November 2019

UK Economic Outlook

Special features on:

The Productivity Puzzle revisited: why has UK productivity lagged behind other advanced economies?

What drives regional productivity gaps across the UK and how can these be closed?

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Highlights and key messages for business and public policy

Key projections

(%)	2019	2020
Real GDP growth	1.2	1.0
Consumer spending growth	1.2	1.4
Fixed investment growth	-0.3	-0.5
Inflation (CPI)	1.8	1.5

Source: PwC main scenario projections

Recent UK developments and prospects

- In our main scenario, we project UK economic growth to remain modest at 1.2% in 2019 and around 1% in 2020, somewhat below its long-term average rate of around 2%.
- These projections assume an orderly exit from the EU. Risks are weighted to the downside over this period due to the possibility of a more disorderly Brexit as well as global economic risks.
- Consumer spending has continued to drive the economy, helped by stronger real earnings growth over the past year. But the housing market has cooled and business investment has been on a declining trend as a result of Brexit-related uncertainty. Employment also fell back slightly in the third quarter from previous record highs.
- The Bank of England is expected to keep interest rates on hold until the situation on both Brexit and the global economy is clearer.

UK productivity level continues to lag behind other advanced economies

- Latest data suggest that UK output per worker lags around 10-15% behind Germany, France and Sweden and more than 30% behind the US.
- Our analysis shows that, with the partial exception of Germany, these productivity gaps are not due to the UK having too small a manufacturing base. Instead they reflect lower average UK productivity within certain industry sectors relative to other advanced economies.
- Comparative international evidence suggests that relatively low levels of UK investment and R&D spending and a longer tail of companies and workers with relatively low productivity and skills are the main reasons for this productivity shortfall in the UK relative to other advanced economies.

Levelling up productivity across the UK could boost GDP by over £80 billion

- There are wide regional variations in productivity per job across the UK. This is mostly due to productivity differences within particular sectors, rather than differences in industry structures across the UK.
- Our analysis suggests that variations in skills levels and transport connectivity are the most important factors in explaining differences in productivity across UK local areas and so should be a particular focus of investment for both government and business.
- If local areas with productivity below the UK average level could make up half of this gap, the boost to UK GDP could be as much as 4%, or around £83bn.

1. Summary

Recent developments

Economic growth has been volatile so far this year, with relatively solid growth in the first and third quarters interspersed with declining output in the second quarter. This largely reflects Brexit-related timing effects, however, and looking through this volatility the underlying trend has been for continued modest growth of around 1% over the past year.

Consumer spending has remained relatively resilient, despite some slowdown in retail sales growth in recent months, and government spending has picked up during 2019. But business investment shrank for four consecutive quarters in 2018 as anxiety about the uncertainties of Brexit became more acute. Investment rose slightly in the first quarter of 2019, and stockbuilding jumped due to contingency plans for a possible no deal Brexit at the end of March, but both dropped back in the second quarter. Business surveys suggest continued subdued confidence and investment in the third quarter.

The jobs market has generally remained strong, with the employment rate at near record levels and unemployment down to its lowest rate since the mid-1970s, but employment did fall back slightly in the third quarter. Over the past year the scarcity of workers has finally lent them some bargaining power, which has fed through into increased real wage growth. But this will be difficult to sustain in the medium term unless productivity growth also picks up from the subdued rates seen over the past decade.

Table 1.1: Summary of UK economic growth and inflation prospects

Indicator (% change on previous year)	Bank of England forecasts (November 2019)		Independent forecasts (October 2019)		PwC main scenario (November 2019)	
	2019	2020	2019	2020	2019	2020
GDP	1.25	1.25	1.2	1.0	1.2	1.0
Consumer spending	1.25	1.5	1.4	1.3	1.2	1.4
Inflation (CPI)	1.8	1.5	1.9	2.0	1.8	1.5

Source: Bank of England forecasts (November 2019), HM Treasury survey of independent forecasters (average value of new forecasts made in October 2019 survey) and latest PwC main scenario.

Future prospects

As shown in Table 1.1, our main scenario is for UK GDP growth to average around 1.2% in 2019, down slightly from 1.4% in 2018, before moderating slightly to around 1% in 2020. Our views on growth and inflation are broadly similar to the latest consensus and Bank of England forecasts (see Table 1.1).

Consumer spending growth held up relatively well in 2018 and the first three quarters of 2019 but is projected to moderate to around 1.2% in 2019 as a whole in our main scenario and remain below trend at around 1.4% in 2020. This reflects our expectation that stronger real wage growth will be offset by concerns about the implications of Brexit, slower projected jobs growth and subdued house price growth.

Brexit-related uncertainty will also continue to hold back business investment in the UK. Our main scenario assumes that an orderly Brexit will be achieved, but there are still important uncertainties surrounding this assumption.

The September 2019 spending round provided a significant boost to government spending in 2020/21, and other major parties are also indicating plans for significant fiscal expansion over the next few years. This will support growth, but at the cost of rising public borrowing.

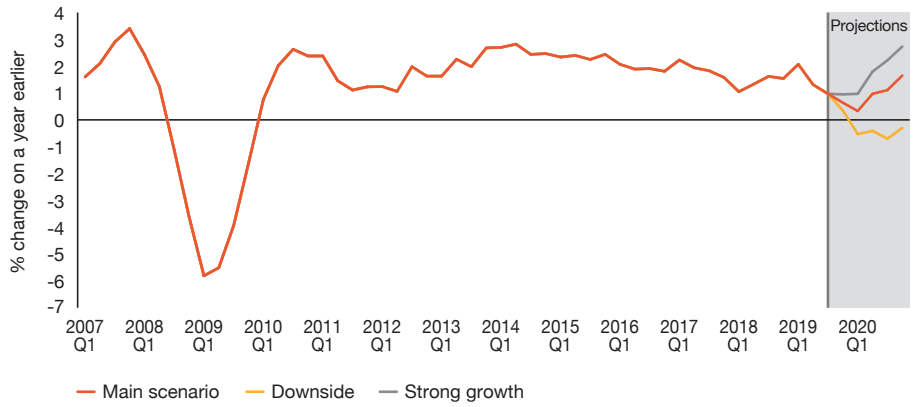
The global economy has cooled since mid-2018 as a result of slower growth in each of the US, China and the Eurozone. In the US, the impetus given by one-off personal and business tax cuts in early 2018 has faded, though recent Fed rate cuts will support domestic demand over the next year. The Chinese government is continuing to manage the gradual moderation of its economy as smoothly as possible. In the Eurozone, a progressive deceleration in growth from 2016 peak rates has already caused the ECB to start to undertake renewed monetary loosening.

The fact that the three largest economies in the world have slowed simultaneously has weakened business sentiment. There is also a risk that US trade policy towards China and others could cause a broader slowdown in global growth in 2020, although trade tensions continue to ebb and flow from month to month. If a full-scale trade war did break out, however, this would have adverse effects on both UK exports and, through confidence effects, business investment.

There are always uncertainties surrounding any growth projections, as illustrated by the alternative scenarios in Figure 1.1. There are still considerable downside risks relating in particular to the outcome of the Brexit process and the global outlook, but there are also some upside possibilities if these problems can be contained and global growth regains some momentum. In our main scenario, we expect the UK to continue to see moderate growth in 2020, but businesses need to monitor and make contingency plans for potential alternative scenarios related to Brexit and other factors such as global growth.

Consumer price inflation has fallen back below the Bank of England's 2% target rate recently, despite some acceleration in earnings growth, and may remain below 2% in 2020 due to planned cuts in regulated energy and water prices. However, there are many uncertainties around this, linked in particular to possible volatility in global commodity prices and exchange rates.

Figure 1.1 – Alternative UK GDP growth scenarios



Sources: ONS, PwC

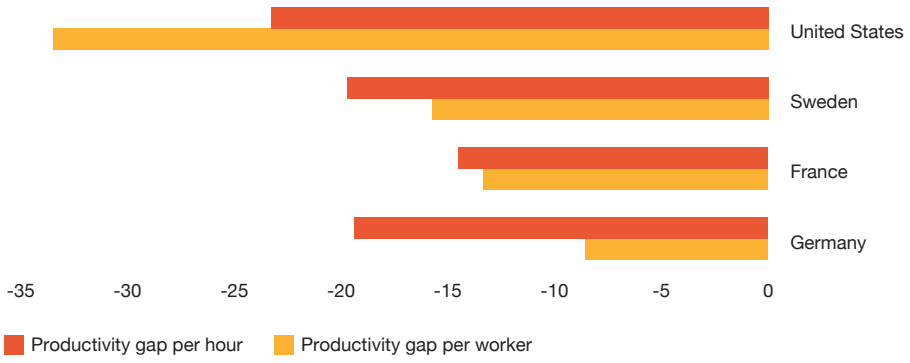
Given benign current levels of inflation and continued uncertainties around Brexit and the global economy, we expect the Monetary Policy Committee to remain cautious. In our main scenario we assume no interest rate changes in the short term. But UK rates could move in either direction over the next year depending on developments on Brexit as well as wider global economic trends.

In a no deal scenario, which looks unlikely in the short term but could return as a possibility later in 2020, both monetary and fiscal policy would probably be loosened in the short term to soften the blow to the economy. But fiscal policy might need to be tightened again in the longer term to repair the potential damage to the public finances from a disorderly Brexit.

> "Businesses need to make contingency plans for alternative scenarios for both Brexit and global growth.

John Hawksworth
Chief Economist, PwC

Figure 1.2 – The UK productivity shortfall (% difference)



Note: Productivity is measured here by GVA per hour and GVA per worker at PPP exchange rates, 2017 data. PPP exchange rates take account of differences in prices between countries and are generally acknowledged as the most appropriate measure when making international comparisons of output or productivity. Data excludes the real estate sector as differences in measurement of imputed rents can distort the figures.

Source: Eurostat

UK productivity lags behind many other advanced economies

A key economic challenge for the next UK government will be to address the long-standing shortfall in our productivity levels relative to other advanced economies.

Latest data suggest that UK output per worker lags around 10-15% behind Germany, France and Sweden and more than 30% behind the US (see Figure 1.2). The figures for output per hour also show significant shortfalls for the UK relative to these countries (although the gap drops to 23% for the US given the longer hours worked there on average).

Our analysis shows that, with the partial exception of Germany, these productivity gaps are not due to the UK having too small a manufacturing base. Instead they reflect lower average UK productivity within certain industry sectors (e.g. retail and wholesale) relative to other advanced economies.

Comparative international evidence suggests that relatively low UK levels of investment and R&D spending and a longer tail of companies and workers with relatively low productivity and skills are the main reasons for this productivity shortfall in the UK relative to other advanced economies. Future policy needs to be targeted on investing more in each of these areas, but business also has a key role to play in achieving these aims, notably through upskilling their employees.

Levelling up regional productivity across the UK could boost GDP by over £80 billion

In Section 4 of this report, we turn our attention to regional productivity gaps within the UK.

The region with the highest level of productivity is London (where productivity is around 40% above the UK average) while the region with the lowest productivity is Yorkshire and the Humber, where productivity is 16% below the national average (see Figure 1.3).

The gap between the best- and worst-performing local economic partnerships (LEPs) in England has widened over time, with productivity in the highest-ranking LEP being around 2.1 times more than the lowest-productivity LEP in 2017, as compared to 1.8 in 2002.

Our analysis shows a statistically significant correlation between skill levels and productivity in different local areas, as well as between physical and digital connectivity and productivity. There is also a positive, albeit weaker correlation between the share of large enterprises and productivity. This may reflect lower adoption of the latest technologies and processes in smaller businesses, resulting in lower productivity levels in those businesses.

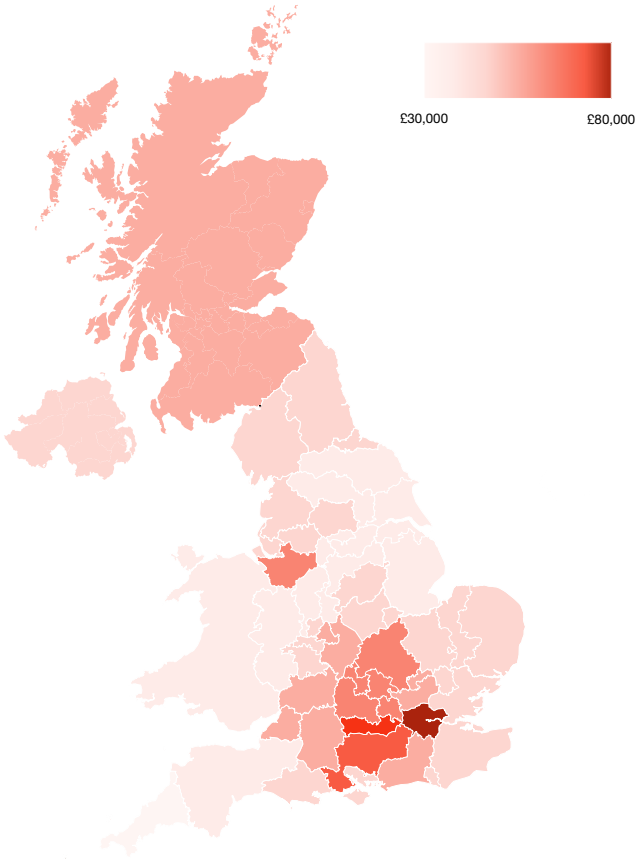
While differences in the composition of industrial activity can explain some regional and local productivity differences, variations in skills and connectivity appear more significant based on our cross-sectional regression analysis.

These findings suggest that both policymakers and businesses need to focus on upskilling workers, particularly in areas where there are skills gaps, such as self-management and leadership skills as well as digital capabilities.

Investing to improve the quality and capacity of local infrastructure could help boost the connectivity of a place (and consequently its productivity). LEPs could work in collaboration to strengthen intra-region connectivity and access to economic hubs, for instance drawing on the experience of the Oxford-Cambridge arc, which is supported by four LEPs in the region.

The economic prize for getting this right is potentially significant. We estimate that, if areas that are currently performing below the UK average can close 50% of this productivity gap, this could boost total UK GDP by nearly 4%, equivalent to around £83 billion per annum at today's values.

