerbated those issues, it is too recent to explain an underlying trend which goes back decades, nor can it explain what is happening globally.

3. What Has Caused the Slowdown and Why is the UK Under-Performing?

Many papers submitted to The Commission do not attempt to provide root cause explanations of why the international economy is slowing down, nor why the UK is underperforming. Rather they tend to account for it by identifying patterns in the data.

The subject matter of that analysis, much of which is addressed in summary form in Coyle (2023), offers the following 'explanatory' weaknesses relative to peers:[1]

- TFP and under-investment/lack of capital deepening (Carella et al., 2023);
- a low-level of Research and Development spending (Jones, 2022);
- under-investment in intangibles (Corrado et al., 2022, Goodridge and Haskel, 2022);
- extreme UK differences in regional/spatial productivity (Tilley et al., 2023);
- wage flexibility (Pessoa and Van Reenen, 2014);
- inward investment (Driffield et al., 2021);
- over-centralisation of institutions (Westwood et al., 2021);
- a lack of public investment in education (Nelles et al., 2022);
- a shortage of STEM graduates (Stansbury et al., 2023);
- infrastructure (Coelo et al., 2014); and
- welfare spending (Driffield et al., 2022).

Other observers, not in The Commission sample, might bemoan over-regulation and high taxes. Neither list is exhaustive of the explanations on offer.

This paper does not take a view on the relative merits of these propositions, many of which are well-researched, important observations and all of which have strong supporting evidence. Rather, two working conclusions are made:

1. Despite the slowdown being an international phenomenon, and the UK under-performance persistent, there is no single cause that has been identified to convincingly explain either. Rather, there is a long list of candidate explanations.

1 These are sample references with apologies to those not included who wrote about the same topics.

2. The explanations offered – to this author at least – mostly appear not to be root cause explanations. Rather they account for the slowdown or locate it in a particular dimension, but do not demonstrate causality. To explain that low productivity has been caused by low TFP, or weak investment, simply relocates the question. Arguably, such accounting could be documenting the consequences of the slowdown rather than identifying its causes. To claim causality one would need to identify the original shock and/or the fundamental economic and social forces at work.

Given these conclusions, which are open to challenge, it is much harder to advance policy proposals than if one were sure of the root cause(s) of the problem. The risk is that policy addresses the symptoms only. Of course, alleviating symptoms may be very worthwhile, and this paper does not take issue with most of the policy recommendations that have been made, but there is a risk of missing the fundamental productivity objective and/or not responding appropriately to the issues that it is creating.

3.1 Candidate Explanations for the Global Slowdown

One theory (e.g., Bloom et al., 2017) is that there is a lack of ideas that can be translated into investment opportunities. That hypothesis appears to be quite widely cited yet doesn't sit easily with the internet-based revolution over the past quarter century which has transformed the way most people work and live. Nevertheless, it is an observation that would be consistent with the structural explanation favoured by this paper.

Another theory (e.g., implicit in King, 2011), which is consistent with there being a lack of investment opportunities, is that the slowdown in the developed world was caused in part by mercantilist exchange rate and protectionist policies adopted by many Asian countries, especially China. Since the Asian Crisis of 1997, China's policies effectively reversed the flow of net exports between the developed and developing Asian countries. The trade surpluses which arose in consequence meant that those developing countries had to export capital to the developed world, helping to drive down real interest rates globally.[2]

The initial timing of that change in policy stance is reasonably consistent with a slowdown from about 2000. But could it really be the case that the productivity slowdown is the result of distortionary exchange rate and trade policies? Nominal exchange rate controls do not prevent real exchange rate fluctuations which are what should matter for growth and trade. And for the past decade at least, those Asian countries appear to have changed stance somewhat – China apparently stopped accumulating foreign currency reserves after a peak in 2014. Certainly, part of the story of global growth is a great 'levelling up' as the developing Asian countries catch up with the industrialised countries. Notably, and not surprisingly, growth in many Asian or other EME countries has also been slowing down as they catch up.

A third explanation may be in mismeasurement (see for example Ahmad et al., 2017). The theory is that as the developed part of the global economy has shifted away from manufacturing to services and then to digital services, productivity in output becomes conceptually more difficult to define and practically harder to measure. The productivity of a personal service depends not on the number performed in an hour, but the quality of the service provided for the price.

2 Borio et al., (2017) link the trend decline in real interest rates to monetary policy regimes rather than a decline in the natural (equilibrium) real rate.

One can measure how much actual nominal expenditure and income is associated with personal services, so those measures for services should be relatively accurate. But how does one measure whether the quality (and hence true quantity) of that service has changed?

The productivity growth of services, including and especially non-marketed public services, is generally measured to be much slower than in manufacturing. But perhaps that is just because it is hard for economic statistics to capture the implicit quality changes of services. If the problem is in measuring the quantity and quality of output for a given nominal expenditure, then the problem might reasonably be in price measurement. In principle, price indices are already corrected for quality changes and the quality adjustment would have to be increasing in order to affect growth rates. That is not totally implausible.

To the extent that these various explanations or others not cited here are valid, there doesn't seem to have been an effective policy response to them from any of the major developed countries. The slowdown has continued in the face of much handwringing (as reported by the BBC) and ineffective fiscal and monetary stimulus (as experienced since the GFC).

We should note that demand expansion in excess of long-term supply trends would never be an effective or sustainable policy response to slowing productivity. We should not look to monetary policy or the fiscal stance as a long-term cause or solution, although certain structural aspects – such as the size of the public sector or the level and arrangements of taxes – may be relevant to productivity.

It may be worth considering, as a separate topic, whether the slowdown in nominal income growth, alongside structural changes such as deindustrialisation, and coupled with the growth of social media, have been driving the developed economies towards 'populist' political and economic solutions (immigration controls for example). Such solutions are generally ineffective because they do not address the underlying cause. In consequence, both the slowdown and the political response to it may be having negative side-effects, not just on productivity but on social cohesion and a wider range of public policy issues.

In this paper we use Occam's razor and take the simplest possible cause of the global slowdown, which explains most of what has been observed, as the most likely.

As economies industrialise and develop, their structure changes. First away from agriculture and to manufacturing and services. Then away from manufacturing towards services, then towards digital. This is simply a version of the S curve model that is used in microeconomics to explain new product diffusion and other phenomena. It is not just a compositional issue. Manufacturing processes themselves cannot be made infinitely more productive. The underlying explanation for slowdown will be in factors such as market saturation, exhaustion of productive improvements, shortages of raw materials and natural capital boundaries.

Rather than the default model assuming ever-continuous exponential growth, the default model should be that every phase of human progress eventually slows down as its own success reaches natural boundaries.

If that is the underlying economic explanation, much of The Commission evidence and analysis, and the wider literature, would appear to be consistent with it.

One should also note that slowing growth does not mean no growth, nor does it mean that living standards are doomed to rise more slowly, just that production output cannot rise at the same exponential rate forever.

3.2 Is Exponential Growth Sustainable? Labour Supply

The concept of a fixed trend rate of growth is not well-founded in economic theory. It tends to reflect simplifying assumptions of the sort often used to underpin short-term decision making. GDP growth is fundamentally related to population growth and technology growth, neither of which are exogenously fixed in the real world. And if one delves deeper, perhaps to explain research and development in terms of, say, time preferences, we have no theoretical reason to suppose that society's time preferences remain constant either.

We first consider population growth and then broader issues of labour supply.

Global population is likely to peak in the second half of the twenty-first century and then fall back, as it is already doing in a number of developed countries such as Italy and Japan and not just because of pandemic-related deaths. The reasons for this are explored in Dorling (2020). In short, as economies develop, the birth rate falls and ultimately seems to settle at under 2 per female – it is currently around 1.7 in the UK where population growth is dependent on net immigration. Globally, the falling birth rate seems to be explainable not just by modern contraception methods but by improvements in education i.e., it is a behavioural choice that people make, especially mothers, once they have the knowledge and the technical and financial means to do so.

Population trends change slowly and take a long time to affect total population projections absent significant downwards shocks such as wars and pandemics. So, the prediction of a peak later this century is now reasonably certain. It does, of course, depend on what happens to long-term improvements in life expectancy, with some evidence that this may also be flattening off in developed countries.

The size of the working population depends on participation rates, not just on total population. The pandemic of 2020 onwards seems to have precipitated a trend towards falling participation (in developed countries at least) through a combination of resignation, retirement and sickness (e.g., Montes et al., (2022) looks at the US).

There may also be limits to labour supply growth because of a backward bending labour supply curve. It is not obvious that all the potential workforce always wants to work more, more intensely, or even at all. Automation and artificial intelligence may be the way forward, but ultimately leaves open the question of what work is left for people.

At the same time, some of those not in paid work are contributing massively to society through child or home care, voluntary community work etc.

Fears about the future demand for labour in the face of automation of production have a long history. The British Luddites of the early 19th Century were concerned about mechanisation creating falling employment in the UK textile industry. The UK Swing Riots in 1830 were led by agricultural workers concerned about mechanisation. In fact, whilst there have been many sectoral declines in employment, there has always been growth elsewhere in new types of work to more than replace those which are taken by machines – either because of the total growth in demand for the outputs, or growth in new industries, or more value being placed on artisanal production.

In general, one can assert that most job creation happens in smaller firms which experience rapid productivity growth as they grow, partly through increasing returns to scale. Once a firm reaches decreasing returns to scale and/or a point of market saturation, they improve productivity increasingly through shedding workers.

The idea of all labour being replaced by machines is commonly discussed even while the opposite has been the historical experience. And if it were to happen then the solution is actually straightforward: one could tax the returns to production and use the revenue to employ people in the public sector to do a range of useful work where people will always be appreciated, such as physical and mental health care.

Employment levels are still rising in developed countries, but there are some indications – accelerated by changes in working practice during the pandemic – that workers want more flexibility in hours and location, and that they wish to retire earlier or adopt less stressful working patterns. In some cases, the increased flexibility and lower stress might entice workers to stay active for longer – but that could have a 'batting average' effect in lowering productivity per worker.

The impact of flexibility in work on productivity trends is open to debate. Firms will adjust working patterns in order to keep their most valued worker inputs where that is their most productive choice. It is fairly well accepted that workers in the US take (or are allowed) fewer holidays than those in Europe/UK and that is one reason why US productivity tends to be recorded as highest amongst large, developed countries.

The choice between income and leisure time is a valid trade-off, although the productivity consequence could go either way, as overly burdensome work could reduce the mental health and efficacy of the workforce. As the economy moves towards more professional services, one might think that 'presentism' was less valuable than effectiveness.

The need to earn an income will likely always be a driver for the need to work – universal benefits are unlikely ever to offer enough to make it an attractive option for the majority – but how constant will that desire to work be? For some people, having higher income than their 'neighbours' is the driving motivational factor. For others that is unimportant. One might postulate that the more productive the worker, the greater their material incentives to work, the greater their participation rate will be. But it remains to be seen how recent trends play out going forward.

At a national level, one also needs to form a view. What sort of productive improvement is the country's workforce willing and able to make? Do we want higher national productivity if that means that many people are trapped for long hours in low paid jobs?

What are the other trade-offs? For example, building extra airport, rail and motorway capacity might make the UK a more productive economy, at least in the short-run. But do those benefits offset all the costs, including the environmental and other negatives associated with such expansion? Should travel be encouraged rather than remote connectivity?

3.3 Is Exponential Growth Sustainable? Output and Productivity

GDP growth will likely slow because of demographic trends and other constraints on labour supply. But could output really have kept growing exponentially?

Take a relatively conservative assumption of 2 per cent pa growth in GDP for a developed economy. At that rate, output would double every 36 years. Quadruple every 72 years. Clearly, that cannot be reflected in the quantity of material 'things' being produced, where productivity is most easily measured.