Figure 1.3 – Heatmap of UK productivity based on output per job for LEPs in England as well as Scotland, Wales and Northern Ireland (2017)[1]



Sources: ONS. PwC analysis

1 There are 38 local enterprise partnerships (LEPs) in England. We present these alongside the data for the other three nations of the UK (Wales, Northern Ireland and Scotland).

2. UK economic prospects[1]

Key points

- In our main scenario, we expect economic growth in the UK to remain modest, at 1.2% in 2019 and around 1% in 2020, following an expansion of 1.4% in 2018. These projections assume that there is an orderly exit from the EU, but there are still many uncertainties around this at the time of writing.
- Consumer spending has continued to drive the UK economy, supported by recent rises in real incomes. However, the housing market has cooled and jobs growth has slowed recently, so we project only moderate consumer spending growth of around 1.2% this year and 1.4% in 2020.
- Business investment has been weighed down by uncertainties related to Brexit as well as a slowdown in global growth. There could be some revival in investment later in 2020 as and when an orderly Brexit is achieved, but this may be modest given that uncertainties will remain about the UK's longer term trading relationship with the EU as well as the wider global economic outlook.
- We expect UK growth to be more balanced across regions in 2019-20, with London only growing slightly faster than the UK average.
- As consumer price inflation remains moderate in 2019-20, real wages are expected to continue to grow at a reasonable rate.
- The Bank of England is expected to keep interest rates on hold until greater clarity has been provided on Brexit and the wider global economic outlook, although the next move in rates could be either up or down depending on how events develop.

Introduction

In this section of the report we describe recent developments in the UK economy and review future prospects. The discussion covers:

2.1 – Recent developments in the UK economy

UK economic growth has been somewhat erratic in 2019 with relatively strong growth in the first quarter but negative growth in the second quarter (see Figure 2.1). Growth in the first quarter was artificially inflated by increased stockbuilding ahead of the original Brexit date at the end of March 2019, which was then unwound in the second and third quarters. Preliminary estimates for the third quarter suggest a return to positive GDP growth, but with continued volatility as unexpectedly strong growth in July was followed by weaker trends in August and September as Brexit uncertainty took its toll on business investment and also began to erode previously resilient consumer confidence[2].

As Figure 2.1 shows, business investment was flat in the third quarter of 2019 after having fallen in five of the previous six quarters. By contrast, consumer spending has maintained modest but positive growth ever since the EU referendum.

Manufacturing sector output is still below pre-financial crisis peak levels (see Figure 2.2) and suffered a renewed decline in output in the second quarter of 2019 after an upward blip in the first quarter due to pre-Brexit stockpiling. Preliminary estimates suggest flat output in the third quarter. The sector has suffered from the slowdown in the global economy since mid-2018, particularly its key export markets in the euro area and through the effects of the US-China trade war.

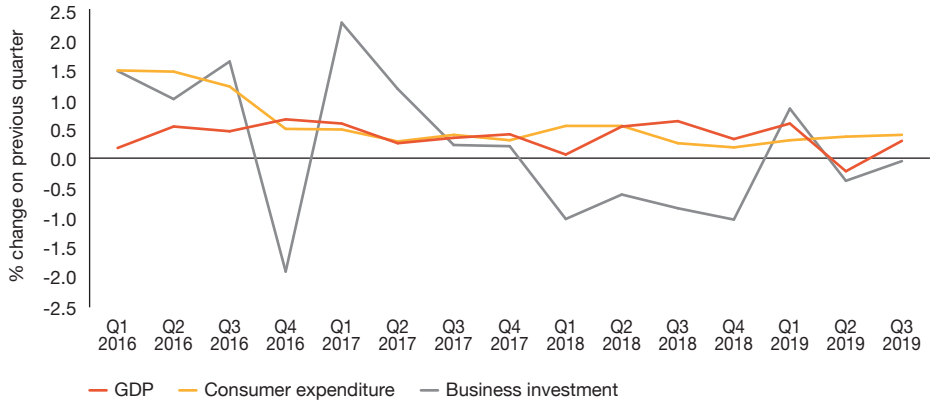
1 This section was written by John Hawksworth.
2 As indicated by PwC's own consumer sentiment survey, which showed some fall in optimism about household disposable income growth in Autumn 2019, although not a dramatic decline. For details see: https://www.pwc.co.uk/industries/retail-consumer/insights/consumer-sentiment-survey.html

The performance of the construction sector is generally quite volatile. The referendum appears to have ended a period of relatively strong growth in 2014-16, and the sector has also had to cope with a moderation of house price inflation that has dampened housebuilding activity somewhat (although this has been offset in part by the impact of the Help to Buy scheme).

Brexit-related uncertainty has also had a clear, negative effect on commercial construction activity, and this has continued to be a drag on sector growth in the autumn of 2019 according to the latest purchasing managers' surveys for construction. Increased public sector infrastructure investment has, however, partially offset this weakness, helping to support a modest pick up in construction output in the third quarter of 2019 after a weak second quarter.

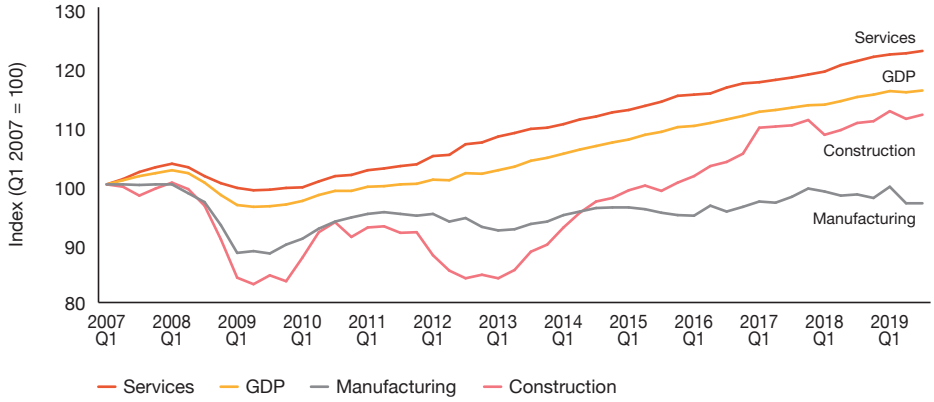
The dominant influence on UK growth comes from the services sector, which now accounts for almost 80% of UK GDP (compared to only around 10% for manufacturing and around 6% for construction). Services sector output has grown relatively steadily ever since the recession bottomed out in mid-2009, although there has been some dampening in the pace of growth more recently. Retail sales, which represent an important component of services, have also generally grown more slowly in recent months (albeit with considerable volatility from month to month).

Figure 2.1 – Trends in GDP, consumer spending and business investment growth



Source: ONS

Figure 2.2 – Sectoral output and GDP trends



Source: ONS

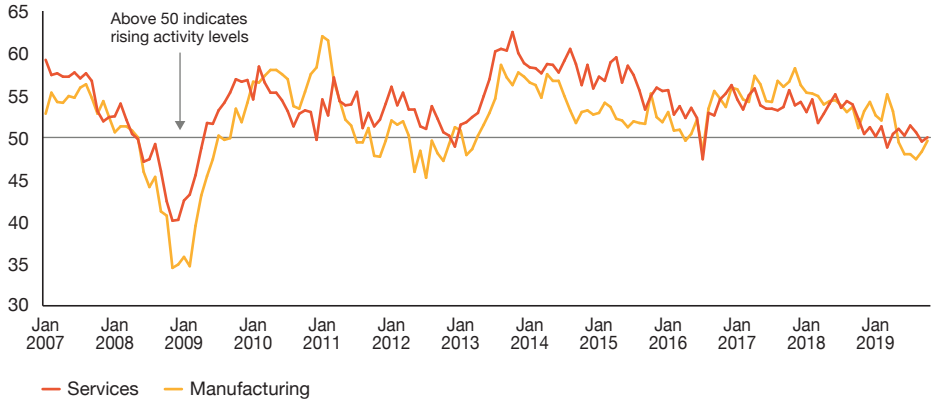
Although official data are more comprehensive, business surveys can provide a more timely indication of short term economic trends. In particular, it is worth keeping an eye on the Markit/CIPS purchasing managers' indices (PMIs) for services and manufacturing, as shown in Figure 2.3. The manufacturing PMI began to weaken in late 2017 and has been on a steady downward trend since then. Since May it has signalled a contraction (with an index value below 50) for the first time in three years, after a brief pick-up in early 2019 due to 'no deal' Brexit-related stockpiling (although this may also have given a more modest boost to manufacturing activity in October based on the latest PMI survey).

The services PMI has also been subdued for most of this year, with the latest data showing flat activity in October. These readings suggest that growth could have weakened significantly in the autumn after a reasonably good summer, based on past relationships between the PMI survey results and GDP growth.

A key factor influencing UK economic trends since the Brexit vote in June 2016 has been the relative weakness of the pound, as shown in Figure 2.4. Sterling regained some ground during October as fears of a no deal Brexit receded, but remains weak by pre-referendum standards against both the US dollar and the euro. A relatively weak currency has made UK exports cheaper for overseas customers, promoting the sale of British goods and services and making the UK a more affordable destination for international tourists.

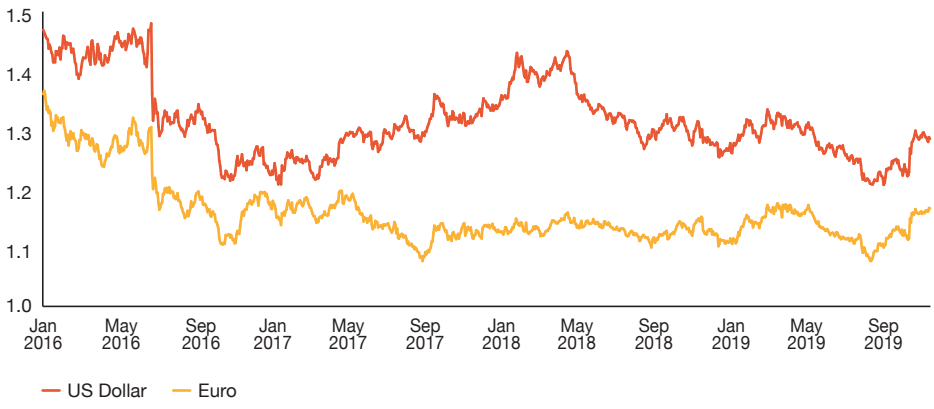
But depreciation also raised the price of imports, resulting in faster inflation in 2017 in particular and squeezing consumer spending power. These effects have now worked their way through the economy, but the exchange rate is likely to remain volatile until there is more clarity over Brexit.

Figure 2.3 – Purchasing Managers' Indices of business activity



Sources: Markit, CIPS

Figure 2.4 – US dollar and euro exchange rates against the pound



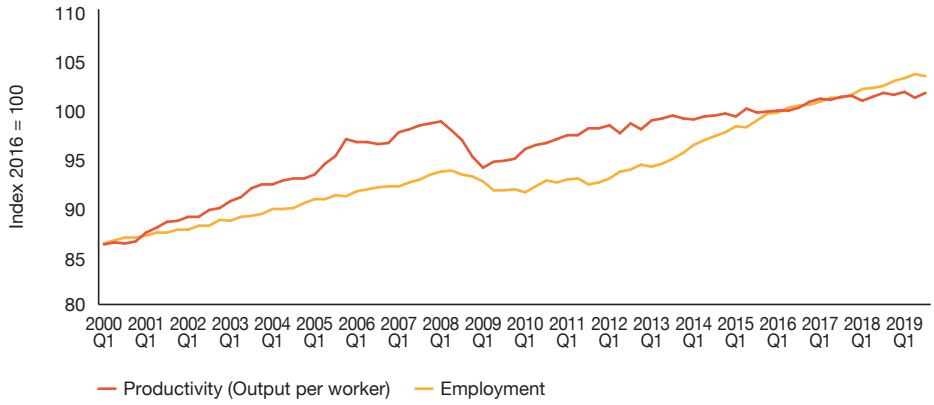
Source: Bank of England

UK creates record number of jobs, but productivity growth remains subdued

UK productivity growth, measured using output per worker, has been relatively weak since the global financial crisis, as illustrated in Figure 2.5. The positive side of this has been strong jobs growth, particularly since 2012.

More recently, there are some signs that jobs growth has weakened, reflecting the uncertain economic and political environment and possibly also the rise in real wages over the past year as unemployment has fallen to near record lows. So far, however, productivity growth has not shown sustained signs of recovery. We discuss the reasons for the UK's relatively disappointing productivity performance by international standards in Section 3 of this report, while Section 4 looks in detail at how and why productivity levels vary across the country.

Figure 2.5 – Trends in productivity and employment



Source: ONS

2.2 – Economic growth prospects: national, sectoral and regional

Our main scenario is for real GDP growth of around 1.3% in 2019 and around 1% in 2020, significantly below the UK's estimated long-term trend growth rate of just under 2%. Further details of this main scenario projection are set out in Table 2.1.

We assume in this main scenario that the UK will avoid a 'no deal' Brexit, where it falls out of the EU without any transitional arrangement, which could be highly disruptive. But this remains a downside risk as discussed further below.

Slower year-on-year growth in 2018 was driven primarily by a decline in business investment growth, which has persisted during 2019. There could be a modest bounce in business investment later in 2020 if the UK achieves an orderly Brexit, but the annual growth rate may remain negative given the low starting point. Firms will remain wary of making major commitments until they know more about the nature of the UK's longer term trading relationships with the EU and other major economies such as the US.

There could also be continued volatility in stockbuilding around potential future key Brexit dates, as we saw with the stockpiling before March 2019 that went sharply into reverse in April. This seems to have been less strong ahead of the October deadline, perhaps because it was evident by mid-September that Parliament would block a no deal exit from the EU. But this issue could return in future and may make quarterly GDP growth volatile. However, this will have less impact on underlying growth trends.

Table 2.1: Main scenario projections for UK growth and inflation

% real annual growth unless otherwise stated	2017	2018	2019	2020
GDP	1.9	1.4	1.2	1.0
Consumer spending	2.3	1.6	1.2	1.4
Government consumption	0.3	0.6	3.4	2.7
Fixed investment	1.6	-0.1	-0.3	-0.5
CPI inflation (%: annual average)	2.7	2.5	1.8	1.5

Source: Latest ONS estimates for 2017-18, PwC main scenario for 2019-20

Consumer spending held up relatively well in 2018 and first three quarters of 2019, helped by a moderation of inflation, higher earnings growth and continued strong jobs growth. The latest data on retail sales suggests consumer spending growth may have slowed in recent months, however, perhaps reflecting ongoing Brexit-related uncertainty that has already started to feed through into slower jobs growth.