Many of the Earth's physical planetary boundaries are already either under stress, or more likely broken. There may well be binding constraints in future from a shortage of certain minerals and metals (Lithium for example) which are fundamental to modern technology. Manufacturing may come increasingly to depend on the circular economy: reuse, refurbish, repurpose, reclaim, and recycle.

The circular economy could permit growth even when some supplies are practically exhausted, although it is likely that shifting patterns of demand and supply will be needed as well. Much of that will happen as a result of market forces. As resources become limited, their prices will rise, making the circular economy more attractive. But the shortage of some materials could dampen sustainable growth relative to the past.

The S-curve model of economic development would be consistent with such natural capital boundaries and much of what we see in productivity trends.

There have been many stories[3] over the years about how much it costs to make a pair of training shoes, especially those made in Asia and imported into the West. The answer seems to be that the producer receives only about 20-25 per cent of the Western retail price. The rest of the cost goes to a variety of services, taxes, and a relatively small net profit margin. And even within that, the Asian factories making the shoes will have bought in or employed in-house services which would make the true 'manufacturing' process an even smaller share of value added. One could reach a point of automation where the entire chain of shoe production was person-less but there were a growing number of people involved in the rest of the sales process.

Manufacturing processes are not likely to become always exponentially more efficient over time. To the extent they do become more efficient, it is likely to be for ever-diminishing value added. If that sounds implausible, one should note it is broadly what happened to agriculture after the industrial revolution. Agriculture in the UK was once very labour intensive – in 1600 it accounted for about two thirds of the male workforce (Wallis et al., 2018). It has now become highly mechanised and counts for just 1 per cent of total UK employment, and consequently only around 0.7 per cent of GDP. Manufacturing is likely to develop in the same direction.

3 Example: https://www.solereview.com/what-does-it-cost-to-make-a-running-shoe/

Given that any theory or model is only as useful as its explanations of the world, we can ask what the S-curve model would help explain. The model would predict that:

- There would not be a single factor or reason which accounts for the slowdowns in GDP growth or productivity – it would be widespread across sectors, and factors of production.
- The slowdown would not be constant across sectors which were themselves at different stages of maturity.
- The slowdown would not start at a fixed point in time – it would happen slowly unless accelerated by a shock.
- It would not occur at exactly the same time in all countries – which differ in economic structure and work cultures. But it would be observable in all developed countries as they matured.
- It could explain the UK as an early case: it was the first to have an industrial revolution, it was one of the first to have deindustrialisation.
- The existence of a welfare state could facilitate the transition, whilst imposing bigger challenges for the public finances. The UK is one of a few mixed economy countries with a comprehensive welfare state in which health and education for the majority are provided free at the point of access.
- A generalised slowdown in overall productivity growth could also sharpen both the existence and the perception of social inequalities. The bottom quartile in the income distribution will notice the falling growth rate in their (expected) incomes much more readily than the upper quartile. There are many related social trends in our society today, which could be a result of the productivity slowdown.

The history of the past quarter century would appear to be consistent with the S-curve model, but more work would be needed to challenge it thoroughly.

3.4 Policies to Support Investment When Growth is Naturally Slowing Down

If a natural process of structural development always leads to an eventual productivity slowdown, then would it be possible to adopt policies to preserve the status quo? Unfortunately not. Productivity growth itself is a process of change and defensive measures would risk preventing all change, slowing the economy even more.

Responding to slow growth by demand expansion could also make it worse by obscuring the reality and creating imbalances in the medium-term.

This should not be taken as the 'politics of despair', nor of an 'anti-growth' agenda. Rather it argues for focusing policy on what is beneficial, not on what is wasteful, looking forwards, not backwards and on improving living standards, not the quantity of things.

It should be possible to close gaps in productivity levels compared with peer countries, but probably not by following policies which worked for the historical economic structure. For example, the shares of manufacturing or agriculture in the economy will not return to what they once were, even if supporting the high value manufacturing and agriculture that the UK retains is extremely important. Promoting investment will be crucial, but policy needs to take a broader view of what investment is needed in future.

If one wants to seek out investment opportunities, one should really focus on facilitating structural change that underpins the modern digital economy. For example, more work meetings are now happening through video conference calls. Arguably, working from home has led to some productivity loss. There are definite productivity benefits from working together with colleagues in an office, including training, knowledge sharing and culture. And there can be social benefits. But technology and work processes could be improved enormously to offset much of the productivity loss: it is easy to observe that some people working from home still have poor IT equipment,[4] are using unfriendly software, badly, and those processes deserve a lot more attention and investment by employers.

The 'return to the office' policy, in its extreme form, is a 'return to the past' mentality. Appropriately mixed hybrid working is the future for many professional workers, but executives and managers will need re-training or at least a reorientation to make it function properly.

There are indirect consequences to consider. If people meet more often virtually, and work at home more flexibly, perhaps that takes some of the pressure off the transport network. It would also shift demand from facilities based in cities to those in suburbs or feeder towns. The number of restaurants in big cities may decline, but their quantity and quality in the suburbs might usefully rise. Indeed, in most high streets, drinking and eating establishments have been replacing narrow retail for a long time. Paradoxically, some lessening of demand may make it easier to upgrade public transport facilities to be more reliable and attractive than, say, driving. This may be one argument to justify a boost to regional investment – but not just in cities.

During the pandemic, schools often had to teach online. For teachers, parents and students in many schools it was a disaster because there had been very little investment in the networks/hardware/software/training that were needed. For the most part, neither teachers nor students really understood how it should be made to work.

Properly designed and delivered on-line study, as already provided by some universities for international or mid-career students for example, draws on all the benefits of multi-media resources. This could transform how we expect students to learn. For example, one really good set of on-line lessons on core subjects could, in principle, be accessed by every school in the country. But this requires a radical re-think of how education is to be delivered in the future, and the appropriate investment to support it.

Virtual provision of services cannot simply seek to recreate the physical provision – that would always result in a worse outcome. Rather the virtual environment offers far greater possibilities that can be exploited to offer much that is new and better. As with all change, there is some loss of experience that should be much more than offset by the gains.

Similarly, investment is badly needed to improve health services and some of that could be provided more efficiently. Many people are now getting consultations, advice and prescriptions from medical staff by telephone. It can be a big efficiency improvement for patients and doctors alike. But it would be so much better if, say, a doctor could actually see their patient i.e., a video call rather than phone call. In contrast, trying to arrange a traditional physical appointment with an NHS GP can be a very time-consuming process. Of course, one should not assume that all people are alike. Some people are very attuned to using new technology, others are not, so differential approaches are needed, and the technology needs to be fit for purpose for all.

4 Many of the author's 'professional' contacts do not have good cameras, microphones, headphones, software etc at home or even in the office. These need not be expensive.

The conclusion of this section is that if the UK wishes to address the productivity puzzle by stimulating investment, it needs to take a broad view of what type of investment is required in the light of the structural changes that have occurred and are ongoing in the UK economy. In general, investment is likely to be much less tangible in nature than previously, which raises new challenges, not least in financing arrangements. In particular, the UK should be investing in new technology to maximise the benefits of the IT revolution. Policies focussed solely on encouraging investment in physical assets will not have the desired impact.

These observations lead us on to the next topic of how it can be that these productivity improvements are already possible, and many have already been implemented, and yet productivity growth is apparently slowing down.

4. Slowdown in the Growth of Living Standards – Really?

Over 35 years ago, Robert Solow astutely observed that 'you can see the computer age everywhere but in the productivity statistics' – which is further evidence that the slowdown started a long way back. The period since then has seen one of the most astonishing transformations in human existence. The creation of the internet, then personal computing and finally the smart mobile phone and related devices, means that there has been a massive change in the way people live. It is still changing: transportation, communications, entertainment, education, how and where people work, how they socialise or even meet life-long partners. And this is pretty much available to everyone.

In the UK, as of 2022, some 92 per cent of the adult population had a smart phone.[1] Smart phone ownership ranges from 80 per cent of the over-55s to 98 per cent of the 16-24s. In 2008, those numbers were 4 per cent for over-55s and 29 per cent for 16-24s. Of course, the 8 per cent or so of adults who can't or don't have a smart mobile device is a large number of people – around 4 million adults in the UK – although many of those might have access to the internet through other channels.

With the prevalence of mobile devices, so much has changed – home shopping deliveries, ticket purchases for travel or entertainment, car parking, banking and other finance, television, life-long learning, the list is long. The 'productivity' of a human life has clearly changed hugely in so many ways.[2] And many more improvements are possible through network effects as other services become digitised, including in production. Competition knocks out things which don't work well, and 'clunky' software and operating systems get upgraded.

Yet the aggregate statistics suggest that this transformation has happened at the same time as the unprecedented slowdown in productivity growth (see van Ark et al., 2023). It may well be that conventionally measured productivity for the firm has not benefitted so much, but the economic rent for the consumer must have risen sharply.

What could be going on? The answer may be mismeasurement. There is an inherent difficulty in quantifying the quality of services and hence their true price (Coyle and Mei 2022, op cit). When one buys a smart phone, the utility to the purchaser is huge because of the network benefits from mobile computing, yet in output terms, it is the cost of the handset and the subscription service etc that gets measured. Price indices can adjust the purchase cost of a phone, or a call/data subscription for quality, perhaps with hedonic pricing which adjusts for the implicit price of improved features on what people purchase. But it is not clear how one could account for the improved services which are being accessed independently and often for free.

It is not clear whether price measurement issues alone could account for the slowdown. It would not explain slower nominal growth unless one imputed some additional and growing notional income, output and expenditure. Quality adjustment and network effects are not new. The value

1 Source: USWITCH report sourced from Statista. https://www.uswitch.com/mobiles/studies/mobile-statistics/

2 Not always for the better of course, but it is generally the case that 'improvements' in society are accompanied by some bad outcomes. For example, food is generally cheaper and more readily available in developed countries than it ever has been historically – but there are consequent issues with obesity and bulimia etc.

of a television, for example, is dependent not just on the quality of the set but the programmes made available. For this to be a major explanation for a slowing growth rate, the quality adjustment problem would need to be getting larger over time. That sounds doubtful, and difficult to prove, but is clearly possible and hence an area for further research.

If the answer is not mismeasurement of quality, could it be something more pervasive around the ability of economic statistics to capture consumer rents when there are network externalities relating to particular purchases? Buying a smart phone, relative to not having one, opens up a completely new world of possibilities for the owner, that cannot be captured by the price of the handset alone. And there are huge network benefits if 'everyone' has such a device. But measured productivity of the economy may not capture this unless the benefits are monetised.

Consider a commuter who uses the train. They can now buy and keep their train tickets on a mobile device, thus avoiding queues. They have the real-time timetable instantly to hand for planning, can check whether their train is running, can look up alternatives when something goes wrong etc. And they can do this from anywhere. They can work more easily on the train, communicate with others, carry out family chores, or be entertained. What is now provided by the train service and mobile device combination is a completely different service. It represents a big increase in consumer utility that would not be captured in the price of a train ticket nor the price of the mobile connection (at least, not directly).

Mobile computing devices are frequently used for accessing social media. Younger people especially, but not uniquely, spend many hours posting on-line content without monetary return, while others access it, most often at little or no marginal cost. The costs involved relate to electricity, data allowances, hardware and software purchases and advertising – which seems to be the primary method of monetising social media, although streaming paid-for content is a growing trend. There is also a monetizable gain in the value of consumer data which allows targeted behavioural research to underpin advertising, product design, sales etc.

There is also some monetisation through the sale of internet-based services for controversial or even illegal activities and one can only guess how much of that is not being captured for statistical or tax purposes.

The IT revolution could be seen as having generated a massive growth in living standards, (notwithstanding the various bad social outcomes it also facilitates). But as Solow noted, that doesn't seem to be reflected in any national productivity statistics.

If there is more in real output terms each year from the same nominal expenditure, then adjusting prices is one appropriate method of recording higher real output. But adjusting those service prices for new features will not capture fully the utility of the consumer: that is not what a price index is intended to do.

A similar, but related issue has arisen in the trade-offs between income and work. Many more people are working from home, and one might reasonably suppose that some are less productive in their work as a result – either by working less intensely in the absence of being monitored/managed, working fewer hours overall, or through the absence of peer communications leading to less knowledge sharing/problem solving etc. But the saving on travel time and cost, and the stress reduction, may be hugely beneficial for many of those workers and even if their income were to reduce to reflect lower productivity, they may consider their living standards to have risen. The income cut would be reflected in national statistics but not their increase in welfare.

GDP is not designed to measure living standards and the past 15 years may be evidence of a greater disconnection between the two, as welfare becomes less dependent on owning 'things' and more about physical and mental experiences. This topic has been explored by McAfee and Brynjolfsson (2017), amongst others.

Given this consideration, what can one say constructively? It suggests that people's digital access should be prioritised if that is where societal benefits can be most readily achieved. The government's job would be to make sure that the infrastructure is close to the frontier, reliable, comprehensive regionally, that the systems are safe to use, that consumers get a good deal (e.g., preventing monopoly pricing) and that government itself takes advantage of the opportunities to improve its own productivity.

Public policy should always look to encourage investment in the areas where social benefits are greatest, and that may well be in the network effects of the digital revolution, rather than in the physical networks of the past.

One last observation on taxation. There is a huge amount of personal utility being created by social media with very little monetisation and hence little tax revenue, and not just because of the large corporations which manage their tax liabilities internationally. To make sure it can pay for public services, the government needs to consider its tax policy in this area. The following ideas are suggestive, not exhaustive:

- Checking that it is receiving tax from anyone earning an income from internet-based services. That may require the government itself to use sophisticated IT approaches.
- Considering whether some services need to be taxed regardless of whether they are monetised. If everyone was charged 1p for every individual digital post on social media, email, text etc, then not only would that probably solve the government's tax revenue challenges, but it would also help promote more responsible use of the technology. Unfortunately, such a tax would probably be political suicide for anyone brave enough to implement it!
- Maybe there should be more tax on social media and other platforms directly, rather than individual users, perhaps justified in part by the costs of policing to prevent abuse. That would likely force more explicit charging for consumers so the policy could still meet popular resistance.

5. Regional Issues

Many of the papers submitted to The Commission have addressed regional disparities – in investment, productivity, and by implication income, wealth and living standards more generally. It is demonstrated that there are larger productivity differences between UK regions and cities than in comparable countries (e.g., OECD, 2020) and that this captures much of the discrepancy in productivity. It is very tempting to conclude, on the basis of elementary arithmetic, that if one could raise productivity in the regions and cities other than London without reducing it in the most productive, then UK productivity would be much higher overall. But good arithmetic does not always yield good policy prescriptions.

The UK's 'Levelling Up' agenda may be justified on social grounds, but in terms of national prosperity, it appears to rely on that same arithmetic. Naturally, those interested in or responsible for prosperity in the regions use observed disparities to argue for increased attention to, and investment in their regions. That could be justified on various grounds, but it is not clear that it would solve the national productivity puzzle.

Uncovering and decomposing the large regional discrepancies in the UK is valuable analysis. Support for, and investment in the regions of the UK, especially in the poorer regions, could be justified on social, political and broader economic grounds. Devolution of power to the regions might be a very good way of delivering democracy, as well as better economic policies, including those that are suggested in later sections of this paper. But unless one is sure of the root cause of why regional differences exist, one cannot be sure that the regional policies advanced would actually close the gaps in productivity or raise UK productivity overall, and they could even be perverse if they led to weaker productivity in the strongest regions.

Given the attention paid to these regional disparities, it would be remiss of this paper not to consider them, but it does so to illustrate the risks that arise from the wider absence of root cause analysis, not to undermine the regional agenda.

We should note that regional differences are not exactly the same as spatial differences although the two are related. Any region, of any size, will have spatial dimensions within it. And any two or more regions will have spatial connections across them. In many cases, examination of these spatial relationships could be more informative than looking at regions or cities.

To consider some of these arguments, consider the following "straw man" theory as the root cause of regional differences in productivity, based on spatial considerations.

Suppose that workers and firms naturally differ in their levels of productivity and assume that the distribution of the productivity of potential workers at the time of leaving full-time education is the same in every location. Take as given that, because of proximity benefits of concentration, particular industries tend to cluster in particular locations.

The most productive young people, with no fixed geographical ties, have a strong financial incentive to move to the highest paid (most productive) jobs that they can find, and those jobs will similarly tend to locate where the highest concentration of productive workers can be found or attracted, reinforcing any such movement. We know that this happens: over many years, the UK as a whole has often bemoaned the 'brain drain' to the US, where top professionals in many sectors can earn much higher financial rewards than in the UK.

With a few geographical attractions or other starting point differences, large regional disparities may simply be a natural outcome of co-location over time. The UK could be especially prone to this in that it is both small and flexible enough that workers can move, but large enough, developed enough and densely populated enough to have distinct economic centres.

Within the UK, the example cited in many of The Commission submissions is London's high average productivity which in modern times is almost certainly based on its success as an international financial sector. Over the years, people with relevant skills who wish to be extremely well rewarded financially have flocked to London and the south-east for jobs, many of them in, or related to, the financial sector. By arithmetic that means that the distribution of the most productive workers across the UK will have become skewed towards London and the south-east. Similar locational forces have long generated movements from rural areas into cities.

Non-financial firms operating within this region have to compete with those in the financial sector for office space and for workers, who in turn compete for housing, schools etc. Lower productivity firms, requiring less skilled or less productive workers, might decide they would do better to concentrate their businesses in other locations. Call centres are seldom located in the richest areas for example. One can observe a version of this internationally with the off-shoring of jobs to countries that have a cheaper labour supply. And low paid/low productivity workers may get squeezed out of the most attractive residential areas, leading to very localised disparities.

If these arguments have any merit, it would mean that one root cause of regional productivity differences is labour market and firm location flexibility. Individuals and firms respond to incentives and there are benefits from high productivity sectors concentrating in particular locations (generating a critical mass of supporting services, infrastructure etc).

Importantly, it would also be consistent with there being large discrepancies within regions such as those identified by Collinson et al., (2022). London may well be the richest UK city on average but the differences in income are much greater in London than in the rest of the UK, particularly after the high costs of housing in the capital are taken into account. London has a higher proportion of households at the bottom of the wealth distribution than the rest of Great Britain.

If flexibility of labour and capital is the root cause, or even one root cause amongst several, then many of the policies being proposed to invest in regions outside London need to be (re-) considered in that light. To raise productivity in a region, ultimately one would need to focus on retaining or attracting those higher productivity workers with highly paid jobs. Industries and firms would need to be targeted on that basis and living conditions would need to be made attractive to that cohort. Policies can be designed to achieve that, but with limited access to the full range of fiscal incentives and legislation, it could be controversial, expensive, and take a very long time.

Perversely, it could be necessary to accept an increased degree of inequality within regions to attract more productive jobs with higher paid workers (see Collinson et al., 2022).

Even if successful locally, regional policies might simply shift productive jobs within the UK rather than raising the productivity level nationally. That could be a good outcome on equality grounds, but it wouldn't solve the aggregate problem.

The conclusion of this section of the paper is not to be critical of pro-regional policies. As noted, promoting regional investment – especially public investment to improve people's living standards in poorer parts of the country – is a worthwhile objective in its own right.

If the root cause of the issue at hand has not been identified then the impact of proposed policies on related objectives cannot be certain, and choosing between policies could be fraught with the risk of resource misallocation.

Suppose, for example, a region or a nation within the UK were able to raise local income taxes to pay for incentives to attract inward investment. That might attract some firms, but would risk driving away the most productive workers. The suggestion of Byrne (2021) for regional income and wealth taxes to fund local investment expenditures could be hugely counter-productive.

Finally, one aspect of spatial economics is the effects of local planning on productivity. One could also approach the topic of land-use as a capital input. The UK is well-known for having potentially very restrictive local planning processes. But the outcomes for local areas are not obviously optimal, especially when compared with other countries. Most notably the UK has a chronic shortage of homes (at its simplest, one can observe that most of the world's great cities have far more tall apartment buildings than do the UK equivalent). The UK workforce often faces very long and unproductive commutes as a result, and employers, including the NHS and schools, face shortages of key workers who cannot afford to live near or travel to the locations where they are needed.

UK high streets, often the focus of protection by local town planners, are increasingly frequently being seen as economic and social disaster areas. This is an example of where the economy has moved on: retail investment has focussed on edge-of-town/out-of-town development or online. Modern town centres across the UK are increasingly focussed on drinking and eating, with some specialist establishments taking advantage of relatively low lease rates, and discount retail including charity shops. Whatever plans our local authorities had, one can't quite believe that this was their intended outcome, nor that the changes in demand and supply have been properly understood and embraced.

Many have called for reform of the UK planning system to support productivity and growth,[1] dating back at least to the Barker Review of Land Use Planning (Barker, 2006), but the problems seem to be worsening rather than improving. This may be an example of short-term electoral considerations trumping longer-term growth considerations: local planning is very sensitive.

1 E.g. Anthony Breach at https://www.centreforcities.org/publication/a-very-short-guide-to-planning-reform/

6. Strategic Considerations in Promoting Investment

Insufficient investment is synonymous with low productivity growth, rather than an explanation for it. Certainly, investment is usually essential to raising productivity.[1] In contrast, trying to insist that workers simply produce 'more with less', as is common within the public sector, is doomed to failure. The result of such pressure is nearly always to reduce quality, not to improve productivity. Similarly, outsourcing services with the sole intention of saving money, rather than accessing extra investment or new skillsets, also produces poor outcomes. Creating more efficient processes requires one to 'spend money to save money'. But what forms might that investment take in a mature economy?

6.1 What Counts as Investment?

Historically, economic analysis of the business cycle – such as the accelerator model of investment – had a physical production context in mind in which there is an element of fixed capital. Accordingly, pro-investment policies have been geared primarily to support manufacturing and a few other sectors that rely heavily on machinery. That may have altered somewhat to now include elements of IT expenditure, but policy is still very restricted in its coverage. The BBC report cited earlier noted the following:

> *"This spring, Mr Hunt (The Chancellor of the Exchequer) announced a new scheme to allow every pound invested by businesses in IT equipment, plants* ***(sic)*** *or machinery to be deducted in full from taxable profits." (This author's emphasis in bold).*

Investment in new plant and machinery can be made for several reasons: to improve quality, facilitate new products, improve health and safety, reduce pollution or waste, or to increase capacity. In the author's experience of interviewing manufacturers, increased capacity is often a by-product of investing for other reasons. In most instances, productivity will be improved regardless of the original motivation of investment and the cost-benefit analysis can be made quite precisely. But manufacturing (and similar industry) is not as important as it once was.

In 1970, UK manufacturing was over 30 per cent of total output. Now it is only about 9.4 per cent in the UK, 9.3 per cent in France, 12 per cent in the US, 18.5 per cent in Germany and 20 per cent in Japan. In all these countries, the sector shares have been declining for some considerable time, with goods expenditure being outgrown by services and with the remaining domestic manufacturing often being displaced partly by imports. There have also been upward trends in public sector output which is predominantly services.