However, any weakness in household spending will be offset by the stronger trends we are now seeing in government spending, with the Chancellor announcing in September that there will be a significant rise in planned spending in 2020/21 on top of an already rising trend in 2019. This shift away from austerity is common to varying degrees to both major parties and is therefore likely to support growth in 2020 irrespective of the outcome of the general election in December.

Net exports have so far had a negative impact on growth in 2019 owing in part to the 'no deal'-related surge in imports in the first quarter of the year. Net exports could make a more positive contribution to annual GDP growth in 2020 as these distortions unwind, but will still be held back by relatively modest expected global growth (see Appendix A for details).

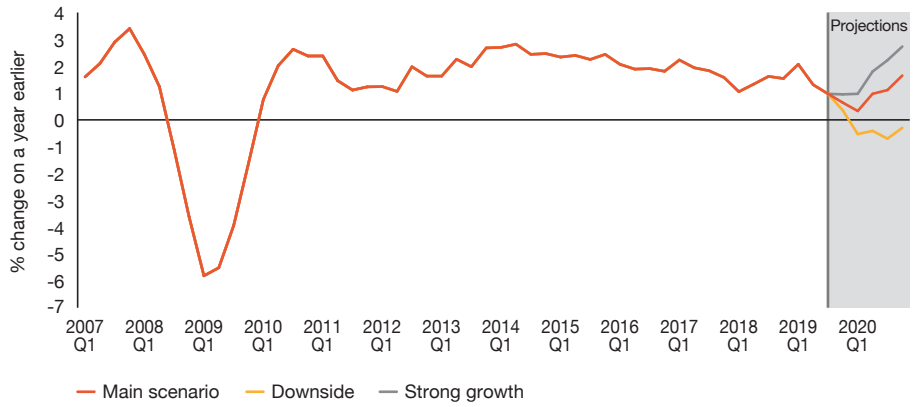
Our main scenario for UK GDP growth in 2019 is similar to our last report in July (1.2% vs 1.4%), but we have revised down our main scenario for 2020 slightly from 1.3% in our previous report to 1% now. This reflects weaker global growth and the continuation of Brexit-related uncertainty at least until early 2020 and possibly for longer.

Alternative growth scenarios – businesses need to make contingency plans

To reflect the uncertainties associated with any such projections, particularly but not only in relation to Brexit, we have considered two alternative UK growth scenarios, as shown in Figure 2.6.

- Our **'strong growth scenario'** projects that the economy will expand by over 2% in 2020, a significant increase from around 1% in our main scenario. This is a relatively optimistic scenario, which assumes not just an orderly Brexit in early 2020, but also good early progress in subsequent UK-EU trade negotiations. It also assumes that global economic growth revives later in 2020, following a resolution of US-Chinese trade tensions, so boosting UK exports.
- Our **'downside scenario'**, by contrast, could see the economy shrink in 2020 if Brexit related uncertainty persists for much longer and the global economy suffers a further marked slowdown. The associated uncertainty would be likely to reduce UK business investment, jobs and growth, although the potential effects could vary considerably across sectors and individual companies depending on their particular circumstances. We do assume here that some kind of mitigating measures would be put in place to avoid more severe disruption, including looser monetary and fiscal policy in the short term.

Figure 2.6 – Alternative UK GDP growth scenarios



Sources: ONS, PwC

We do not believe that either of these two alternative scenarios is the most likely outcome, but they are certainly possible. At present, risks to growth are weighted to the downside given both global trade tensions and, in particular, the political and economic uncertainties around Brexit (and the general election outcome in the short term). Businesses would therefore be well advised to make appropriate contingency plans for the potential impact of different Brexit outcomes[3] on their operating environments (see Table 2.2).

3 For more material on the potential impact of Brexit on your business, please see our Beyond Brexit hub here: http://www.pwc.co.uk/the-eu-referendum.html

Table 2.2: Key issues and questions for businesses preparing for Brexit

Issues	Implications	Questions
Trade	The EU is the UK's largest export partner, accounting for around 45% of total UK exports. Leaving the EU is likely to make trade with the EU more difficult, but the extent of this will depend on what is agreed about future UK-EU trading relationships. There could also be new (or revised) trade deals with the US and other non-EU countries after Brexit.	• How much do you rely on EU countries for revenue growth? • Have you reviewed your supply chain to identify the potential impact of tariffs and additional customs procedures on your sales, procurement and logistics? • Have you identified which third party contracts would require renegotiation in a disorderly Brexit? • How well prepared are you for different scenarios for the longer-term UK-EU trade relationship and for possible alternative trading arrangements with the US and other non-EU countries? • If your business operates in or via Northern Ireland, are you prepared for the new trading arrangements proposed in the latest UK-EU deal? • Have you ensured your banks can continue to provide financial support for your operations in different Brexit scenarios? • What risk assessments and contingency plans have you made for alternative Brexit scenarios?
Tax	The UK would gain more control over VAT and some other taxes. However, Brexit could also open the door to new tax initiatives within the EU that the UK might currently have sought to block.	• Have you thought about the impact of potential changes to the UK and EU tax regimes after Brexit? • Have you upgraded your systems to deal with a significant volume of tax changes?
Regulation	The UK is subject to EU regulation. Brexit could mean less red tape in some areas. But it could also mean that UK businesses need to adapt to a different set (or multiple sets) of regulations, which could be costly.	• Have you quantified the potential regulatory impact of Brexit and how future changes might impact your business? • How flexible is your IT infrastructure to deal with potential future changes to Data Protection laws (notably as regards the ability to transfer personal data between the UK and the EU27)? • Is your compliance function ready to deal with any new reporting requirements arising from Brexit?
Sectoral effects	The UK is the leading European financial services hub, which is a sector that is likely to be significantly affected by Brexit. Other sectors which rely on the EU single market could also feel a strong impact.	• Have you briefed potential investors on the impact of Brexit for your sector and organisation? • How up-to-date are your contingency plans in place to deal with different Brexit scenarios, including no deal variants? • Are you aware of the impact of potential volatility in financial markets on your capital raising plans?
Foreign direct investment (FDI)	FDI from the EU makes up around 45% of the total stock of FDI in the UK. Brexit could put some of this investment at risk.	• How much do your rely on FDI for growth? • How does Brexit affect your location decisions? • How are your competitors responding to the risk of Brexit? Are they relocating any key functions?
Labour market	The UK may change its migration policies. Currently EU citizens can live and work in the UK without restrictions. Businesses will need to adjust to any change in this regime or in work preferences for EU nationals.	• How reliant is your business operation and supply chain on EU labour? • Have you provided guidance to your UK-based employees who are nationals of other EU countries? • Have you considered the additional cost of hiring EU labour after Brexit? • Could changes in access to EU labour increase the case for automation?
Uncertainty	Uncertainty has increased since the referendum and this seems likely to continue through the Brexit negotiation (including extension) period.	• How well prepared are you to manage future volatility in the exchange rate (and other asset prices) related to Brexit? • Is your organisation ready for a prolonged period of uncertainty and/or a 'no deal' Brexit?

Source: PwC

Most industry sectors projected to see relatively modest growth in 2019-20

The sector dashboard in Table 2.3 shows latest ONS estimates of growth rates for 2018 along with our projected main scenario growth rates for 2019 and 2020 for five of the largest sectors within the UK economy. The table also includes a summary of the key trends and issues affecting each sector.

The distribution, hotels and restaurants sector recorded relatively strong output growth of 2.9% in 2018, and remained reasonably strong in the first half of 2019, but we expect a slowdown in 2020.

Business services and finance growth was relatively strong in 2018, but has weakened in 2019 as Brexit-related uncertainty has persisted. We project a modest recovery in 2020 assuming an orderly Brexit, but risks remain significant around this main scenario.

Manufacturing growth has fallen back into negative territory this year, reflecting the recent downward trend in global trade and in growth in the euro area economy in particular. Unless conditions improve in the global economy, there is unlikely to be a major improvement in 2020 although greater clarity on Brexit would be helpful to international investors in UK manufacturing for the longer term.

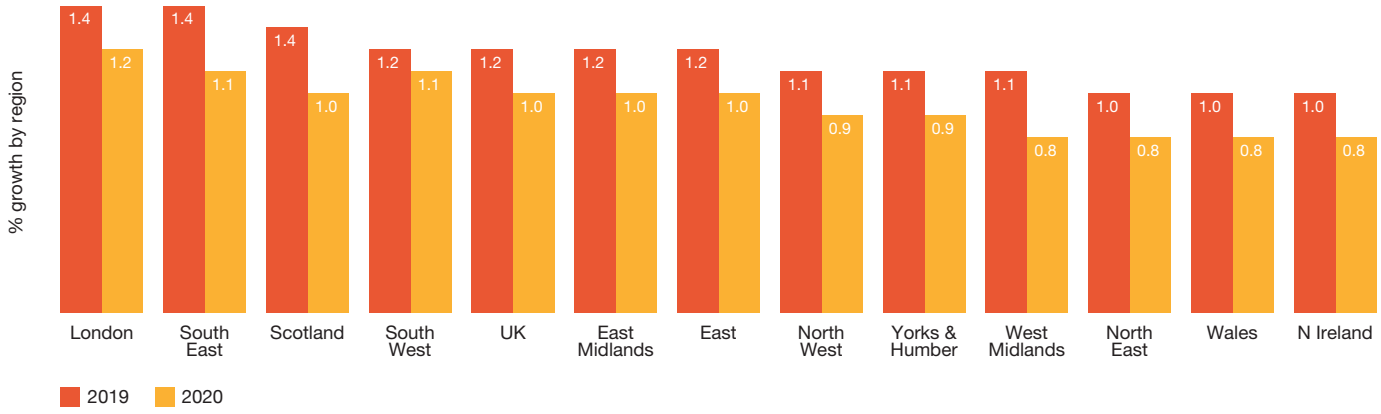
Construction, as ever, has been volatile, with growth having dropped dramatically in 2018 according to latest ONS estimates. There could be some recovery in 2019 from a low base, but the underlying trend is likely to remain weak while Brexit-related uncertainty persists. But there will be more support from increased government infrastructure spending.

Table 2.3: UK sector dashboard

	Growth (%)			
Sectors (% of total GVA)	**2018**	**2019**	**2020**	**Key issues/trends**
Manufacturing (10%)	0.4	-0.8	-0.5	• Manufacturing PMI has been on a declining trend for some time, despite a modest recovery in October to a more neutral reading • Exporters gained in 2017-18 from a weaker pound and a stronger global economy, but manufacturers around the world are now struggling with weak demand, particularly in the euro area
Construction (6%)	-0.4	1.9	0.8	• Government measures to boost infrastructure investment to try to offset weak commercial construction demand are starting to take effect • Housing market remains sluggish but some support for new building from Help to Buy
Distribution, hotels & restaurants (13%)	2.9	2.5	1.3	• A weaker pound since 2016 has boosted tourism, both from overseas and domestically, but Brexit-related uncertainty has also had some negative impacts on spending • Total consumer spending growth remains positive, as earnings growth has picked up, but could slow in 2020 as jobs growth declines
Business services and finance (34%)	2.2	0.4	1.2	• The financial sector remains particularly concerned about the possible implications of Brexit, especially if this is disorderly • Business services grew strongly in 2018, but trends have been weaker in 2019 and growth may remain modest in 2020 by historical standards
Government and other services (22%)	1.1	1.5	1.6	• Public services continue to face tight budgets, but the September spending round pointed to significant increases in 2020 (and beyond for the NHS, schools and police).
Total GDP	**1.4**	**1.2**	**1.0**	

Sources: ONS for 2018 estimates, PwC for 2019 and 2020 main scenario projections and key issues.
These are five of the largest sectors but they do not cover the whole economy – their GVA shares only sum to around 85% rather than 100%.

Figure 2.7 – PwC main scenario for output growth by region in 2019 and 2020



Source: PwC analysis

Regional prospects: all parts of the UK projected to see modest but positive growth in 2020

In contrast to previous years and indeed decades where London has generally had the strongest growth rate of any UK region by some margin, our latest projections suggest London will grow at a similar rate to the UK average in 2019 (see Figure 2.7). This is partly due to the greater exposure of some London activities (e.g. the City) to adverse effects from Brexit-related uncertainty, as well as growing constraints on the capital in terms of housing affordability and transport capacity[4]. If, as we assume in our main scenario, a 'no deal' outcome is avoided and greater clarity is provided on Brexit, we expect London could see growth remain slightly above the UK average in 2020, although this rate would still be markedly slower than the pace seen in past periods.

The South East, South West and Scotland could also perform reasonably well this year and next, but the differences from the UK average growth rate are small. The North East and Northern Ireland are projected to lag behind slightly with growth of only around 1% in 2019 and 0.8% in 2020.

It is important to note that as regional output data are published on a less timely basis than national data, the margins of error around these regional projections are even larger than for national growth projections. Therefore, they can only be taken as illustrative of broad directional trends.

We should also bear in mind that economic growth is only one of several indicators that should be considered in assessing performance of regions and cities across the UK, as discussed in more detail in our latest Good Growth for Cities report published in November 2019. The index used in that report also includes, for example, factors such as average commuting times and housing affordability where London scores much less well than on traditional measures likes real income growth.

2.3 – Outlook for inflation and real earnings growth

Inflation as measured by the consumer price index (CPI[5]) picked up from just 0.7% on average in 2016 to around 3% in late 2017 due to the effect of a weaker pound into import prices. Since then, however, inflation has fallen back to just 1.5% in the year to October 2019, some way below its 2% target rate. We expect CPI inflation to remain somewhat below target for the rest of 2019 and 2020 in our main scenario (see Figure 2.8), in part due to cuts in regulated energy prices from October 2019 and water prices from April 2020, but there could be considerable turbulence along the way.