1 One might say it was a 'no-brainer' but that statement would rather point to the risks!

Although UK manufacturing investment is nearly 15 per cent of business investment, it is only 8.6 per cent of Gross Domestic Fixed Capital Formation (GDFCF) and manufacturing employment is some 7.7 per cent of total UK employment. Whilst efficient manufacturing remains important, a focus on that sector will not do much to address the overall productivity challenge that the UK faces.

As people earn higher real incomes, they tend to spend more on services including health, education, transport, tourism, housing etc, and rather less on goods. For example, as one can observe in many high streets, they eat out more. Even though some of the measured trend reflects manufacturing firms outsourcing previously internally provided services (cleaning, human resources, catering etc) there is little doubt about the continuing trend towards de-industrialisation in the developed world.

In the UK, a significant de-industrialisation coincided with the oil price shocks of the 1970s, followed by the advent of North Sea oil in the early 1980s, a period of time accompanied by mass unemployment. The stress on the UK from these shocks seemed to be more than in other developed countries, but most industrial countries have since experienced a noticeable decline in manufacturing share, spread more smoothly over time.

In addition, services have become increasingly driven by technology changes with people being replaced by automated systems. This trend probably has much further to go with the use of Artificial Intelligence (AI).

One needs to consider the nature of the investment to promote in the face of such structural change. An old-fashioned focus on plant and machinery would be irrelevant to the majority of today's businesses. Investment in people, communications, advertising, and commercial premises may be primarily important rather than, say, machines that produce things. And investing in networks such as cloud computing or AI use may be more important than simply buying IT equipment (Andres et al., 2020). Even the nature of commercial premises is changing to include professional workers' own homes.

A defining characteristic of investment in economic models is expenditure on a factor of production that is fixed in the short-run but flexible in the long-run and where, once purchased, a flow of services is provided. That time dimension to the continuing flow of services is the major economic difference compared with recurrent, non-investment expenditure. There may be a timing mismatch between the expenditure and the benefits, but financing arrangements such as term loans or leasing can be used to address that.

Current definitions of investment can apply equally well to capture many types of expenditures on physical things including computer software and hardware. However, structural change means that the concept should really include a much broader range of up-front commitments such as the building of brand value and 'goodwill', patents, the development of firm-specific approaches or in-house accumulated experience and expertise.

In thinking of policies to improve investment – especially in the context of a national productivity challenge – it is crucial one does not limit that to the concept of physical assets. Indeed, a number of The Commission submissions focussed on the importance of particular types of intangibles, although the requisite policies to support and promote investment in intangibles would need careful design. Haskel and Westlake (2022) investigate both the problems and potential solutions.

In many service sector firms it is the skills embodied in individuals which really make the business productive and profitable, and the most important aspect of 'investment' can be in recruitment, training and managing the workforce, both before and during employment. But unless the worker has a transfer value (like a professional footballer's contract), people cannot be treated as fixed assets and investment in people doesn't count as investment in the national accounts – it is not fixed capital formation. It is, however, investment in the sense of up-front expenditure which generates an enhanced flow of services. But people are relatively free to change employer. In essence, investment in people has a positive externality to the economy which the individual firm cannot rely on recouping. That externality can easily justify positive public intervention.

One characteristic of investment in people, intangibles etc is that they are less able to play the traditional role of fixed assets in securing finance. Most banks are credit service providers who care most of all about getting loans repaid. They are not investors with an equity stake in the business. Hence banks make relatively low-risk loans, usually taking a claim against security which would have a residual value in the event of default.

Firms that are based on ideas and people, but not physical assets, such as technology start-ups, can find it difficult to get bank finance even if they need to pay wages up front, rent premises, advertise etc before making a profit. Unsecured lending, including overdrafts or credit card debt, is usually very expensive. Small business entrepreneurs may have to offer a claim on their own residential property as security for a loan, which drastically increases their personal risk.

Consideration of how to help finance start-ups that have no tangible assets would be an area worth further consideration. Equity finance is often more appropriate than (bank) credit but the supply of equity investment for small businesses is less well orchestrated than bank debt.

One should not rule out the use of public grants or tax credits for start-ups where there are long-run public benefits from supporting a company. That may depend on the company's social purpose e.g., to facilitate the transition to net zero. For example, some action has been taken to support industrial scale battery manufacturing in the UK, but that seems very patchy.

If policy focuses on encouraging investment in physical assets only, then even if it succeeds in that aim, the impact on national productivity will be limited.

6.2 How to Prioritise?

An 'accounting' approach to productivity is often based on a standard production function, which relates output growth to increases in factors of production, plus increases in TFP, which is calculated as the unexplained residual. But what one labels as factors of production is a matter of analytical choice. Traditionally, the simplest model just considers physical capital and labour hours. But some approaches include any or all of the following: financial capital, intangibles, the quality of the labour hour, land, natural capital and social capital. The UK Levelling Up documentation identifies 7 types of capital (HMG, 2022). And such lists are not analytically exhaustive. What such choices do is to help unbundle the residual of TFP to identify contributions of interest.

In the absence of root cause analysis, it would be risky for policy to focus on any one factor of production, however so classified. Given the uncertainty of why investment has been so weak, how can one minimise the risk of supportive policies leading to a serious resource misallocation?

One strategy to support investment would be to forget about the national productivity puzzle. If investment support were to be driven solely by the ambition of increasing national productivity, one could get a lot of 'bridges to nowhere'. It may seem obvious, but most investments should be justified first and foremost by appealing to their specific, known benefits.

The main decision criterion for public policy intervention should not be whether the investment is justified on narrow financial grounds, nor based on traditional measures of productivity in terms of output per head, but whether it is justified after taking into account all public benefits (externalities) in addition to financial returns. There will be an element of politics in this consideration: the importance of communities and social infrastructure for example is an area where people might reasonably differ.

One reason for caution is that the costs and benefits from long-term projects are often very uncertain in advance and may not be revealed in full until many years later. The Thames Barrier has turned out to be much more of an essential flood defence than ever envisaged when it was commissioned and will need to be enhanced. In contrast, for example, the short M45 motorway (the road link between the M1 and South Coventry) became something of a white elephant after the M6 was completed (linking the M1 with North Coventry). Some examples of failures are detailed in King and Crew (2013).

6.3 A Project-Based Approach

If one has a long-term objective of any sort, a sensible approach to delivering it is to use standard project disciplines. Projects are commonplace in any large business, private or public. Many are very successful and some are not. Success depends on certain factors each of which is necessary but not sufficient. What follows is a not a comprehensive review of project management but is based on the author's own experience of some of the most important requirements, which appear to be missing from UK national investment strategies.

The Plan:

The most essential starting point is of course a detailed project plan that sets actions, timelines, outcomes etc. But some plans bear little relation to reality and so simply having a plan is not sufficient.

Investment Budgets:

Investment spending cannot be unlimited, so how does one budget and make choices? In classical microeconomic theory, one should keep investing until the benefits of the marginal project are equal to the cost, perhaps subject to a margin of profit and risk. That is not the approach traditionally found in business. Often the limiting factor is not financial but the bandwidth of management to oversee change. A common approach is to decide on an investment budget for a portfolio of projects, perhaps as a percentage of turnover. High level project objectives are set and those which score most highly get the nod.

Prioritisation:

Not all projects are equal. Maintenance, replacement or compliance investments such as health and safety, or regulatory requirements which 'must' be done, tend to receive highest priority. Sometimes, amongst the remaining bids, a CEO may prioritise a project because they perceive a strategic benefit to business development but such projects are likely the most risky. Was HS2 a strategic necessity or something of a political vanity project?

Robust Investment Appraisal and Cost-Benefit Analysis:

A key to project success is a proper prior assessment of the costs and benefits. Both elements are often underplayed.

Benefits should be clearly articulated and quantified, with specific targets that can be evaluated ex post. They should not be driven by ideology or notions of prestige.

Costs must be assessed prudently. Funding must be appropriately judged ex ante, for any project. That means that the individual project plan needs to be specific, costed, proportionate to the need and as certain as possible. Projects can fail both because they are insufficiently funded and because of excess funding that leads to wasteful expenditure creating more problems than it solves.

Optimism bias in projects is well-documented and quite common. Projects that are politically inspired may be particularly subject to over-optimism on both benefits and costs and there are many examples from Concorde to HS2.

Risk Management:

Known risks to delivery need to be mitigated but some unforeseen risks always crystalise. A proportionate, unallocated reserve of funding and other resource needs to be allowed for.

Mission Creep:

Radical changes to a project sometimes require a complete re-set. More insidious is amending objectives along the way in a series of small changes or reversals. Small, unplanned changes sometimes have major consequences. Stakeholders can lose confidence in the overall plan if it keeps changing in small details.

Governance:

Individual projects can be prioritised and validated by a properly managed framework, with starting dates determined as finances allow. That approach creates a pipeline of projects which has some predictability, operates beyond a financial year and allows projects to be developed and ready to go when capacity is available. This need not be overly constraining or completely centralised. Projects below a minimum threshold may be delegated, financed out of reserved funds or, if very small, draw on recurrent expenditure budgets.

It should be possible to have a national investment budgeting process for national-scale investments. Similar approaches could be adopted regionally or at more local levels.

Governance is not just about selection or management of a project, which is anyway best left to the experts in delivery, with clear objectives. Governance includes bringing together all stakeholders so that they are informed, consulted and remain invested in a project. McCann (2022) proposes a greater collective ownership of large-scale projects in the UK and notes the benefits of such approaches in peer countries with better outcomes on the most contentious projects.

More generally, other countries seem to have organised themselves more effectively in addressing the productivity puzzle (Pilat, 2023). One particular challenge for the UK comes from the two-party system in UK politics. Ideally, long-term strategy would be endorsed by all parties so that planning can operate across changes in government. In contrast, in the UK one sees big swings in approach even with successive governments led by the same party. The ‘political risk’ premium is high.

Project Delivery:

Managing the delivery of a project has several phases. These can be set out in a number of steps. The simplest version can be described as:

1. Initiation
2. Planning
3. Execution
4. Closure

As part of the Initiation and Planning phases one needs to agree budgets, governance and success metrics and receive approvals to proceed. A key observation is that if planning is done well, the Execution phase can often be relatively short. For example, in the case of building a house, or even an office block, most of the time will be taken in the preparatory stages – the actual construction can be relatively quick.

Short-cuts in those early phases or poor governance can be a major cause of later failure in execution. But even well-run projects hit problems. As part of Closure one often needs 'fitting out' or 'de-snagging' to make the outcome fit for purpose.

In large-scale infrastructure projects the execution phase will be longer, but the same consideration applies: that failure to plan properly will generate an enhanced risk of failure.

Mid-Project Review:

This is a particular feature of good governance and project delivery. A standard approach to project management is to have a mid-project 'peer review' or other independent assessment. For projects with long timescales, there might be more than one. These reviews should be coordinated with critical decision points when a project could be abandoned or change course. If scheduled as a matter of routine process, then the political aspect associated with discretionary reviews of public projects can be avoided. Such reviews can have benefits both in project delivery and in allowing for early termination of a failing project. Again, there should be a commitment to publication of such reviews.

Strategy:

Strategy may well be the biggest gap for the UK to address in public policy. If one considers some of the Government's recent strategy papers – for example on the green transition (HMG, 2023) or on industrial strategy (HMG, 2017) – the one thing that is notably absent, one could argue, is a strategy.

To deliver a desired outcome, one of course needs ambition, a clear objective and a plan of actions. Those are generally present in government strategy documents but are not sufficient. The strategy should knit these together, it should describe what approach is going to be used to deliver and should inform all those working on a project of the agreed approach to deal with questions and challenges that they may encounter. If the people delivering a project do not know what the strategy is, then success is going to be slow at best and failure is much more likely. A good strategy statement needs to be kept short and succinct so that it can be remembered. Some examples are needed to illustrate.

One example of a business strategy would be to always be the first mover and innovator in a new product or service. An alternative strategy would be to wait and be reactive to competitors, and engage only where something is proven to be successful. Both strategies can have advantages and be successful for different firms. But clarity is needed in designing and marketing departments for example.

Perhaps the major strategic choice for a government is between public sector and private sector finance, or what degree of mix. It may be that different financing choices need to be made in particular circumstances – in which case the strategy should be to establish clarity on the grounds for making such choices. Unfortunately, the UK does not seem to have a clear political consensus on the right mix of public versus private investment in any particular context, even where there are apparently shared objectives, such as net zero.

If the government and opposition – or even successive governments of the same party – do not agree on the best strategy for long-term projects, then the UK has a major problem for promoting long-term investments. Swings in approach can even occur as a result of the regular and frequent changes in junior ministers.

To be clear, the strategy is not the objective and not the plan. Alternative strategies for 'levelling up' might be to lead from central government, or to devolve to the regions, or to set up new bodies to work in partnership. It might be to lead with public money, or with private money. It might be to grab just the quick wins and low hanging fruit, or to be a deep-rooted, multi-parliament investment for the long-term. But it should be clear to everybody as to which of these strategies are being employed.

Even the IMF have commented that the UK needs more public investment. The 2023 Article IV report (IMF, 2023) highlights a long shopping list:

> *"...the need for further measures, including to improve health outcomes, fine-tune immigration arrangements to address labor and skills shortages and enhance labor market flexibility, **increase critical public investment**, provide permanent incentives for investment, and ease planning restrictions." (Emphasis added).*

A lot of infrastructure, such as transport (airports, rail, roads) or communications, produces public benefits beyond private returns. Those positive externalities may be lost without government intervention. In some of these areas, investments can be monetised to produce an income return. In those cases, various forms of private investment, perhaps alongside public investment, may be both suitable and obtainable and there does not seem to be an unbridgeable political divide on that.

As discussed later, achieving net-zero is a political objective which all the main UK political parties have adopted. It would therefore seem ripe for a cross-party approach that would yield a more certain and lower-cost transition.

Our conclusion to the discussion on strategy is that a disciplined approach to the problem needs to be adopted. Better governance is required to manage stakeholders and to ensure that the highest priority projects are chosen and delivered without undue optimism leading to underestimates of costs which then spiral out of control. One-off political decisions on whether to pursue or drop major projects, especially involving reversals of strategy, are inimical to good delivery and to related private sector investments. A bi-partisan approach could be possible where there are shared objectives.

Ex post evaluation:

In a large organisation, a standard project discipline is to review projects ex post to assess whether the benefits have been achieved and to learn lessons for future project planning and delivery. Knowing that this will be required should help determine measurable objectives at the outset. There is no reason why such a process should not be followed automatically for all large public sector projects, and the results published, perhaps by the National Audit Office. Importantly, this needs to be done routinely for successful projects as well as unsuccessful.

7. Investment in Health and Education

The UK has an almost unique strategic choice to make in terms of health and education investment. As countries get richer, it is generally the case that individuals (or governments on their behalf) will spend a greater proportion of their income on health and on education for themselves and their families. Indeed, the productivity of a worker will depend heavily on both their education and health, so investment in these sectors is core to the issue at hand.

One would expect to see spending on health and education rising slowly as a share of GDP over time.[1] The UK data do show an increase overtime, albeit not a smooth one. In 1980, UK spending on healthcare was just over 5 per cent of GDP and had reached 10 per cent by 2019.[2] Within that, public healthcare spending rose from around 4 per cent of GDP to around 7 per cent by 2019. But crucially, total public spending on health peaked in 2009/10[3] at over 7.5 per cent before falling back somewhat over the ensuing decade.[4]

It is often alleged that society has not seen the benefits of extra spending on health and education, but usually these statements represent a view of those who would prefer a smaller state, with no aggregate evidence cited. For what it is worth, prior to the recent pandemic, UK life expectancy had been steadily rising for at least 180[5] years if not longer – albeit the improvements have slowed over the last decade. Similarly in education: by 2019 over half of young people were going to university compared with 1980 when around one in seven went into higher education. In 1950 the number was just 3.4 per cent.[6] One can of course argue about the quality of degrees, and the nature of what is taught, but in general it would be hard to find evidence against the proposition that health and education have improved significantly over the long run, in large part because society has spent more on them.

The UK faces a choice. If it wants to maintain the NHS as the main supplier of health services, free at the point of consumption, at least for specific categories of health treatments, then the NHS needs sufficient investment to deliver that objective and that would be consistent with NHS spending, including investment, continuing to rise, slightly faster than GDP.

Of course, the NHS can and should be made more efficient, as could any large, mature business. That includes investing more for prevention, rather than relying on cure. That would be economic investment in the sense that expenditure on prevention today creates a flow of health improvements over time. In practice, policies of 'cure' seem to take priority, perhaps because they are seen as non-discretionary. Investing more in prevention could substantially reduce costs overall and contribute to investments needed elsewhere.

1 In what follows the years from 2020 are ignored since the global pandemic has distorted the numbers.
2 Source: https://www.statista.com/statistics/317708/healthcare-expenditure-as-a-share-of-gdp-in-the-united-kingdom/
3 The peak in these figures and those quoted below for education will have been distorted by the sudden fall in GDP during the GFC. But pre-GFC levels of UK GDP were recovered by 2013 Q2 and the trends since then have still been of general decline as a share. Over any lengthy period of time, the upward trend will also be distorted by population growth – ideally the numbers should be looked at per capita to establish preferences.
4 Source: https://www.health.org.uk/news-and-comment/charts-and-infographics/health-spending-as-a-share-of-gdp-remains-at-lowest-level-in
5 Source: Office for National Statistics https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/articles/mortalityinenglandandwales/pastandprojectedtrendsinaveragelifespan
6 Source Times Higher Education https://www.timeshighereducation.com/features/participation-rates-now-we-are-50/2005873.article behind a paywall.

The recognition or even the allegation of 'inefficiency' can also be an unwanted drag on necessary investment. All firms and organisations are inefficient to some degree whether private or public. Good managers should be constantly identifying and removing inefficiencies, at the same time as investing in and developing new processes, products and services. New inefficiencies will rise to displace the old, and so this is never-ending. In many cases extra investment is precisely what is needed to improve efficiency. If one waited for all inefficiencies to be tackled before new expenditure was allowed, the outcome would be very poor. A balance of efforts is constantly required.

Squeezing budgets or bureaucratic spending limits applied top-down leads to poor productivity outcomes. Managers who are struggling to maintain services then have to make short-term decisions which are less efficient, such as paying overtime or employing expensive contractors because of a shortage of staff.

Crucially, if less money is available to fund a service, ultimately someone will decide what is not going to be done. If that is not consciously decided at the top level, then managers or front-line staff must decide what they do not do. That is how quality of service gets reduced when budgets are squeezed.

Similarly, measurement of performance is not a substitute for improving it. In some circumstances, what one measures miraculously improves to the detriment of what one does not. In other circumstances, under-performance may even be exaggerated as part of a 'cry for help'. Where there is measurement and targets, one needs a follow-up strategy of how to respond, otherwise such measures just become a political lightening rod and a cost burden.

Any net increase in NHS expenditure needs to be paid for. Investment – using a broad definition – could be financed by increased borrowing, but increases in recurrent spending above that consistent with GDP (and hence tax) growth would need to come either by reducing expenditure elsewhere or, more likely, by raising taxes. Either would be politically contentious.

Economic nirvana might be described by higher public spending and investment, lower tax rates, low and stable inflation and national debt levels falling as a share of GDP. With very strong growth that can sometimes be achieved, but only briefly and not sustainably. The Government has a long-run budget constraint.

It is not easy to identify any component of public expenditure that can be increased or decreased as a regulator of the fiscal position. Unnecessary expenditure would always be run down to zero and cutting necessary expenditures problematic. Varying taxes may be easier to implement, but is politically contentious when they need to rise, and there can be negative supply-side effects if the tax system becomes distorted or over-burdensome.

Although there is always some short-term leeway on each item of the budget constraint, ultimately a political choice has to be made. If the UK collectively decides that it wants continually improving health services, then the answer is likely either higher taxes or moving more health provision to private markets.

As it happens, the tax burden in the UK has been steadily rising as the Government has struggled to control the fiscal deficit, partly but not solely as a result of the pandemic since 2020. According to the Institute for Fiscal Studies[7] the current UK tax burden is the highest in 70 years. It may be that such an outcome was always inevitable without a major shift in public services to the private sector.

That alternative choice of a shift to the private sector is worth setting out. Ultimately, it would mean that the NHS was no longer the main health provider for all the services it currently offers. For this to happen, there would need to be more private health care provision and more private health insurance, possibly encouraged through tax incentives. That could allow overall expenditure on health to rise in line with the revealed preference of UK citizens and would doubtless generate substantial new investment in private facilities. It would in turn reduce financial pressure on the NHS. And yes, it would probably help move the UK towards the productivity frontier, if it made the workforce healthier.

That private-sector solution would be challenging. For people to choose to pay for private health care, it would have to be perceived as a distinctly better quality of service than the NHS (i.e. a two-tier system). And there would be additional resentment if the private health system cherry-picked the easy services.

One certainly wants to avoid the outcomes of the US system, where health expenditure is over 18 per cent of GDP but dominated by large, vested interests charging high prices for drugs and medical services, without obvious health benefits accruing to most of the population (Deaton, 2023).

This paper is not espousing either choice but notes that neither of these models is currently being supported by policy. Despite taxes rising, policy seems intent on delivering an increasingly lower proportion of GDP spent on the NHS, with declining investment and current spending despite a growing demand for its services. That policy may not be sustainable as the inevitable public reaction to failing services kicks in and emergency budget increases are made (generating an inefficient outcome). But there has not been a clear policy of promoting and encouraging private health care either. It is likely that this combination has meant that the UK is under-investing in the optimal level of health care overall.

A similar position obtains in education. In 2010 UK government spending on education was over 5.6 per cent of GDP (perhaps inflated by the GFC reducing GDP), but by 2019 (pre-pandemic) it had declined steadily to around 5.2 per cent of GDP.[8] Meanwhile, there has not been a clear alternative policy to expand and encourage private sector education.

As this paper is being written, that policy inaction is being revealed in the issue of crumbling concrete in UK schools (and hospitals): there has not been sufficient investment even to maintain the safety of school buildings.

7 https://ifs.org.uk/articles/will-be-biggest-tax-raising-parliament-record
8 Source: https://tradingeconomics.com/united-kingdom/public-spending-on-education-total-percent-of-gdp-wb-data.html

To quote the BBC report once more:

> *"Net public investment will fall from 2.9 per cent of our national income to 2.1 per cent over the next four years."*

There is no sign of private investment rising to replace falling public investment. There has been no sign of public investment 'crowding out' private investment over the past quarter century. Interest rates for much of that period have been low in real and nominal terms. Pre-pandemic, the UK corporate sector's finances were generally in good health with firms simply struggling to find profitable investment opportunities as conventionally defined. Against this backdrop of weak private sector investment, plans to lower public investment will mean lower investment in aggregate.

To be clear, this paper is not advocating a party political or ideological position on whether investment in health and education should be (more) public or private led, or continue with the same mix. But it is making the case for an activist policy to increase investment in health and education, whichever strategy is chosen, rather than continuing with a passive decline.