4 As highlighted in our 2019 Good Growth for Cities report here: www.pwc.co.uk/goodgrowth

5 The ONS switched from CPI to CPIH as its primary inflation indicator in March 2017, despite some continuing methodological concerns about the reliability of the way that CPIH captures owner occupied housing costs through estimates of equivalent market rents rather than actual outlays on mortgage payments. For the moment, we have stuck to CPI as our key inflation indicator, but we may consider switching to CPIH in the future if this becomes more widely used (in particular if it becomes the MPC's target measure of inflation). In the long run, however, we would not expect significant differences between average inflation on these two measures (based on long-term historical averages).

Alternative inflation scenarios

There is always considerable uncertainty over inflation projections as they are particularly sensitive to movements in exchange rates and global commodity prices, both of which are very hard to predict with any confidence. As such, we also present two alternative scenarios for UK inflation in Figure 2.8:

- In our **'high inflation' scenario** we project UK inflation to rise back to around 3% by the end of 2020 as a result of renewed falls in the pound and/or strong growth in global commodity prices if other economies grow more strongly and/or global oil supply is constrained by producers. Such a scenario could also be the result of continued strong UK earnings growth without corresponding productivity gains, so pushing up unit labour costs and prices.
- In our **'low inflation' scenario**, by contrast, the UK and global economies weaken by more than expected in our main scenario leading global commodity prices to fall back sharply over the next year. In this case, UK inflation could fall back to well below 1% over the next year.

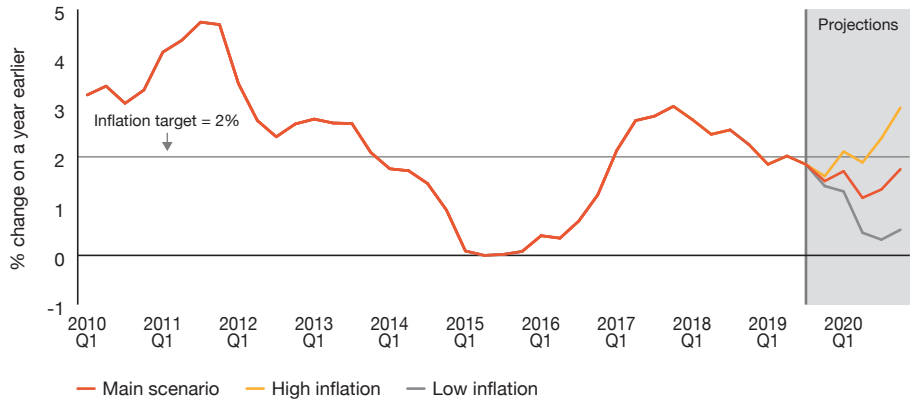
As with our GDP growth scenarios, neither of these two alternative variants is as likely as our main scenario. But given recent volatility and uncertainty, businesses should plan for a broad range of outcomes. It is worth noting here that a 'no deal' Brexit scenario could push up UK inflation in the short term by weakening the pound, but might lead to lower inflation in the medium term if it slows economic growth.

Real earnings projected to pick up gradually

As Figure 2.9 shows, real earnings growth was squeezed from 2009-14 but then regained some ground in 2015-16 as low global commodity prices pushed UK inflation down to close to zero. The real earnings squeeze returned temporarily in 2017 as the post-referendum weakness of the pound pushed up inflation again, but since early 2018 nominal wage growth has accelerated markedly as the unemployment rate has fallen to below 4%, the lowest level seen since 1974.

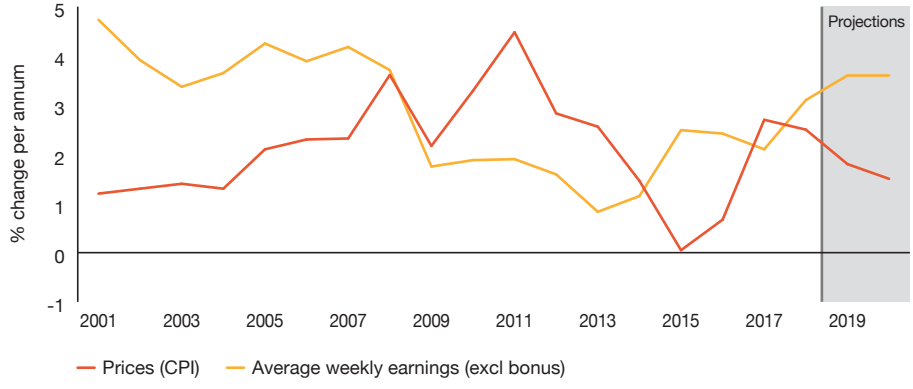
As inflation has slowed in recent months, real earnings (excluding bonuses, which tend to be erratic) have now started to grow again at a reasonably strong pace and we expect this upward trend to continue in 2020 even if nominal earnings growth now levels off (see Figure 2.9). It is difficult for real earnings to grow significantly on a longer term basis, however, unless productivity growth also picks up for a sustained period. As discussed in Sections 3 and 4 below, this remains the major long-term challenge facing the UK economy.

Figure 2.8 – Alternative UK inflation (CPI) scenarios



Sources: ONS, PwC scenarios

Figure 2.9 – CPI inflation vs average earnings growth



Sources: ONS, PwC scenarios

2.4 – Monetary and fiscal policy

The Monetary Policy Committee (MPC) have left interest rates on hold at 0.75% since August 2018 in the face of ongoing Brexit uncertainty. The MPC had previously been signalling for some time their eventual intention to raise interest rates very gradually over the next few years, but at their November 2019 meeting the tone of the MPC minutes became more dovish, with two members voting for a 0.25% rate cut. For the moment, we assume that the MPC will leave interest rates on hold while they await more data on global and UK growth, and greater clarity on Brexit, but it is clearly possible that the next rate move could be either up or down depending on how events unfold over the next few months.

The UK public finances had been improving for several years up to 2018/19, but recent trends have been less favourable. With both major parties now promising significant rises in public spending over the next few years, borrowing looks set to rise though considerable uncertainty remains over the extent of any such increases. However, looser fiscal policy should support economic growth in 2020.

2.5 – Summary and conclusions

UK economic growth has slowed since early 2018 as Brexit-related uncertainty has dampened business investment, although there has been considerable volatility from quarter to quarter in 2019. Consumer spending has held up better so far, helped by rising real earnings growth, but could start to slow as the jobs market shows early signs of cooling.

Our main scenario is for UK GDP growth to remain subdued, growing by around 1.2% on average in 2019 and around 1% in 2020. These main scenario projections assume an orderly Brexit with a deal, and continued moderation in global growth. It also takes into account the boost to short-term growth from the public spending rises announced by the Chancellor in September.

Most industry sectors are projected to see relatively modest growth in 2019-20, although short-term trends remain volatile and highly dependent on how events develop on Brexit. Manufacturing also faces pressures from the downturn in global and particularly euro area growth over the past year owing to heightened trade tensions.

In our main scenario with an eventual orderly Brexit we assume that interest rates remain on hold in the short term, but the latest MPC minutes make clear that the next rate move could be either up or down depending on how events develop on the global economy, UK growth and Brexit.

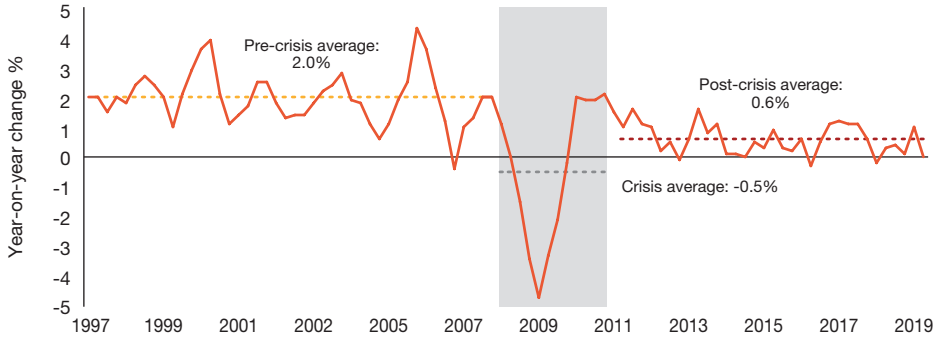
Given the ongoing uncertainty around Brexit, there are particularly large uncertainties around any economic projections at present. Organisations should therefore stress test their business and investment plans against alternative economic and political scenarios and review the potential wider implications of different Brexit outcomes for all aspects of their operations.

3. The Productivity Puzzle revisited: why has UK productivity lagged behind other advanced economies?[1]

Key points

- Labour productivity in the UK has consistently lagged behind a number of other advanced economies including France, Germany, Sweden and the US.
- Our analysis shows that this cannot be explained by the UK having too small a manufacturing sector, with the partial exception of comparisons with Germany.
- Instead it seems to reflect lower average UK productivity levels within a number of major industry sectors, including retail and wholesale, where it may have made sense for UK companies to pursue a more labour-intensive business model than in other advanced economies.
- This is partially offset by sectors where UK productivity is higher than most other advanced economies, such as financial services.
- Higher investment levels, a stronger education and skills strategy and improved adoption of existing technologies could all help the UK to close the productivity gap with other leading economies.

Figure 3.1 – Growth in UK output per worker



Source: ONS

Introduction

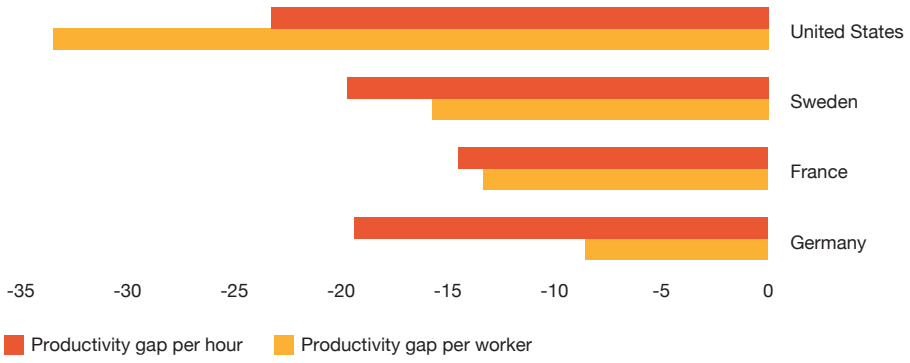
Over the last ten years the UK has seen much discussion of the 'Productivity Puzzle'. But really, there are two such Productivity Puzzles: a 'growth' puzzle and a 'levels' puzzle. These puzzles could equally be called a 'slowdown puzzle' and a 'gap puzzle'.

The first 'puzzle' is that UK productivity has grown more slowly since the crisis than before. Figure 3.1 shows that in the ten years prior to 2008, output per worker in the UK grew at an average annual rate of 2%[2]. In the crisis years (2008-10), productivity actually fell. But more importantly, it has grown only slowly in the recovery, averaging just 0.6% growth since 2011. Although the extent of this differs, most advanced economies have experienced a similar slowdown relative to pre-crisis growth rates.

> "Increasing output per worker to German levels would boost UK GDP by £180bn a year.
>
> **Alex Tuckett**
> Senior Economist, PwC

1 This article was written by Alex Tuckett and Thanh Dinh.
2 We use output per worker as the measure of productivity in this article. Other measures are available; for instance, Total Factor Productivity (TFP) takes account of how effectively both capital and labour are used. However, comparing TFP across countries is very difficult, and for many questions – such as how an economy delivers living standards – output per worker is more relevant.

Figure 3.2 – The UK productivity shortfall (% difference)



Note: Productivity is measured here by GVA per hour and GVA per worker at PPP exchange rates, 2017 data. PPP exchange rates take account of differences in prices between countries and are generally acknowledged as the most appropriate measure when making international comparisons of output or productivity. Data excludes the real estate sector as differences in measurement of imputed rents can distort the figures.

Source: Eurostat

The second 'puzzle' is that the average level of productivity in the UK has been persistently lower than in a number of other 'leading' advanced economies. Figure 3.2 shows the shortfall that the UK faces in comparison to a number of other advanced economies. Output per hour in the UK is around 14% lower than in France, and around 23% lower than in the US.

Calculations of productivity per hour take account of both Gross Value Added (GVA) per worker – the economic output of the economy relative to the number of workers – and the average number of hours worked.

Average hours can vary substantially across countries, reflecting cultural differences as well as labour market factors such as the balance between part-time and full-time work. More importantly, there are problems with measuring hours in a way that is consistent across countries, as highlighted in recent work by the OECD[3]. For this reason, in the rest of this article we focus on output per worker. Although the shortfall to other European countries is smaller on a per worker basis (also shown in Figure 3.2), the gap relative to the US is even larger (since US working hours are significantly longer on average).

This 'productivity levels gap' has existed since the 1970s and shows little or no sign of closing. If the UK were to increase output per worker to, for example, German levels, the economy could be more than £180bn per year larger; or £5,800 higher for each worker in the UK. In this article, we examine some possible explanations for the gap and discuss ways in which the UK could try and close this gap. Section 3.1 investigates the role of industrial structure in explaining differences in productivity. Section 3.2 goes on to look at the underlying drivers of relatively low productivity in the UK. Section 3.3 concludes and draws out the implications for public policy and for businesses.

3 https://oecdecoscope.blog/2019/01/21/statistical-insights-are-international-productivity-gaps-as-large-as-we-thought/

3.1 – How much does industrial structure matter?

One way in which a country can increase productivity is by transferring resources from low productivity to high productivity sectors. This process is sometimes referred to as the 'Lewis Model', after the economist Arthur Lewis. In the 1960s, Lewis described a simple stylised model of economic development, where a country can increase total productivity by transferring labour from low productivity agriculture to high productivity manufacturing[4]. Much of the debate around the UK's productivity gap is rooted in similar logic: namely that the problem has been a 'reverse Lewis shift' from manufacturing to lower productivity services sectors[5].