8. Investing in the Transition to Net Zero

8.1 The Climate Change Threat

Climate change is the single most important challenge facing humanity today. In 2023, the Earth was around +1.5°C warmer than the reference point of the global 'pre-industrial period' 1850-1900.[1] Most of that warming has happened in the past 50 years or so. It is not just a long-term problem – the world economy has already witnessed huge financial losses in addition to major loss of life as a result of climate change generating increasingly extreme weather events, more frequently, coupled with consequences such as sea-level rise.

Newsworthy examples in developed countries include the unprecedented flooding in major cities such as New York, New Orleans and Brisbane, and uncontrollable wildfires in places such as Europe, Canada, the US and Australia. The variation in global temperature is erratic but the underlying trend is clearly upwards. These are all observable, measured facts and the likelihood is that the damage will get much worse over ensuing decades.

The best scientific hypothesis is that climate change is being caused by human activity, most notably the emission of 'greenhouse' gases (GHGs) such as carbon dioxide and methane. Since the industrial revolution first started, the presence of carbon dioxide in the Earth's atmosphere – where it acts to trap heat radiating from the Earth – has risen to around 420 parts per million[2] (ppm), about 80 per cent more than the average over the previous 800,000 years.

According to the Royal Society,[3] this is not unprecedented:

> *'...the concentration of CO_2 last approached 400 ppm about 3 to 5 million years ago, a period when global average surface temperature is estimated to have been about 2 to 3.5°C higher than in the pre-industrial period. At 50 million years ago, CO_2 may have reached 1000 ppm, and global average temperature was probably about 10°C warmer than today. Under those conditions, Earth had little ice, and sea level was at least 60 metres higher than current levels.'*

At the COP21 inter-governmental meetings in Paris, 2015, 196 signatory authorities stated their collective intention to limit global warming to no more than +2°C with ambitions of limiting it to no more than +1.5°C. Many governments have since set GHG emissions targets of net zero by the middle of this century.

If net zero emissions are achieved – and emissions are not yet even falling globally – then that would still leave the stock of GHGs in the atmosphere around double its previous average. It is hoped that this may limit global warming to no more than +2°C but no one can be really sure that level of warming would result in a stable climate.

1 The 1850-1900 average is the reference temperature for the 2015 Paris Agreement to limit global warming.
2 Source https://www.co2.earth/daily-co2 .
3 https://royalsociety.org/topics-policy/projects/climate-change-evidence-causes/question-7/#:~:text=Measurements%20of%20air%20in%20ice,particularly%20remarkable%20%5Bfigure%203%5D .

Global warming will continue for quite some time after net zero is reached. Eventually, the Earth will likely need net GHG extractions for a long period to return the stock of GHGs, and hence the climate, to its previous 'normal' ranges. By then a huge amount of irreversible damage will have been caused. It is a bleak prognosis for our descendants, even if current policy ambitions are met in full.

The theories explaining man-made global warming are supported by the evidence and generally accepted by the scientific community and by governments, if not by vested interest groups. We have to allow, nevertheless, that it cannot be 100 per cent proven that climate change is man-made. But if society waits for 100 per cent proof, then it will miss the opportunity to avert what appears to be a severe, existential threat. No one would want to live on a planet which had warmed by, say, an average of 4°C and in which the sea level – currently rising by around 3.5 mm a year[4] – was many metres higher.

At the World Economic Forum (WEF) each year, many public and private leaders of the world participate in a survey of the greatest risks (WEF, 2023). For some years now, climate and environmental risks have dominated the top ten risks.[5] World leaders know about the risks, they have accepted them, and they have promised to act. But global society is still collectively on the road to potential disaster.

In order to achieve net zero, and ultimately move into negative emissions territory, there needs to be changes in some of the basic ways in which economies operate, most especially in energy sources. This will not happen just by individuals making personal choices or firms making business decisions. It requires a systematic approach to national energy policies, that will require a huge amount of investment. It will inevitably require political authorities and their technical arms to at least coordinate and most probably lead.

At a minimum, the global economy needs to move away from fossil fuels: first coal, then oil, then gas. Net zero will require electricity supplies, national grid and local, that operate entirely on renewable and (most likely) nuclear energy. That in turn requires an investment in industrial-capacity energy storage solutions: the wind doesn't always blow; the sun doesn't always shine and the rain doesn't always fall.

At an individual level, people also need to avoid the use of fossil fuels in transport and other portable energy consumption. For transport there needs to be some combination of electric, hydrogen fuel cells, biofuels or other technology to replace petrol and diesel engines. In particular, the world needs an alternative to aviation fuel (kerosene). There is currently no tax on aviation fuel, by international treaty.[6] This means that the global economy effectively subsidises air travel relative to rail or road. Similar arguments apply to marine fuel.

Carbon-related emissions pricing is necessary. But carbon pricing is not sufficient to address climate change, even if it was to be comprehensively and consistently applied – which it has not been. Carbon emissions need to be eliminated, not just discouraged or compensated for. The reasons why carbon pricing is necessary but not sufficient to achieve that are explored in Fisher et al., 2023.

4 Source: NASA. https://sealevel.nasa.gov/faq/8/is-the-rate-of-sea-level-rise-increasing/ .
5 Global Risks Report, 2023. https://www.weforum.org/reports/global-risks-report-2023/ .
6 The Convention on International Civil Aviation, ratified in 1947 https://www.icao.int/publications/pages/doc7300.aspx .

In the near-term, investing in measures to reduce energy use, such as increased home insulation, will help on the journey towards net zero, but ultimately a complete change in energy source away from fossil fuels is essential and that will require even more substantial investment.

Solutions could and should be more holistic than currently envisaged. For example, as well as changing the energy used in transportation, a decrease in the total demand for travel would be useful. If businesses could rely increasingly on virtual connections, rather than in-person, congestion and costs would be lowered, productivity improved and emissions reduced.

International trade in goods could also be affected. Relocating the production of goods to be closer to the point of consumption could reduce global emissions. Although exploiting comparative advantage is a strong incentive to trade, if the full societal costs of transportation had to be paid, that would offset at least part of the benefits from international specialisation. And as manufacturing moves towards fully automated production, productivity differences in the production of physical goods may anyway diminish to the point of being smaller than the costs of transport. Trade in those services which do not rely on physical location may become increasingly dominant (tertiary education is one example, software, architecture and other design services another).

8.2 The Cost of the Transition

Transition to net zero is necessary to preserve the existence and effectiveness of a global economy. It should not be thought of as a net cost. The costliest path would be to neglect the challenge and allow global temperatures to rise to a level which was unsustainable for most of humanity. Since the 'do nothing' path is unsustainable and would lead most likely to massive displacement of populations, death and war, as well as a disintegration of the global economic system, it does not even provide a counterfactual against which transition paths can be properly costed. The transition to net zero is an investment in the survival of the global economy.

There are alternative trajectories that could be chosen for the transition. One could, in principle and with a lot of guesswork, compare those choices. Stern (2006) concluded that:

> *'the benefits of strong and early action far outweigh the economic costs of not acting.'*

The simple proposition is that action taken sooner will be more effective in limiting global warming. Global warming and its consequences are not linear processes – there are likely to be 'tipping' points beyond which damage is much greater and potentially irreversible. Delayed action, most likely in reaction to growing crises, would be more expensive, more abrupt and hence cause more disruption as well as leading to more, and hence more costly, consequences of climate change.

The most relevant calculation is not the cost of climate change mitigation, it's the cost of delay and neglect. Whilst one could optimise the transition path, a strategy of front-loading is clearly going to be more efficient in the long-run than back-loading (unless one has an extremely high discount factor).

Reaching net zero may well be dependent on technology not yet available for widespread use. Examples include small-scale green hydrogen fuel cells, large scale GHG extraction techniques, and non-fossil alternatives to aviation fuel. That suggests not just investment, but significant dedicated resources need to go towards Research and Development for both climate change mitigation and adaption, preferably in technologies which don't rely on scarce resources.

This paper does not enumerate the various targets for investment expenditure needed to achieve the transition, which can be found elsewhere and are variable but consistently very large. Rather we note that, if the economy is to become net zero, all investment and all government expenditure must become consistent with zero emissions.

It is particularly important to note that investing in the transition to net zero and climate change adaption is not simply a matter of net public expenditure. It is a huge business opportunity for the private sector, and a way for government to stimulate economic growth, notwithstanding the trend slowdown.

The transition will create demand for new goods and services – this could range from electric cars and local renewable energy generation through to an increased demand for efficient air conditioning. Those businesses which can provide appropriate new products or services will thrive, investing in new facilities and creating new jobs.

At the same time, the transition will shift production methods to be more sustainable. Contrary to the 'cost' arguments, renewable energy is likely to be much cheaper and more secure in the long-run. Despite recent costs rises, off-shore wind is reckoned to be the cheapest energy supply in the UK (according to Carbon Brief amongst others).[7]

War in Ukraine has demonstrated (yet again) that dependency on fossil fuels supplied from distant countries does not provide energy security. For the past 50 years the developed world has been regularly rocked by volatility in oil prices, with a large part of global oil production coming from a would-be cartel in the form of OPEC. If a country could rely on cheap, plentiful, renewable energy from within its own borders, that must improve its security of supply and reduce the likelihood of inflationary shocks, as well as hit emissions targets.

Could investing in the transition actually help restore economic growth and productivity? Perhaps, since it could mark a new post-industrial phase of human technology. If growth rates were to resume at previous levels, that would be the likely reason. Productivity growth would be higher in the new industries than the old for at least a while and it would stimulate a lot of activity in relevant sectors. But at this stage, one could not be sure that this wouldn't simply displace activity in fossil-fuel dependent sectors.

In employment terms, the benefit of moving to net zero is perhaps clearer. In the US coal industry in 1923 there were estimated to be 883,000 people employed. By 2013 that had fallen to just under 85,000 people and by 2023 to 55,000[8] (having troughed at 41,000 in 2021). In contrast the US solar industry in 2022 employed about 263,000.[9] New jobs will be grown in the new industries, not the old.

7 https://www.carbonbrief.org/analysis-uk-renewables-still-cheaper-than-gas-despite-auction-setback-for-offshore-wind/ .
8 https://www.ibisworld.com/industry-statistics/employment/coal-mining-united-states/
9 https://irecusa.org/programs/solar-jobs-census/

Following earlier conclusions, the focus of investment in the transition should be on preserving and improving the quality of life. Clean air and a sustainable environment are justification in themselves even if they do not get reflected in GDP. Change in production techniques and new goods and services should also be a source of employment growth. If there is a spill-over that raises total productivity, then so much the better. But that may be hard to demonstrate if the choices are between differing speeds of slowdown.

8.3 What Investments is the UK Making in the Transition?

In the UK's 2023 Green Finance Strategy (HMG, 2023) the Government noted that:

> *"We established a UK Infrastructure Bank with £22 billion of capital to level up and decarbonise our economy. And we have raised over £26 billion through selling green gilts."*

Elsewhere the document acknowledges that:

> *"through the late 2020s and 2030s, an additional £50-60 billion capital investment will be required each year. A 2021 report estimated that over the next ten years, our domestic nature-related goals could require between £44-97 billion of investment."*

Against this it notes that:

> *"We committed £30 billion of domestic investment for the green industrial revolution at Spending Review 2021, as well as £6 billion for energy efficiency at the Autumn Statement 2022 and up to £20 billion for CCUS[10] announced at Spring Budget 2023."*

These policies are described in a rather piecemeal fashion, and because of that it is hard to know whether these numbers involve double counting, how much is new spending, how much is actually through tax incentives, or how hard the commitments really are. For example, recent reports reveal that the UK is struggling to meet its targets on residential heat pump installation, targets for which have been delayed.