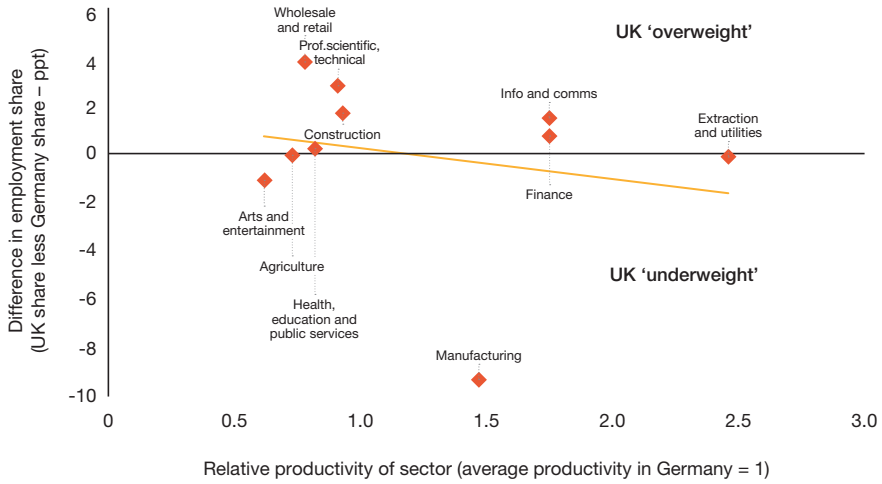
Shifting resources from one sector to another is, however, not easy. Different sectors need workers with different skills and they also need very different forms of capital. A high street shop, for example, cannot easily be turned into a factory making solar panels, nor can retail workers easily shift to high tech engineering or design work. But, setting that aside, is it even true that the sectoral mix of the UK economy is the fundamental problem?

To analyse this systematically, it is useful first to note that the difference in productivity between any two countries can be attributed – in a purely mathematical sense – to a combination of two factors:

- **a 'between-industry' or 'compositional' effect**, where one country has a greater share of workers in industries which have higher productivity (in both countries); in the Lewis example, country A (e.g. China) has higher productivity because it has a greater share of workers in manufacturing than country B (e.g. India), which still has a larger agricultural sector; and
- **'within-industry' effects**, where one country has higher productivity within the same industries - in the Lewis example, country A has higher productivity than B in both manufacturing and agriculture.

These concepts can be used to help us understand the productivity gap between the UK and a country with higher productivity, such as Germany. Beginning with the compositional effect, Figure 3.3 shows the differences in industrial structure between the two countries. Each industry sector is represented by a dot: dots above the x-axis are where the UK has a larger employment share than Germany, dots below the axis where the UK has a lower share. The sectors are ordered by their relative productivity: the further to the right they are in the chart, the more productive an industry is[6].

Figure 3.3 – Differences in industrial structure between the UK and Germany



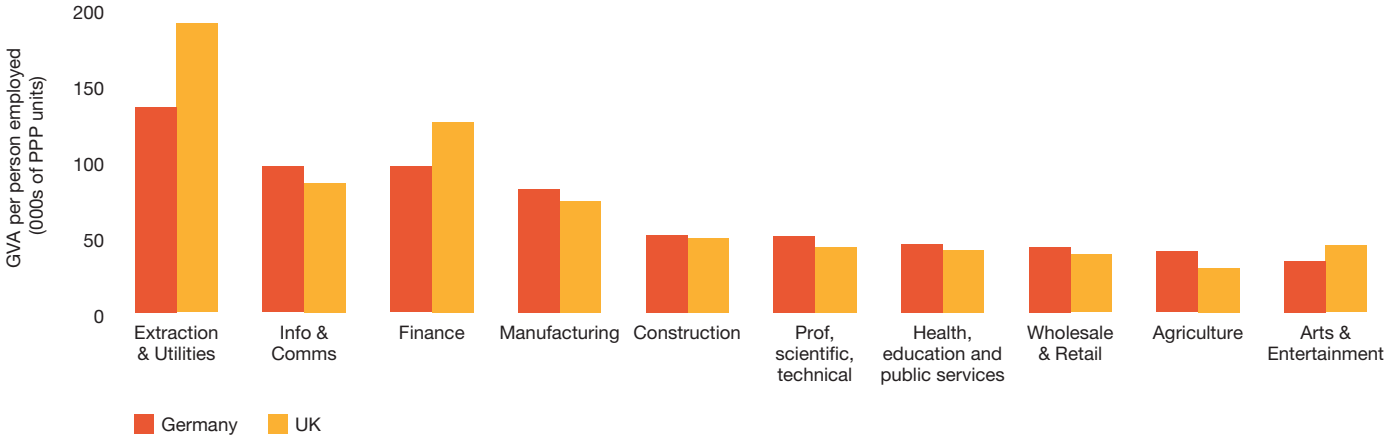
Note: X-axis shows productivity in each industry in Germany, relative to the average for the German economy as a whole. Real estate sector is excluded as this is principally imputed rents.

Source: PwC analysis of Eurostat data

The starkest difference in structure is that Germany has a much larger share of employment in manufacturing, which has productivity 45-50% higher than the economy as a whole in both countries. The UK has correspondingly higher shares of employment in construction and across a number of service sector industries. Some of these are sectors, such as wholesale and retail, that have lower productivity than manufacturing, but some are sectors such as finance or communications that have higher productivity. The downward sloping line of best fit indicates, however, that the overall net effect of industrial composition is to boost German productivity relative to the UK.

4 Lewis (1954), Economic Development with Unlimited Supplies of Labour, http://faculty.smu.edu/tosang/pdf/Lewis_1954.pdf
5 See, for example, Froud et al (2012), Rebalancing the Economy (or Buyer's Remorse), http://hummedia.manchester.ac.uk/institutes/cresc/workingpapers/wp87.pdf
6 The sectors are ordered by their relative productivity in Germany, but using UK relative productivities would not dramatically change the picture.

Figure 3.4 – Productivity per worker at industry level, Germany and UK



Note: Productivity has been calculated using whole economy PPP exchange rates (both for this chart and later ones in this article). This can theoretically lead to some distortion of relative productivity between industries, but it was judged to be preferable given the large potential for error in industry-specific PPP rates. PPP figures are based on the average price level of EU27 countries.

Source: Eurostat

Figure 3.4 shows the 'within-industry' picture. The UK has substantially higher productivity than Germany in the extraction and utilities sectors, and in finance. It also has somewhat higher productivity in the arts and entertainment sector. In every other sector, productivity per worker in the UK is below German levels.

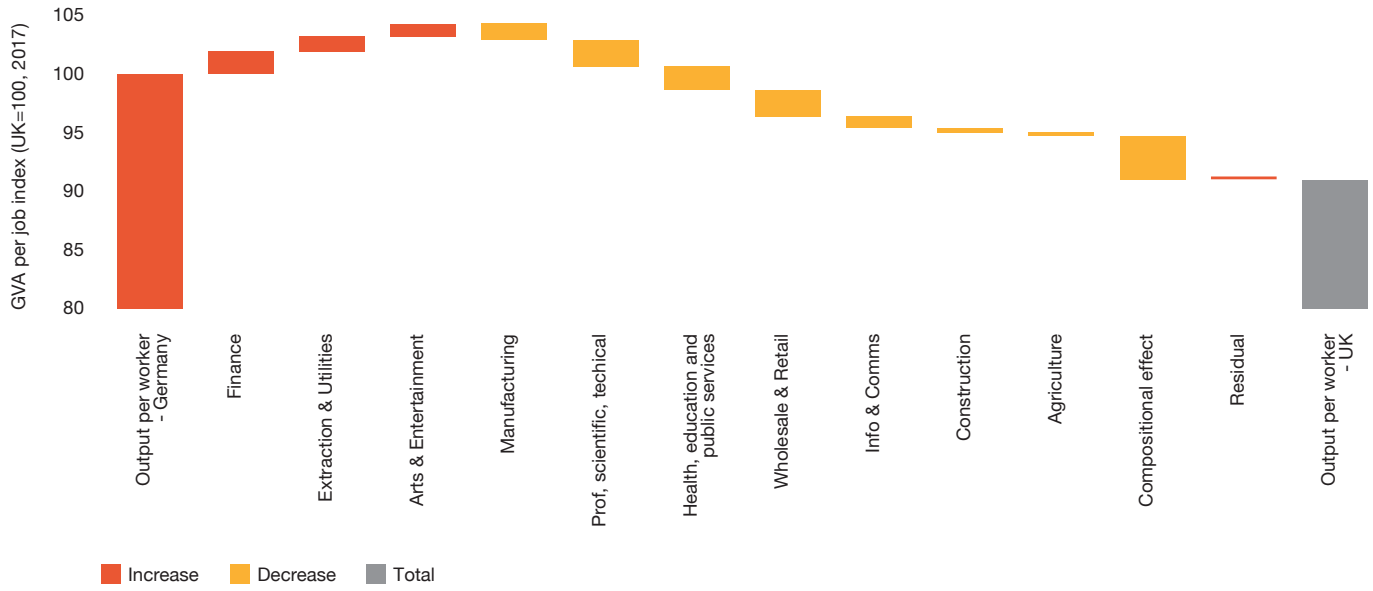
Figure 3.5 shows a decomposition of the per-worker[7] productivity gap between the UK and Germany, splitting the gap into what is attributable to the UK having lower or higher productivity in each sector, which is a function of the size of the gap and the size of the sector; and finally a composition effect showing the net effect of the UK's industrial structure relative to Germany's.

The red bars on the left show the three sectors that make a positive contribution; that is, in which the UK has higher productivity than Germany:

- **Extraction and utilities:** a large part of the extraction sector in the UK consists of North Sea oil and gas, a far higher productivity activity than coal mining, which is the dominant extraction activity in Germany.
- **Finance:** London's role as a major global financial hub means that the UK has a relatively large number of highly remunerated jobs[8] in this sector[9].
- **Arts and entertainment:** the UK is recognised as an international centre of excellence in film, music, TV production and other creative industries[10].

7 For consistency, we have used output per worker, as measurement issues for hours at an industry level are probably even more substantial than for cross-country comparisons.
8 There is a close link between wages and productivity. The most commonly used measure of productivity is Gross Value Added (GVA) per worker. As GVA is by definition the sum of compensation of workers and the operating surplus (a measure of profits) of firms, firms with high average wages tend to have high GVA per head, and so high productivity per head.
9 For more information on the importance of the City to the UK Economy, see https://www.thecityuk.com/research/a-vision-for-a-transformed-world-leading-industry/
10 Recognising the high productivity jobs it can bring, since 2007 the UK Government has operated a Tax Relief scheme for films made in the UK. This was expanded in 2013 to cover high-end TV and animation, and in 2016 to cover video games and children's programming.

Figure 3.5 – Sector decomposition of the gap between UK and German productivity per worker



Note: 'Increase' bars show the contribution of sectors where the UK has a productivity advantage, 'decrease' where Germany has a productivity advantage. Composition effect is calculated by altering German sector employment shares to UK shares, holding productivity in each sector at German levels. The residual is due to convexity.

Source: PwC analysis of Eurostat data

The orange bars in Figure 3.5 show the contribution of the sectors where the UK has a productivity advantage, whilst the yellow bars show the contribution of sectors where Germany has a productivity advantage. Finally, the bar capturing the compositional effect on the right shows the net effect of the differences in industrial structure shown in Figure 3.3. This compositional effect explains around half of the overall gap in productivity between the UK and Germany. The other half can be explained by superior German productivity performance across a range of sectors, outweighing sectors (such as finance) where the UK outperforms.

In comparing UK productivity to Germany, therefore, industrial structure does seem to be an issue. If manufacturing became as important to the UK economy as it is to Germany, then that could raise UK productivity. However, it would depend on what sectors workers relocated from. If workers were moved from relatively low productivity sectors such as retail, there would be a clear productivity gain, but that would be far from easy given the very different skills sets required for workers in high productivity manufacturing sectors like aerospace or pharmaceuticals.

Furthermore, if workers were relocated to manufacturing from high productivity parts of the UK service sector – such as finance or communications (where some workers could have appropriate scientific academic backgrounds) - it is not clear there would be any net productivity gain at all.

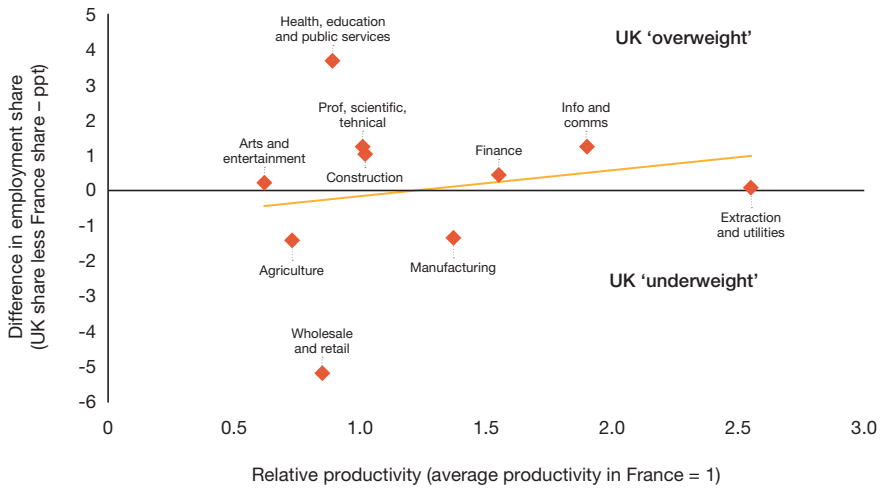
11 This point is explored further in Section 3.2 below.

What about the other countries shown in Figure 3.2? The US has a vastly domestic market, and its leading firms – in technology, aerospace and pharmaceuticals amongst other sectors – produce and bring to market many globally transformative innovations[11]. However, France and Sweden are more similar in size to the UK, and as members of the EU they are more closely aligned on regulation. What explains the productivity gap between the UK and these other two EU countries?

Figures 3.6 and 3.7 show how UK industrial structure differs to, respectively, France and Sweden. Some themes emerge:

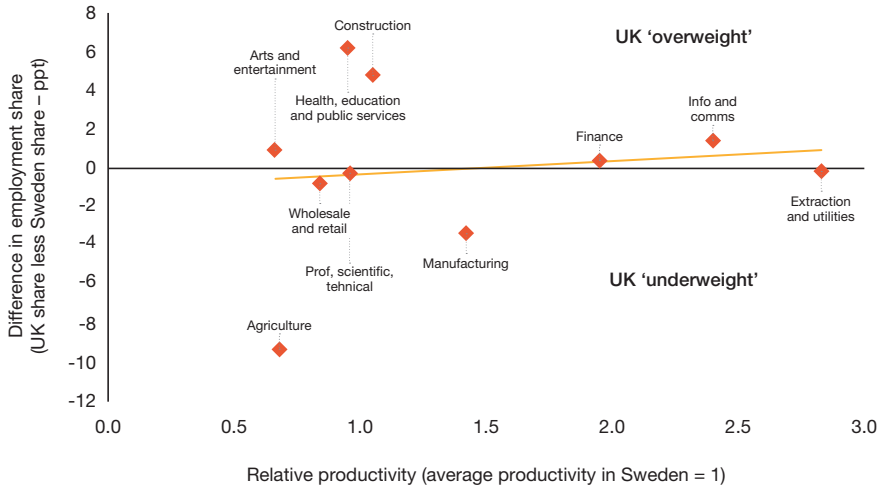
- The UK has a lower share of employment in **manufacturing**; however, the gap is nowhere near as large as with Germany. The effect on productivity is counterbalanced by the UK having a smaller **public sector**, which has below average productivity in each of these countries.
- Compared to France and Sweden, the UK has more employment in **finance and communications**, which are high productivity service industries. However, this is balanced by also having a larger share of employment in **retail and wholesale**, a relatively low productivity industry.

Figure 3.6 – Differences in industrial structure between the UK and France



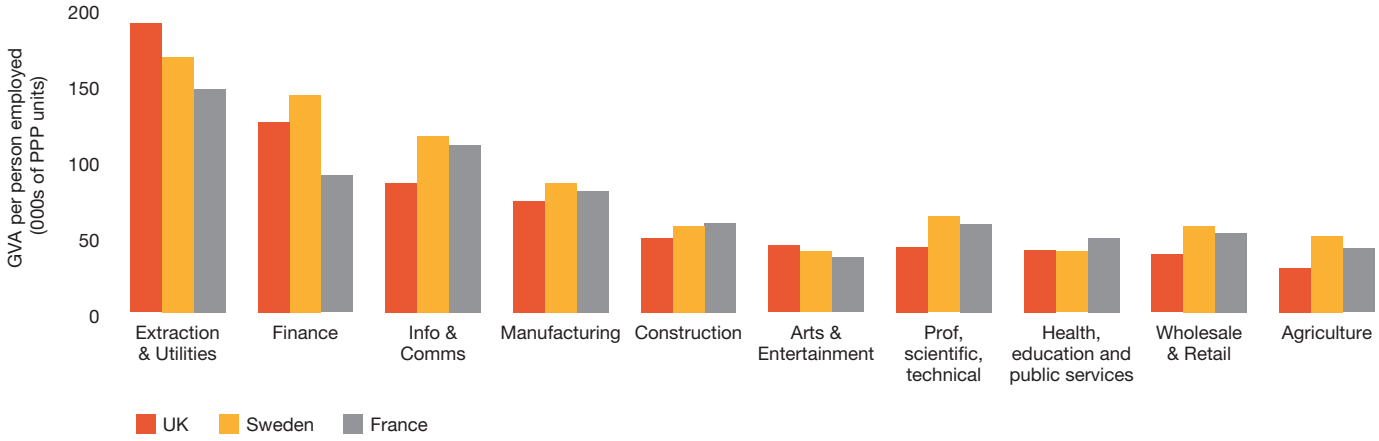
Source: PwC analysis of Eurostat data

Figure 3.7 – Differences in industrial structure between the UK and Sweden



Source: PwC analysis of Eurostat data

Figure 3.8 – Industry level differences in productivity between the UK, France and Sweden



Source: Eurostat

Overall, as suggested by the downward sloping lines in these three charts, industrial composition cannot explain lower aggregate productivity in the UK compared to these countries. If anything, the UK's industrial composition gives it some limited productivity benefit relative to France. Lower UK productivity relative to these economies – which are highly service based economies like the UK – is down to within-industry differences in productivity, as shown in Figure 3.8. The UK does better in extractive industries and arts and entertainment, but across a range of service sector industries it lags behind.

The UK is even outperformed in finance by Sweden, despite having in London a major world financial centre. Sweden scores well on financial innovation, being home to an estimated 400 Fintech firms[12]. However, more than anything Sweden's performance illustrates the power of adoption: widespread adoption of cashless payments and other digital technologies has allowed Sweden to reduce its reliance on labour-intensive branch networks[13].

12 See https://www.investstockholm.com/globalassets/invest/reports/stockholm-fintech-guide.pdf
13 See https://www.swedishbankers.se/en-us/the-swedish-bankers-association-in-english/the-swedish-banking-market/the-swedish-financial-market/ and https://www.mckinsey.com/industries/financial-services/our-insights/disruption-in-european-consumer-finance-lessons-from-sweden

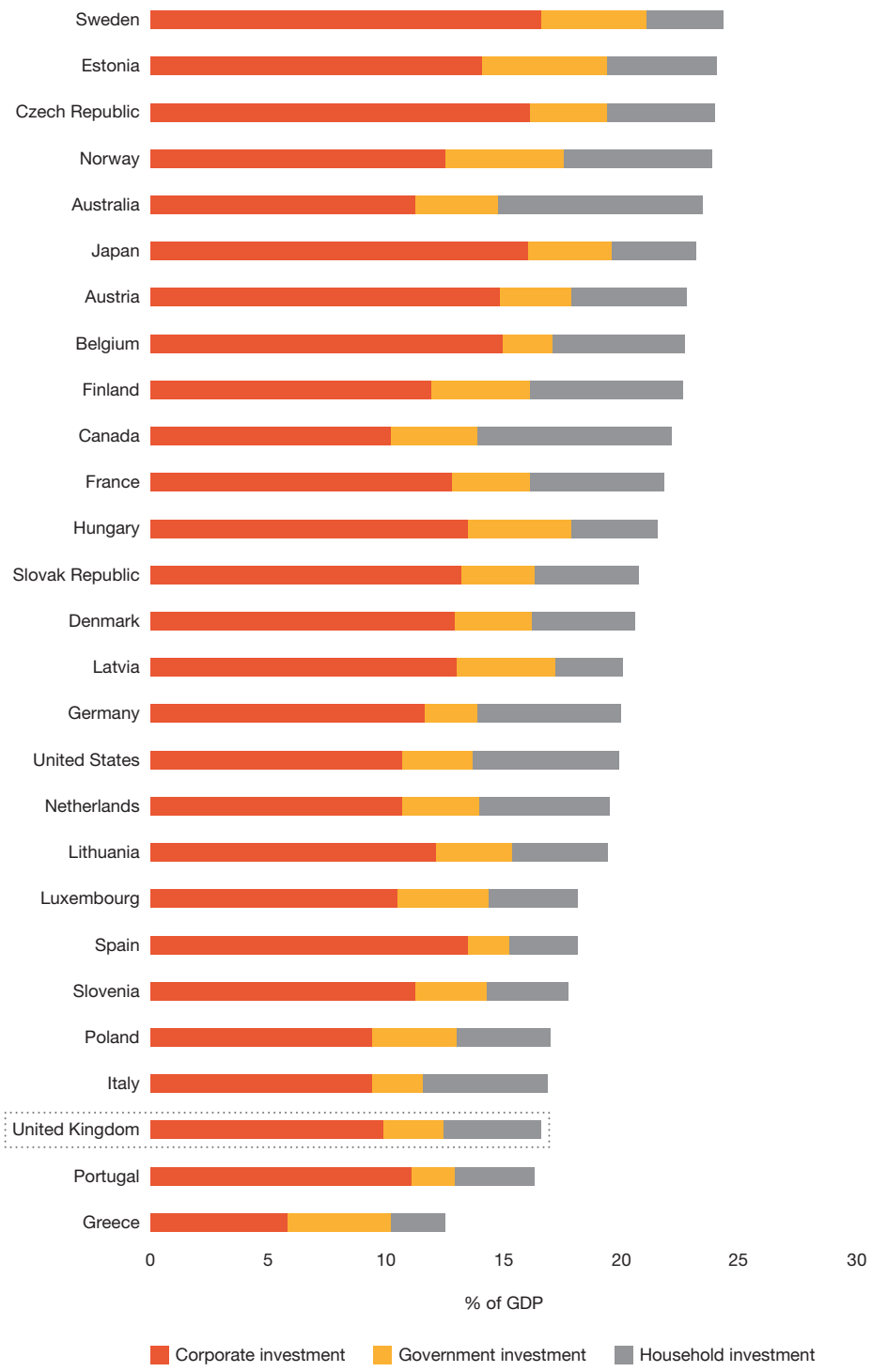
3.2 – What are the underlying drivers of lower productivity levels in the UK?

The analysis above makes clear that within-sector productivity differences are generally the most important factors behind the UK's relatively low overall level of productivity. But what underlies these differences? The first obvious place to look is at differences in capital investment rates.

Investment and capital stock

Figure 3.9 shows the UK's total investment rate – by business, government and households – as a % of GDP, relative to other OECD countries. The UK has the 3rd lowest investment rate in the entire OECD. Part of this is explained by low housing investment; whilst important from a broader social well-being perspective, this has less impact on productivity than corporate or infrastructure investment. However, even judged on business investment alone, the UK ranks close to the bottom of the OECD. National saving rates have been even lower in the UK, such that even with a low investment rate the UK has run persistent current account deficits. National savings rates are correlated with investment rates, so policies that increase UK saving rates could have positive pay off over time. Any increase in saving needs to be balanced against the need to maintain macroeconomic stability and strong employment, so it should be a gradual process over time.

Figure 3.9 – Investment rates for OECD countries

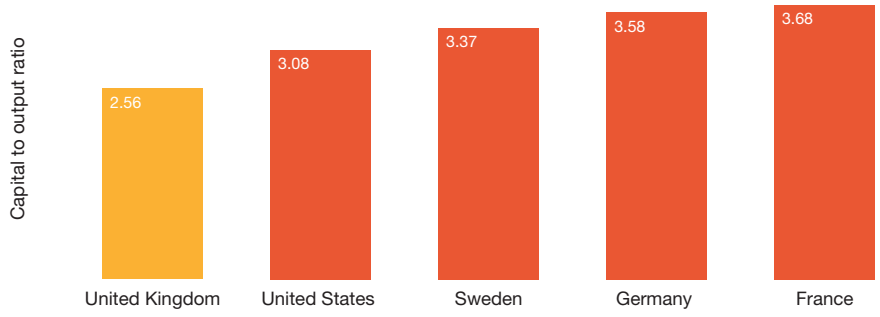


Source: OECD

Investment rates in the UK have been low for a long time, and this has translated into a capital-output ratio that is lower than in many of its peers, as shown in Figure 3.10. Like the productivity gap itself, this is not just the result of differences in industrial structure; the UK has a lower capital-output ratio even than other services-based economies such as France and the US.

In a mechanical sense, this lower capital-output ratio could plausibly explain much of the UK productivity gap. However, rather than being a fundamental explanation in itself, this gap in capital really just brings us back to the question of why UK firms seem to invest less. At a time when innovations such as AI have the potential to transform how goods and services are provided, it is more important than ever for firms and countries to be making the investments necessary to drive improvements in productivity[14]. In this respect, the UK's poor showing in R&D spending is particularly worrying. At just 1.7% of GDP it lags behind the EU average of 2.1%, is lower than Germany and France and barely half the level of Sweden[15].

Figure 3.10 – Capital-output ratios for selected countries



Sources: Eurostat, EUKLEMS

14 PwC research on The Impact of Artificial Intelligence on the Economy has highlighted the transformation new technologies could bring to the way we work: https://www.pwc.co.uk/economic-services/assets/macroeconomic-impact-of-ai-technical-report-feb-18.pdf

15 https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/bulletins/ukgrossdomesticexpenditureonresearchanddevelopment/2017

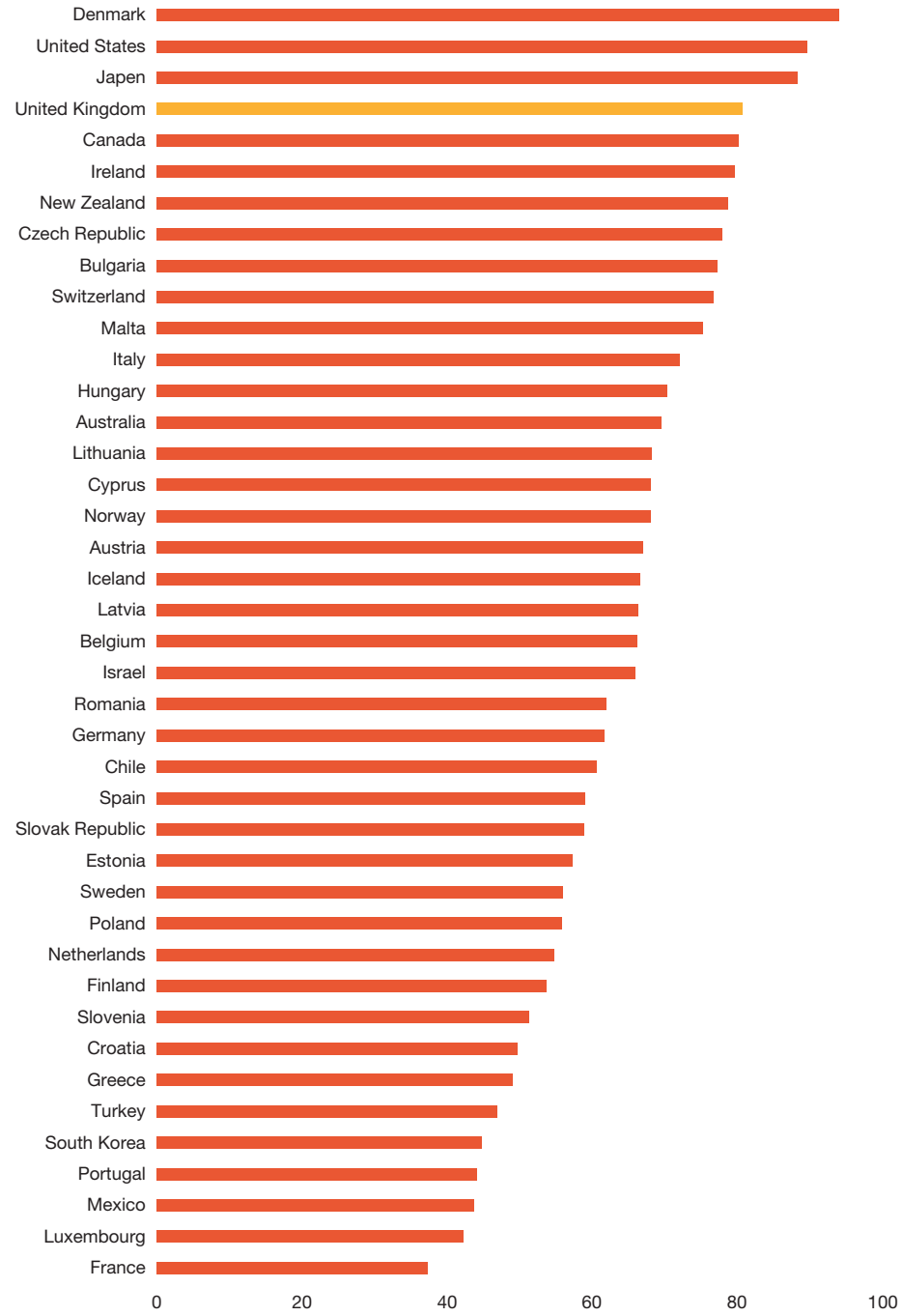
Does UK plc have a labour-intensive business model?