The Green Finance Strategy assumes that private investment is key to the transition. But there is no clear strategy for making that happen, rather a further series of piecemeal policies are cited.

UK Government policy has not obviously had much galvanising effect on British industry so far. Indeed, more recent government announcements – on electric cars, heat pumps and HS2 – have, if anything, created new uncertainties for private business concerning long-term investment plans.

10 Carbon (dioxide) capture, use and storage.

Many of the policies or projects listed in UK Government strategy documents should make a worthwhile positive contribution to the transition and the limited investment incentives should be beneficial. But they don't amount to a clear strategy to deliver net zero and the element of net government spend seems to be small relative to the nature of the problem.

To repeat an earlier point, part of the problem is that the existing investment incentives are narrowly defined to focus on physical assets. As the BBC report cited at the beginning of this paper stated:

> *"Various tax changes have been tried, …. which gave businesses investing in certain types of equipment, like machinery, a much higher tax reduction than usual."*

For many service sector companies contributing to the transition, this narrow approach to investment concepts will not help.

8.4 US and EU Green Investment Policies

The United States passed the Inflation Reduction Act (IRA) in August 2022. It contains some two dozen tax provisions and committed to $370 billion in federal funding for clean energy, with the goal of substantially lowering national carbon emissions by 2030.[11] The funds will be delivered through a mix of tax incentives, grants, and loan guarantees, but it is notable that tax incentives make up the larger part. Clean electricity and transmission command the biggest slice of these commitments, followed by clean transportation, including electric-vehicle (EV) incentives.

In the year after the IRA was passed, it did appear to have had a galvanising effect on the US private sector. The reports of success mostly come with political spin, so have to be treated cautiously, but one such report (CAP, 2023) – which says that it is based on announcements by private sector companies – claims that:

> *"Clean energy projects creating 170,606 new jobs in 44 states were announced or advanced between August 16, 2022, and July 20, 2023. There are 272 new clean energy projects in small towns and big cities nationwide, totalling $278 billion in new investments. Plans include 91 new battery manufacturing sites."*

If accurate, that seems to be a scale above anything happening in the UK, even allowing for the US economy having 8 times more GDP and 5 times more population than the UK.

A White House briefing[12] on the first-year anniversary of the IRA notes that, since the Act was signed:

11 https://www.whitehouse.gov/wp-content/uploads/2022/12/Inflation-Reduction-Act-Guidebook.pdf .
12 https://www.whitehouse.gov/briefing-room/statements-releases/2023/08/16/fact-sheet-one-year-in-president-bidens-inflation-reduction-act-is-driving-historic-climate-action-and-investing-in-america-to-create-good-paying-jobs-and-reduce-costs/

> *"The private sector has announced more than $110 billion in new clean energy manufacturing investments, including more than $70 billion in the electric vehicle (EV) supply chain and more than $10 billion in solar manufacturing."*

It was claimed that the IRA and the Bipartisan Infrastructure Law together would:

- Save American families up to $38 billion on electricity bills
- Reduce U.S. net greenhouse gas emissions 40per cent below 2005 levels by 2030
- Strengthen U.S. energy security by reducing net crude oil imports by nearly 60 per cent
- Reduce industrial and manufacturing emissions up to 40 per cent below 2005 levels
- Double the share of American electricity generated by clean sources to 80 per cent
- Accelerate the electrification of the American vehicle fleet, with the share of zero-emission light-duty vehicle sales reaching up to 65 per cent

And:

- U.S. electricity generation from wind is expected to triple and solar generation is expected to increase seven- to eight-fold by 2030, according to Department of Energy estimates. Over the next seven years, we expect twice as much wind, solar, and battery deployment as there would have been without the Inflation Reduction Act.

The wider context of the IRA was claimed to be one of reducing household bills, reducing the federal deficit and increasing growth and employment. That seems an implausible golden scenario for any policy outcome but it did include other measures to reduce prices and to raise tax revenue from minimum corporate tax rates and by closing tax loopholes for the wealthy. 'Politically friendly' forecasts suggest around one per cent higher GDP net by 2030 as a result of the package of measures (likely to be well within any plausible confidence interval around zero).

A central strategic plank of the IRA expenditure on green energy seems to be a decision to use tax credits for most of the 'funding'. This seems to be a sensible approach. The difficulties of public subsidies and expenditure more broadly include the financial and political costs of funding, even if outweighed by the benefits. Raising taxes to give to businesses, when one could otherwise cut taxes or spend on social projects, is not an obvious vote-winner. But by using tax credits designed to prompt more economic activity, the cash cost is back-loaded, and minimised to the extent that profits are being made at that point of full tax collection. And optically, allowing a business to keep more of its profits is not seen as the same as handing over taxpayers' cash in grants. It might also be difficult to politically roll-back in future years once the tax credits have been allocated.

Tax deductions for investment do not seem to have worked in the UK, so it may be worth further research on whether there is something more effective in the US measures, than the UK's.

A second strategic aim of the IRA – partly from necessity – seems to have been to have one big policy shot, heavily promoted, to drive change. Economic 'shock and awe' perhaps. One might contrast this with the UK's approach which seems to be to announce policies piecemeal, with a perception of small funding allocations and limited ambitions which are often subject to later delays, compromises or constraints.

One lesson from monetary and fiscal policy is that credibility is always and everywhere a key factor in ensuring policy success.

Whether the full claims for the success of the IRA can be justified is difficult to judge, but at least one participant in PC evidence sessions described it as a game-changing approach.

Meanwhile the EU announced a 'European Green Deal Investment Plan' in 2020. This was a set of policy initiatives by the European Commission with the overarching aim of making the EU climate neutral in 2050. It comprises two principal financing streams totalling €1 trillion. Over half of the budget, €528 billion, will come directly from the EU budget and the EU Emissions Trading System. The remainder will be sourced through the InvestEU programme, which combines €279 billion from the public and private sectors to 2030 and €114 billion from national co-financing.

Critics have complained that most of this is not new funding, and merely an exercise in greenwashing.[13] Much of the EU agenda seems to be pursued through regulation, rather than genuine incentives for the real economy. Indeed, one of the hurdles for action in the EU is its rules against state aid for business which make it difficult (but not impossible) to subsidise individual companies. One of the supposed benefits from Brexit was to be the ability to ignore EU rules. There is nothing now externally constraining the UK Government from directly supporting specific businesses that are focussed on delivering net zero.

8.5 A Green Investment Strategy for the UK

Whatever the criticisms of the different approaches embedded in US and EU policies, they set a competitive comparison for promoting green industry, with support for new investment. If the UK wants to achieve net zero and also compete with US and EU firms benefitting from those various support measures, then it needs to revisit its strategy and become more proactive.

The transition to net zero will generate huge public benefits which the private sector cannot (and arguably should not) internalise on its own. In some areas public funding will be needed, in others, where the private sector can invest, incentives will be needed to drive the economy forward quickly. That balance may be subject to political debate, but drawing on the US and EU plans (both positive and negative observations) the requirements might be as follows:

13 https://www.theguardian.com/commentisfree/2020/feb/07/eu-green-deal-greenwash-ursula-von-der-leyen-climate.

i. The amounts of new money invested must be large and commensurate with the existential threat posed by climate change in order to be credible.

ii. A range of financing tools should be used so as to alleviate financial constraints on the public sector: tax credits, guarantees, public-private partnerships etc.

iii. The plans should be certain and be honoured, to establish credibility and so enable both public and private sector to plan and implement. They should not be subject to second thoughts or de-funding on short-term financial or political grounds. Ideally this would be achieved through a bipartisan approach. Although no government can constrain a future government entirely, swings in policy caused by regular changes in government ministers, can destroy long-term policy consistency.

iv. Accountability: The investment plans should be detailed and a full transition plan for net-zero published, that shows how it is to be achieved and against which progress can be judged.

v. The plans should be judged on how they map into reductions in GHGs. They may also help to stimulate overall output growth and productivity, but that is a side-consideration: the transition to net zero would be sufficient justification.

9. Conclusions

Despite the evidence and analysis submitted to the Productivity Commission, and an extensive academic literature elsewhere, there is no consensus on why there has been an international slowdown in productivity growth, nor why the UK has been underperforming (e.g. see Goldin et al., 2022). There is a lot of detailed evidence accounting for the slowdown, identifying absolute or relative weaknesses, but little root cause analysis. That makes it hard to be certain of policies to address that slowdown. Nevertheless, higher investment, both public and private in a range of activities, could be justified on its own merits.

In reviewing the data, this paper observes that the international slowdown has been happening for a long time. It has been visible at least since 2000 in a range of advanced economies, including the UK.

Many studies look at the specific productivity slowdown in the UK since 2007/8, linking it to the Great Financial Crisis. But the demand-driven expansion of UK output in the years from 2002-2007 may be biasing those results and a longer time frame is appropriate.

Over a longer period, the pattern of slowdown seems consistent internationally. It most likely reflects the de-industrialisation of mature economies, leading to slower measured productivity growth as a natural and inevitable outcome of a change in economic structure.

Exponential GDP growth at a constant rate was never feasible, not least given the constraints imposed by the limited physical resources of the planet.

This paper is not anti-growth, nor a counsel for despair. Policy should be aiming to support the maximum sustainable growth rate. It should do that looking forward at how the economy is evolving, not by looking at or even comparing with 'glories of the past'.

Macroeconomic data does not seem to be reflecting the enormous changes in lifestyle following the internet-based revolution. It does not seem plausible that living standards have been growing as slowly as GDP per capita. Society is focussing increasingly on aspects of welfare going much broader than material possessions. Existing statistical indicators are not appropriate to measure the nature of the change in society and its wellbeing.

Any national investment strategy should focus on maximising the welfare benefits to society arising from deployment of the new technology. The fact that many of the benefits of mobile computing are not monetised does create an ongoing problem for the tax base and this needs to be addressed.

Evidence submitted to The Commission identifies substantial differences in productivity in the regions and 'other' cities of the UK and seeks to promote greater regional investment. A strong case can be made for regional-led investment on socio-political grounds, and a plausible case can be made that increased spending on items such as health, education and net zero could be channelled more effectively and democratically by regional bodies, given the relatively high degree of centralisation of UK Government. But this paper argues that no convincing root cause analysis has been advanced to explain why regional productivity differences exist and one cannot be sure that the policies advocated, whatever their merits, would improve the national productivity underperformance. Regional policies can and should be justified by their local context.

In looking at how the UK should approach its national productivity challenge, this paper argues for a more organised, disciplined and activist approach to support investment, using a project-portfolio approach and with greater emphasis on normal project disciplines being rigorously applied. That could at least help close the UK's underperformance gap, even if a long-run slowdown is unavoidable.

Drawing on some of The Commission evidence on intangibles, the paper argues that investment policy needs to go much wider than the traditional focus on supporting physical assets. That includes, especially, investing in the workforce themselves. As the structure of the economy changes, so does the structure of the investment required.

As part of a new approach to investment strategy, the paper argues for a more activist policy on investment in services that are currently being provided by the public sector, especially health and education. The strategic choice is between maintaining these services as public provisions and investing in them appropriately, or actively incentivising more private sector provision. Good health and advanced education are themselves key factors in supporting national productivity growth so achieving improvements by one route or the other is vital. But as it stands, neither choice is being made. Public investment is being squeezed, private provision is not significantly replacing public provision, and hence the services are at risk of increasingly failing to meet public needs and expectations.