In the long run, growth in labour productivity (driven by investment and innovation) underpins growth in real wages. However, some have argued that the causation runs in both directions. If firms have access to plenty of cheap, flexible labour, then they may have less reason to invest in labour-saving technology that increases productivity. Indeed, at the industry level, it is not clear empirically whether it is productivity or wages that drives the other[16].

The UK certainly has a highly flexible labour market, according to comparative OECD analysis (see Figure 3.11). Although slightly behind the US and Japan, the UK is rated as having the fourth most flexible labour market in the OECD. Together with other factors that have underpinned labour supply[17] – such as increases in the participation rate for older workers[18], higher levels of educational attainment and strong inward migration since the early 2000s – this may have encouraged a relatively labour-intensive business model in the UK. It is certainly true that the years since the crisis have seen a combination of disappointing real wage growth and unexpectedly strong employment growth, consistent with a boost to labour supply.

However, it is not clear that labour market flexibility necessarily leads to low productivity outcomes. Economies such as Denmark and the US combine very high ratings for labour market flexibility with high productivity. Indeed, the overall correlation across OECD countries between labour market flexibility and labour productivity is actually positive. Furthermore, the UK's productivity gap long predates some of the trends – such as higher inward migration and increased participation rates by older workers – which have boosted UK labour supply over the past decade.

Figure 3.11 – OECD index of labout market flexibility, 2019



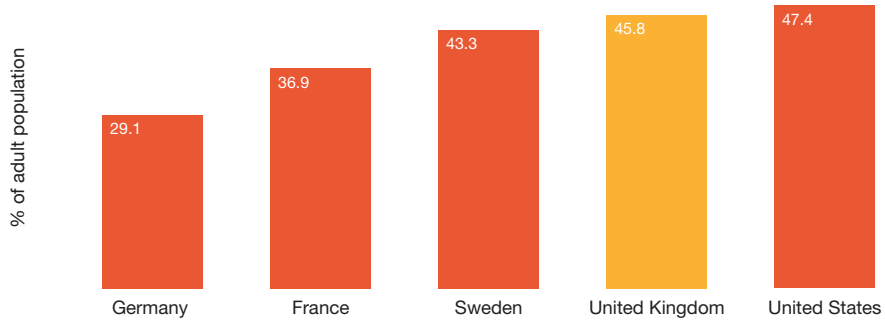
Source: OECD

16 See 'Does productivity drive wages? Evidence from sectoral data'. https://bankunderground.co.uk/2017/03/30/does-productivity-drive-wages-evidence-from-sectoral-data/
17 For example see the speech by Michael Saunders 'The Labour Market'. https://www.bankofengland.co.uk/speech/2017/the-labour-market
18 Although PwC's Golden Worker Index highlights how much further scope for improvement the UK has relative to countries such as Iceland, New Zealand or Israel. https://www.pwc.co.uk/services/economics-policy/insights/golden-age-index.html

Skills and education

Perhaps the key issue is therefore not with quantities of labour relative to capital, but with the quality of labour, particularly the knowledge and skills that workers are able to bring to their jobs. Evidence here is mixed. The UK now has a relatively high share of graduates in the adult population, ahead of other major EU countries and almost matching the US, as shown in Figure 3.12. However, degree level qualifications may not necessarily give workers the skills required for the most productive jobs, and it may be more important how qualified non-graduates are for such jobs. Section 4 includes data on skills gaps which suggests that the workers with the right skills are often in the 'wrong' parts of the UK.

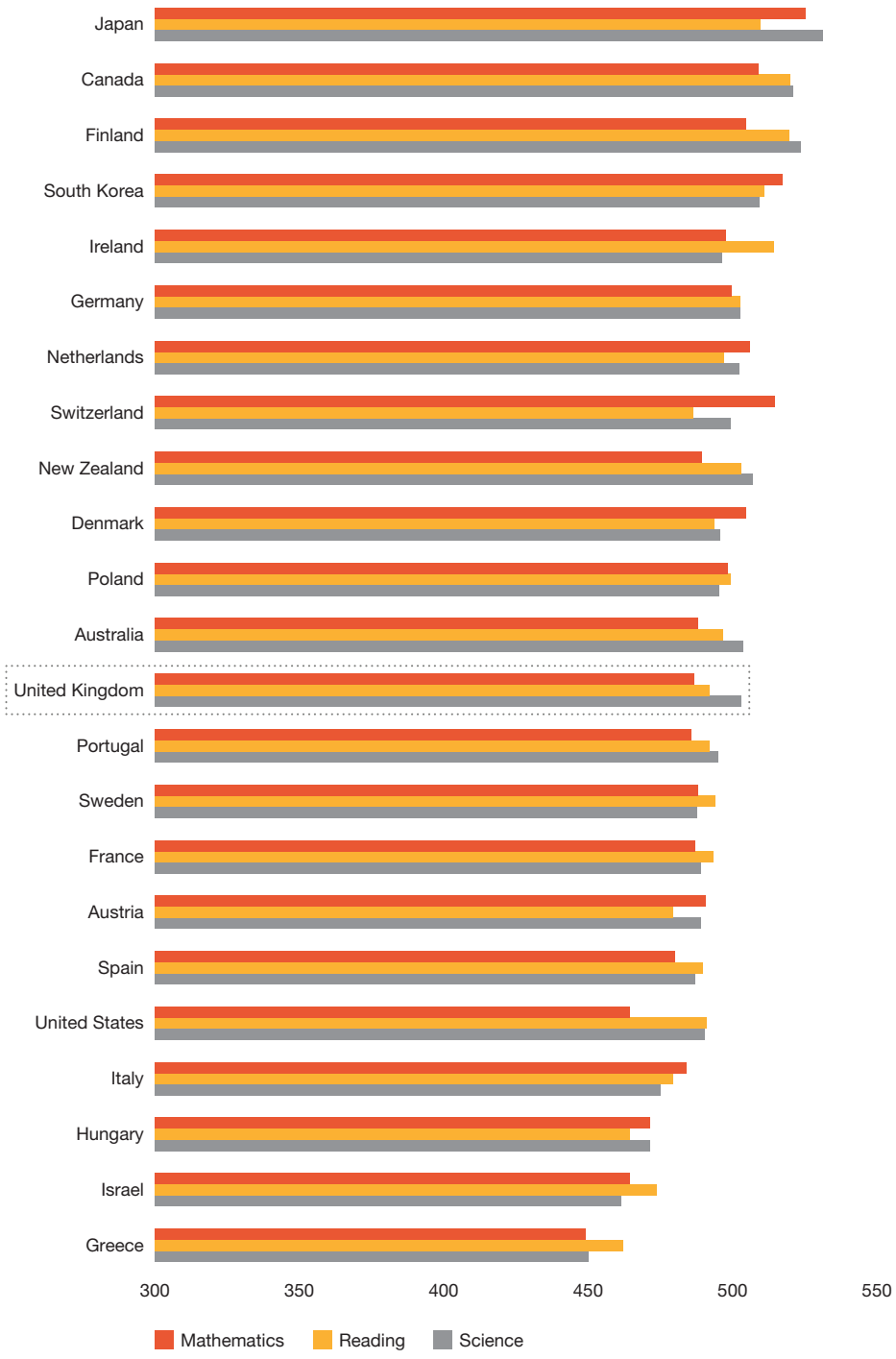
Figure 3.12 – Proportion of adults with tertiary education, 2018



Source: OECD

Another possible measure of interest here is the OECD's PISA exercise, which evaluates school age educational standards in reading, maths and science based on standardised assessments. On these measures, the UK is less impressive, coming mid-table in reading and maths (see Figure 3.13). It scores lower in reading and maths than most of the countries with higher productivity shown in Figure 3.2. However the UK does do better in science, and it should be noted that the US performs worse than the UK in all three subjects and still has high productivity. The US's middling performance also does not appear to prevent it from creating leading innovations in the technology sector, as well as in aerospace, pharmaceuticals and other industries, and – equally importantly – bringing these innovations to market. It may be that the educational performance of the median school student, rather than the top of the distribution, is most important in how it enables diffusion of new technology through the economy. The median student or worker is unlikely to develop a new innovation, but they will need to adapt to using new technologies over the course of their careers. Better educational standards give workers a stronger platform to be able to learn new skills. This point – about the importance of diffusion relative to innovation – is explored in more detail in the following sub-section.

Figure 3.13 – PISA scores in reading, maths and science



Note: Countries are ordered by their average score across Reading, Maths and Science, although this average is not shown on the chart.

Source: OECD

Long tail of relatively low productivity businesses

The importance of diffusion of ideas and techniques for productivity has been highlighted by analysis from the OECD[19] and the Bank of England[20]. In this narrative, the problem with UK productivity is not the lack of high productivity firms: the UK is home to many world-beating companies in sectors like finance, technology, aerospace, pharmaceuticals and business services that have high levels of productivity. Rather, the problem is that the diffusion of ideas, technology and best practice from these 'frontier' firms to the rest of the private sector (and arguably also parts of the public sector, such as the NHS) is too slow. The result is a 'long-tail' of firms with relatively low productivity, which drags down the UK average. This 'long-tail' exists in every economy, but based on analysis of firm-level data, Haldane (2017)[21] finds it to be more acute in the UK than in France or Germany.

In this analysis, the problem is not so much that firms lack the capabilities to create new innovations, but that firms are not effective enough at adopting innovations created by others. R&D spending and innovation tend to be concentrated in a few firms, while most companies undertake little or no R&D activity. The importance of diffusion for productivity can also be seen at the country level; a small country of 10 million people or less is unlikely to account for a very large share of global innovation, but there are small countries – for example Switzerland or Denmark – which have very high levels of productivity. Productivity growth at a global level |must ultimately rely on technological innovation; but the relative level of productivity between firms (or countries) may be driven more by who is better at adopting these innovations.

What would help UK firms adopt technologies and best practice more quickly? Workforce skills are an important factor. Part of this is about educational standards, which give workers the core skills they need to adapt to new technologies. But it is at least as important to have a system that supports and encourages workers to gain new skills throughout their career. School and university age education is important, but 80% of the workers who will be in employment in ten years' time are already in the workforce.

Professor John van Reenen and other researchers have drawn attention to the importance here of **management practices**, and how much these can vary across firms and countries[22]. On their measures, UK firms in manufacturing lag behind their counterparts in the US, Germany, Sweden and Canada. They also find that management practices are positively correlated with worker skill levels, suggesting that improvements in these areas can be mutually reinforcing. If managers can make better use of information to target efficiency gains, and adopt new techniques and technologies, the benefits in productivity for their firms – and the wider economy – can be substantial. Many important new technologies also cut across sectors, and the UK lags behind adoption of technology for enterprise resource planning, supply chain and customer relationship management[23].

Regional disparities

The UK's aggregate productivity gap can be re-cast in regional terms. Productivity in London is around 40% higher than for the UK as a whole, making it more productive on average than any of the comparator countries examined in this article. In contrast, productivity in Yorkshire and Humberside is around 16% below the UK average. Differences at the regional level become even greater at lower levels of disaggregation. The next section of this report explores these differences in regional productivity and what causes them, concluding that if areas with productivity below the UK average could close half of that gap, this could boost UK productivity by almost 4%, closing around half the gap in aggregate output per worker with Germany.

19 For example Andrews, Criscuolo and Gal (2015), Frontier Firms, Technology Diffusion and Public Policy. http://www.oecd.org/economy/Frontier-firms-technology-diffusion-and-public-policy-OECD-productivity-working-papers.pdf
20 Haldane (2017) 'Productivity Puzzles'. https://www.bankofengland.co.uk/speech/2017/productivity-puzzles
21 Ibid.
22 Bloom et al (2012), 'Management practices across firms and countries', NBER Working Paper 17850. https://www.nber.org/papers/w17850.pdf
23 See https://www.kcl.ac.uk/ifis/assets/gearing-up-for-digital-transformation-web.pdf

3.3 – Conclusions and implications for policy and business

The UK has a persistent productivity shortfall relative to other leading advanced economies such as the US, Germany, France and Sweden. Our analysis shows that the industrial structure of the UK is not the primary reason for this shortfall, and strategies that seek to close this gap by promoting any one sector are unlikely to be successful.

A horizontal strategy, which attempts to improve productivity performance across a range of sectors, is a more promising approach. This needs to have a number of elements:

- Higher standards in the formal education system, and a lifelong upskilling strategy that supports workers to acquire new skills – particularly digital skills – throughout their career, both in and out of employment. AI and other new technologies are likely to transform the workplace in coming decades and having an adaptable workforce will be key if UK firms are to reap the potential productivity rewards of these technologies.
- Firms themselves can upskill, investing in digital transformation and making greater use of data to improve management practices, allowing them to adopt new methods more quickly and bring their products to market more effectively.
- A better investment environment, with government ensuring the country has the modern infrastructure it needs, and a financial system which supports private investment by firms of all sizes.

Together with more regionally balanced growth, these could all help the UK reduce or close the gap with other advanced economies. In the next section, we look further at how this could be achieved through policies aimed at closing regional productivity gaps across the UK.