A final section of the paper marks out one other area where the UK needs to specifically raise its investment game: the transition to net zero. Current policy appears to be piecemeal, subject to myopic budget constraints, continual revision and under-delivery. The UK is in danger of falling a long way behind the US and EU in transforming its economy to a competitive net zero. The Inflation Reduction Act in the US is described by some commentators as transformative. The UK's efforts do not seem to have had the same galvanising effect, and it would be worth further research to determine what the UK can learn from the US experience.

References

Ahmad, N., J. Ribarsky, J. and M. Reinsdorf, M. (2017): 'Can potential mismeasurement of the digital economy explain the post-crisis slowdown in GDP and productivity growth?', OECD Statistics Working Papers, No. 2017/09, OECD Publishing, Paris. https://doi.org/10.1787/a8e751b7-en

Andres, R., DeStefano, T, ., Niebel, T., and Viete, S. (2020): 'Capital incentive policies in the age of cloud computing: An empirical case study', OECD Science, Technology and Industry Working Papers, No. 2020/07, OECD Publishing, Paris, https://doi.org/10.1787/4bedeb36-en

Barker, K. (2006): Barker Review of Land Use Planning, HMSO 349591 https://assets.publishing.service.gov.uk/media/5a7c35b6ed915d76e2ebbd10/0118404857.pdf

Barnett, A., Batten, S., Chiu, A., Franklin, J. and Sebastiá-Barriel, M. (2014): 'The UK productivity puzzle', Quarterly Bulletin, Vol 54 (2), Bank of England. https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2014/the-uk-productivity-puzzle.pdf

Bergeaud, A., Cette, G. and Lecat, R. (2016): 'Productivity Trends in Advanced Countries between 1890 and 2012', Review of Income and Wealth, vol. 62(3), pages 420–444. http://www.longtermproductivity.com/

Bloom, N., Jones, C.I., Van Reenen, J., Webb, M. (2017): 'Are ideas getting harder to find?', National Bureau of Economic Research, Working Paper 23782. https://www.nber.org/papers/w23782

Borio, C., Disyatat, P., Juselius, M. and Rungcharoenkitkul, P. (2017): 'Why so low for so long? A long-term view of real interest rates', Bank for International Settlements, Working Paper no. 685, December. https://www.bis.org/publ/work685.pdf

Brynjolfsson, E., Collis, A., Diewert, D.E., Eggers, F. and Fox, K.J. (2019): 'GDP-B: Accounting for the Value of New and Free Goods in the Digital Economy', NBER Working Paper 25695. https://www.nber.org/papers/w25695

Byrne, L. (2021): 'Reformation in the Age of the Shock Wave', Submission to the Productivity Commission. https://www.niesr.ac.uk/wp-content/uploads/2021/11/Liam-Byrne.pdf

Carella, A., Chen, R. and Shao, X. (2023): 'Enhancing Business Investment in the United Kingdom', IMF Selected Issues Paper SIP/2023/050, International Monetary Fund.

Center for American Progress (2023): 'Implementing America's Clean Energy Future'. https://www.americanprogress.org/article/implementing-americas-clean-energy-future/

Chadha, J.S. and Samiri, I. (2022): 'Macroeconomic Perspectives on Productivity', The Productivity Institute Working Paper No.030, December.

Coelho, M. and Ratnoo, V. with Dellepiane, S. (2014): 'Political Economy of Infrastructure in the UK', Institute for Government, December. https://www.instituteforgovernment.org.uk/publication/report/political-economy-infrastructure-uk

Collinson, S., Driffield, N., Hoole, C. and Kitsosz, A. (2022): 'Between a rock and a hard place: Trade offs between prosperity and inclusivity when implementing regional growth policies', The Productivity Institute Productivity Insights Paper No.013.

Corrado, C., Haskel, J., Jona-Lasinio, C. and Iommi, M. (2022): 'Intangible Capital and Modern Economies', Journal of Economic Perspectives, Volume 36, Number 3, Pages 3–28.

Coyle, D. and Mei, J-C. (2022): 'Diagnosing the UK productivity slowdown: Which sectors matter and why?', University of Cambridge, Bennett Institute for Public Policy, Cambridge, UK. https://www.bennettinstitute.cam.ac.uk/wp-content/uploads/2022/04/Productivity-Slowdown-in-Manufacturing-and-Information-Industries_CoyleMei.pdf

Coyle, D., van Ark, B. and Pendrill, J. (eds) (2023): 'The Productivity Agenda'. The Productivity Institute. Report No. 001.

Deaton, A (2023): Economics in America. Princeton University Press.

Dorling, D. (2020): Slowdown: The end of the Great Acceleration - and Why It's Good for the Planet, the Economy, and Our Lives, Yale University Press.

Driffield, N., Görg, H., Temouri, Y., and Yuan, X. (2022): 'Multinational enterprises and the welfare state', Transnational Corporations, Volume 29, 2022, Number 2.

Driffield, N. Lavoratorix, K. and Temouri, Y. (2021): 'Inward investment and UK productivity', The Productivity Institute Working Paper No.014.

Feenstra, R. C., Inklaar, R., and Timmer, M. P. (2015): 'The Next Generation of the Penn World Table', American Economic Review, 105(10), 3150-3182. https://www.rug.nl/ggdc/docs/the_next_generation_of_the_penn_world_table.pdf

Fernald, J. and Inklaar, R. (2022): 'The UK Productivity "Puzzle" in an International Comparative Perspective', April, The Productivity Institute, Working Paper No.020. https://www.productivity.ac.uk/wp-content/uploads/2022/04/WP020-The-UK-productivity-puzzle-in-an-international-comparative-perspective-FINAL-010422.pdf

Fisher, P.G., Garcia, M. and Herbstein, T. (2023): 'The big'C': making carbon markets work'. London Institute of Banking and Finance, White Paper, 06/23. https://sustainable.libf.ac.uk/white-papers/

Goldin, I., Koutroumpis, P., Lafond, F. and Winkler, J. (2022): 'Why is Productivity Slowing down?'. Oxford Martin School, Working Paper, 2022-8. https://www.oxfordmartin.ox.ac.uk/downloads/academic/2022-8-WP-Upload-4-Why-is-Productivity-Slowing-Down.pdf

Goodridge, P. and Haskel, J. (2022): 'Accounting for the slowdown in UK innovation and productivity', The Productivity Institute Working Paper No.022, December.

Haskel, J. and Westlake, S. (2022): Restarting the Future: How to Fix the Intangible Economy, Princeton University Press.

HMG (2017): 'UK Industrial Strategy: A leading destination to invest and grow'. https://assets.publishing.service.gov.uk/media/5a75559fe5274a3cb28699b5/uk-industrial-strategy-international-brochure-single-pages.pdf

HMG (2022): 'Levelling Up the United Kingdom: missions and metrics Technical Annex'. https://assets.publishing.service.gov.uk/media/620b772be90e0710a7b3ffca/Technical_annex_-_missions_and_metrics.pdf

HMG (2023): 'Mobilising Green Investment: 2023 Green Finance Strategy'. https://assets.publishing.service.gov.uk/media/643583fb877741001368d815/mobilising-green-investment-2023-green-finance-strategy.pdf

IMF (2023): 'IMF Executive Board Concludes 2023 Article IV Consultation with the United Kingdom', Press Release, July. https://www.imf.org/en/News/Articles/2023/07/10/pr23259-imf-executive-board-concludes-2023-article-iv-consultation-with-the-united-kingdom

Jones, R.A.L. (2022): 'Science and innovation policy for hard times: an overview of the UK's Research and Development landscape', The Productivity Institute, Productivity Insights Paper No.014, December.

King, A. and Crewe, I. (2013): The Blunders of our Governments', Oneworld Publications.

King, M.A. (2011): 'Do we need an international monetary system?' speech by the Governor of the Bank of England, at the 2011 Economic Summit, Stanford Institute for Economic Policy Research (SIEPR), Stanford, California, 11 March 2011. https://www.bis.org/review/r110315a.pdf

McAfee, A. and Brynjolfsson, E. (2017): Machine, Platform, Crowd: Harnessing the Digital Revolution: Harnessing Our Digital Future. W. W. Norton & Company.

McCann, P. (2022): 'Levelling Up: The Need for an Institutionally Coordinated Approach to National and Regional Productivity', The Productivity Institute Productivity Insights Paper No. 011.

Montes, J., Smith, C. and Dajon, J. (2022): '"The Great Retirement Boom": The Pandemic-Era Surge in Retirements and Implications for Future Labor Force Participation', Finance and Economics Discussion Series, 2022-081, Federal Reserve Board, Washington, D.C. https://www.federalreserve.gov/econres/feds/files/2022081pap.pdf

Nelles J., Walsh, K., Papazoglou, M. and Vorley, T. (2022): 'FECs, innovation, and skills: A literature review', The Productivity Institute Productivity Insights Paper No.012, September.

OECD (2020): 'Enhancing Productivity in UK Core Cities: Connecting Local and Regional Growth'. OECD Publishing, Paris. https://doi.org/10.1787/9ef55ff7-en.

Pessoa, J.P. and Van Reenen, J. (2014): 'The UK productivity and jobs puzzle: does the answer lie in wage flexibility?', The Economic Journal, 124 (May), 433–452.

Pilat, D. (2023): 'The Rise of Pro-Productivity Institutions: A Review of Analysis and Policy Recommendations'. The Productivity Institute Productivity Insights Paper No.015. https://www.productivity.ac.uk/research/the-rise-of-pro-productivity-institutions-a-review-of-analysis-and-policy-recommendations/

Productivity Commission (2022): 'Productivity in the UK: Evidence Review: First report of the UK Productivity Commission', Productivity Commission, June. https://www.niesr.ac.uk/wp-content/uploads/2022/06/Productivity-in-the-UK-Evidence-Review.pdf

Productivity Commission (2023): 'Priorities for 2023', Productivity Commission, February. https://www.niesr.ac.uk/wp-content/uploads/2023/01/Productivity-Commission-Policy-Priorities.

Stansbury, A., Turner, D. and Balls, E. (2023): 'Tackling the UK's regional economic inequality: binding constraints and avenues for policy intervention', Contemporary Social Science. https://doi.org/10.1080/21582041.2023.2250745

Stern, N. (2006): The economics of climate change: The Stern review. https://webarchive.nationalarchives.gov.uk/ukgwa/20100407172811/https:/www.hm-treasury.gov.uk/stern_review_report.htm

Tilley, H., Newman, J., Connell, A., Hoole, C. and Mukherjee, A. (2023): 'A place-based system? Regional policy levers and the UK's productivity challenge', Regional Studies, 57:10, 2102-2114 https://doi.org/10.1080/00343404.2022.2152436

van Ark, B., de Vries, K., Pilat, D. (2023): 'Are Pro-Productivity Policies Fit for Purpose?' Working Paper No. 038, The Productivity Institute. https://www.productivity.ac.uk/wp-content/uploads/2023/09/WP038-Are-pro-productivity-policies-fit-for-purpose-270923.pdf

Vollrath, D. (2020): Fully Grown: Why a stagnant economy is a sign of success, University of Chicago Press. https://growthecon.com/fully.html

Wallis, P., Colson, J. and Chilosi, D. (2018): 'Structural change and economic growth in the British economy before the Industrial Revolution, 1500-1800', Journal of Economic History, Sept; 78(3): 862–903. https://eprints.lse.ac.uk/84510/1/Wallis_Structural%20change_2017.pdf

Westwood, A., Sensier, M. and Pike, N. (2021): 'Levelling Up, Local Growth and Productivity in England', The Productivity Institute Productivity Insights Paper No.005. https://www.productivity.ac.uk/wp-content/uploads/2021/12/PIP005-Levelling-Up-FINAL-011221.pdf

World Economic Forum (2023): Global Risks Report 2023. https://www.weforum.org/reports/global-risks-report-2023/

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