4. What drives regional productivity gaps across the UK and how can these be closed?[1]

Key points

- Regional productivity gaps are large, with average output per job around 40% above the UK average in London, but about 16% below the national average in Yorkshire and the Humber.
- The gap between the best- and worst-performing local enterprise partnerships (LEPs) in England has widened over time, with productivity in the highest-ranking LEP being 2.1 times more than in the least productive LEP in 2017, compared to 1.8 in 2002.
- While differences in the composition of industrial activity can explain some regional productivity differences, "horizontal" issues such as skills, connectivity and innovation appear more significant in general.
- Using a cross-sectional regression analysis, we find that places that are better connected physically and have access to skilled workers tend to be associated with higher productivity levels.
- These findings suggest that both policymakers and businesses need to focus on upskilling workers, particularly in areas where there are skills gaps, such as self-management and leadership skills as well as digital capabilities.
- Investing to improve the quality and capacity of local infrastructure could help boost the connectivity of a place (and consequently its productivity based on our analysis). LEPs could work in collaboration to strengthen intra-region connectivity and access to economic hubs, for instance drawing on the experience of the Oxford-Cambridge arc, which is supported by four LEPs in the region.
- The economic prize for getting this right could be significant. If areas that are currently performing below the UK average can close 50% of this productivity gap, it could boost GDP by £83 billion in these areas, equivalent to an increase of nearly 4% in total UK GDP.

Introduction

As our analysis in the previous section shows, UK productivity levels continue to lag behind other advanced economies such as France, Germany, Sweden and the US. This reflects slower productivity growth since the financial crisis (see Figure 3.1 in the previous section), but also long-term structural challenges facing the UK economy related to factors like infrastructure and skills.

In this article we apply a regional lens to the 'productivity puzzle' by examining disparities in regional productivity and the causes and drivers of these differences. As our analysis shows, the issue for many parts of the UK is less about how to catch up with other countries than about how to catch up with cities and regions much closer to home. Questions of devolution and decentralisation have risen up the agenda in recent years, with local cities and regions now having greater capacity and autonomy to respond to local needs and challenges.

We also show the potential further gains that could be achieved from 'levelling-up' productivity across areas.

The discussion in the rest of the article is structured as follows:

- Section 4.1 How does productivity vary across different parts of the UK?
- Section 4.2 The causes and drivers of varying regional performance across the UK
- Section 4.3 How can the UK boost productivity in regions that lag behind?
- Section 4.4 The potential prize from closing the regional productivity gap

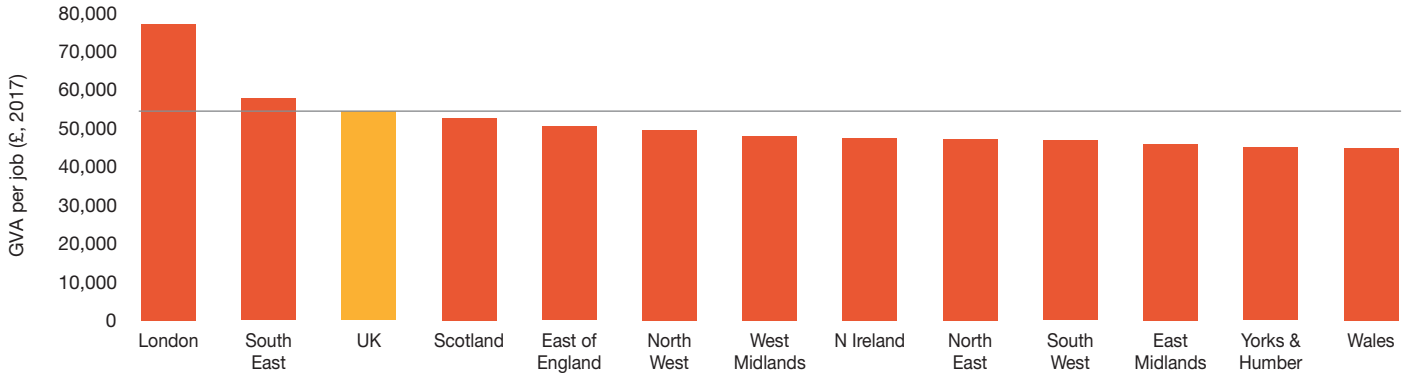
Details of our regression analysis of the possible drivers of local productivity differences are provided in a technical annex.

> "Halving the regional productivity gap could increase UK GDP by £83bn.

Jing Teow
Senior Economist, PwC

1 This article was written by Jing Teow and Natasha Reilly.

Figure 4.1 – Productivity (GVA per job) by NUTS 1 region, 2017



Sources: ONS, PwC analysis

4.1 – How does productivity vary across different parts of the UK?

Figure 4.1 shows variation in productivity performance at the NUTS1 level[2]. The region with the highest level of productivity is London, where productivity is around 40% above the UK average, while the region with the lowest level of productivity is Yorkshire and the Humber, where productivity is 16% below the national average.

UK average productivity is skewed by the high performance of London, which accounts for 17% of the workforce and had average GVA per job of around £77,000 in 2017 (the latest year for which data are available at the regional and LEP level).

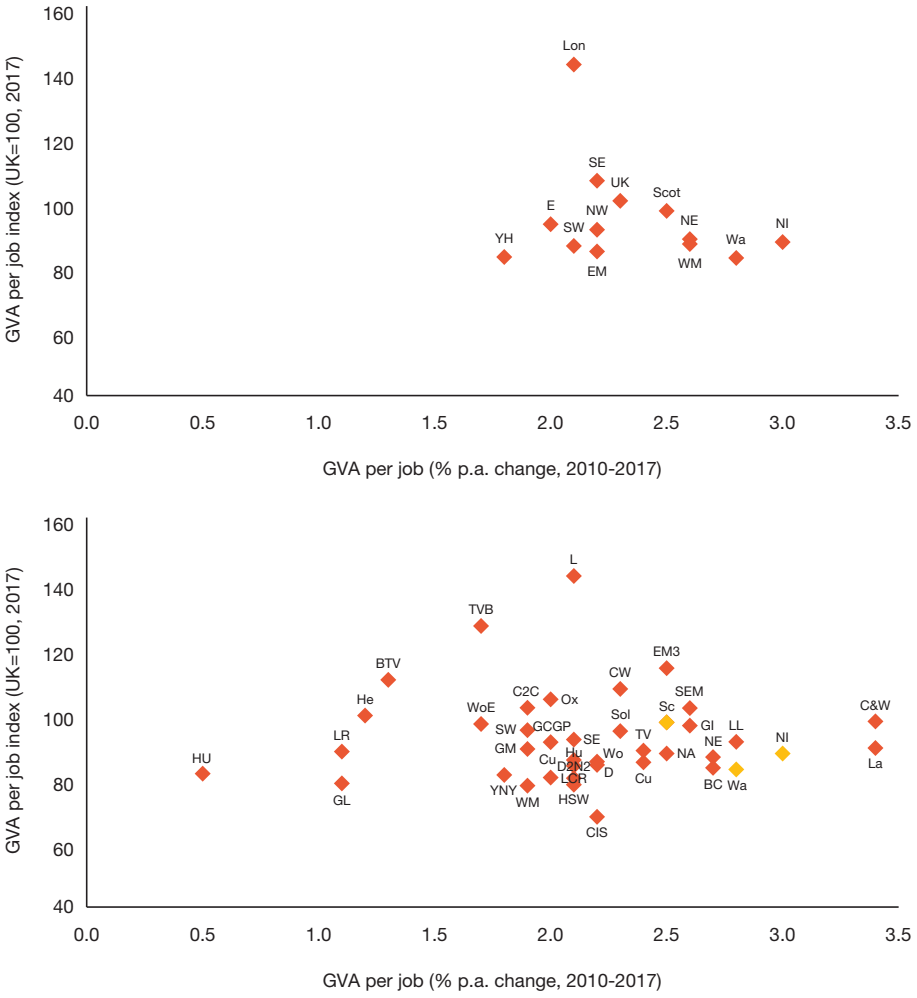
As a result, the majority of English regions sit below average UK productivity as do Wales and Northern Ireland. Scottish GVA per job is also slightly below the UK average level, despite being higher than all English regions except London and the South East.

2 When discussing regional productivity, the standard measure that has been used in this article is GVA per filled job from the regional/sub regional productivity data estimated by ONS. The NUTS1 and LEP data presented is from the most recent year of available data, 2017.

This variation in productivity becomes more distinct when considering more geographically granular areas[3], which we compare at the local enterprise partnership (LEP) level for England[4]. Figure 4.2 shows a larger dispersion in productivity performance, reflecting the diversity in the characteristics of LEPs as well as individual countries (Wales, Scotland and Northern Ireland are included as observations in the bottom panel of Figure 4.2).

Figure 4.3 presents these local productivity estimates as a heatmap to make the regional differences more clearly visible: five of the eight LEPs with above average productivity are located in London or the South East region. A number of these LEPs are located along the M3 and M4 corridor towards the west of London, an area that encompasses tech clusters that are relatively prosperous such as Oxford[5] and Swindon. The next best performing LEP in the country after London is Thames Valley Berkshire, where Reading, its biggest city, is home to tech multinationals such as Oracle, Cisco, Microsoft and Huawei.

Figure 4.2 – GVA per job, and annual growth rates at the NUTS1 and LEP level, 2017



Sources: ONS, PwC analysis

3 The speech 'Is all economics Local?' by Andy Haldane investigates this in more detail. https://www.bankofengland.co.uk/-/media/boe/files/speech/2019/is-all-economics-local-speech-by-andy-haldane

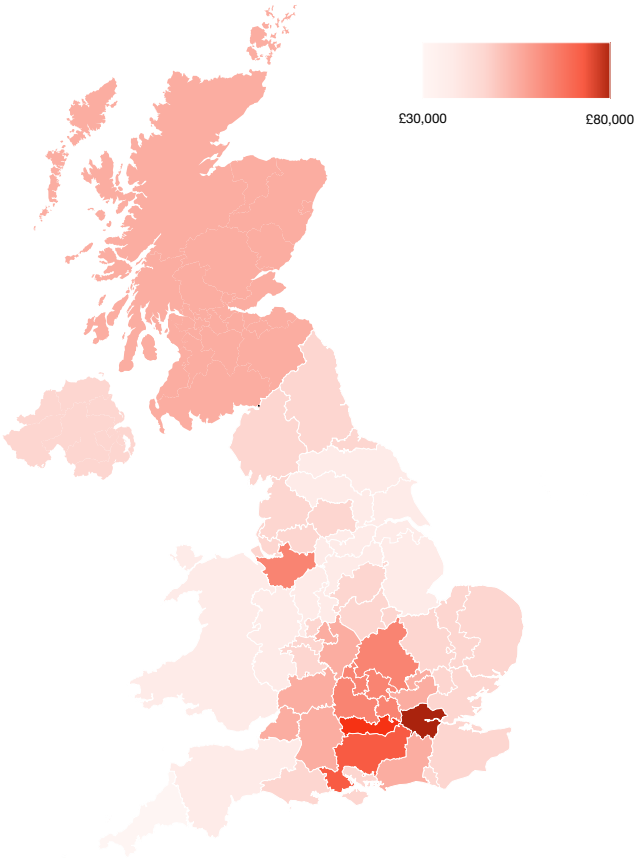
4 We also include observations for Wales, Scotland and Northern Ireland as single regions, given that LEPs only cover England.

5 It is notable here that Oxford has consistently come top of our Good Growth for Cities index in recent years, followed by Reading. This index covers a broader range of indicators beyond income and jobs, including health, housing, transport, environment, income distribution and skills. See our 2019 report for more details: PwC, Good Growth for Cities, November 2019.

The South West lags behind the South East in productivity and is home to the lowest-performing LEP – Cornwall and Isles of Scilly – which has productivity levels more than 30% below the UK average. There is also significant variation in productivity growth across LEPs. A number of LEPs, such as Lancashire and Coventry and Warwickshire have seen rapid improvements in productivity, while LEPs like Humber have struggled to improve their productivity in recent years.

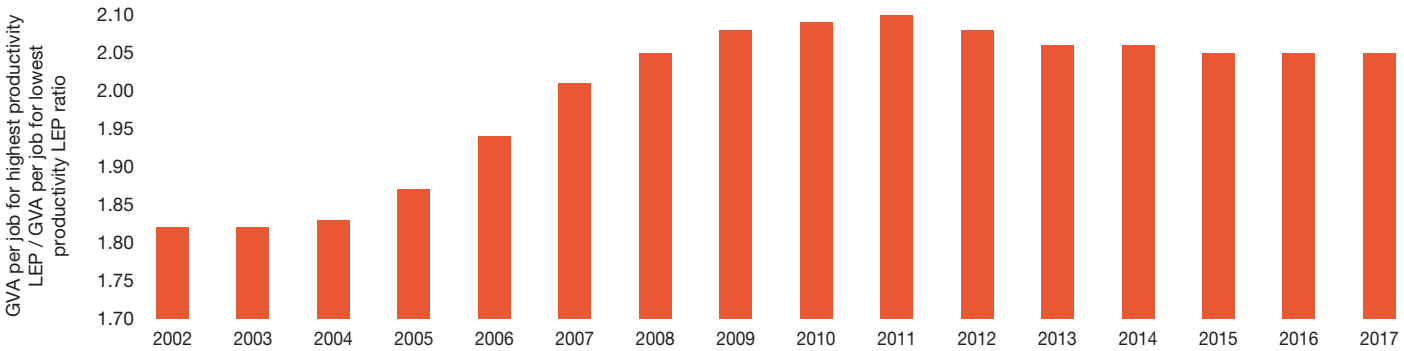
This disparity in productivity at a regional level has also risen over time (see Figure 4.4). In 2002, a London worker was 1.8 times more productive (as measured by average GVA per job) than a worker in Cornwall; by 2011 that gap had grown to 2.1 times and remained around that level up to 2017.

Figure 4.3 – Heatmap of UK productivity based on output per job for LEPs in England as well as Scotland, Wales and Northern Ireland (2017)[6]



Sources: ONS, PwC analysis

Figure 4.4 – Ratio between the highest- and lower-productivity LEP based on nominal GVA per filled job, 2002-2017



Source: ONS

6 There are 38 local enterprise partnerships (LEPs) in England. We present these alongside the data for the other three nations of the UK (Wales, Northern Ireland and Scotland).

4.2 – The causes and drivers of varying regional performance across the UK

In this section, we explore a number of possible causes and drivers of regional productivity gaps across the UK. We consider the following factors:

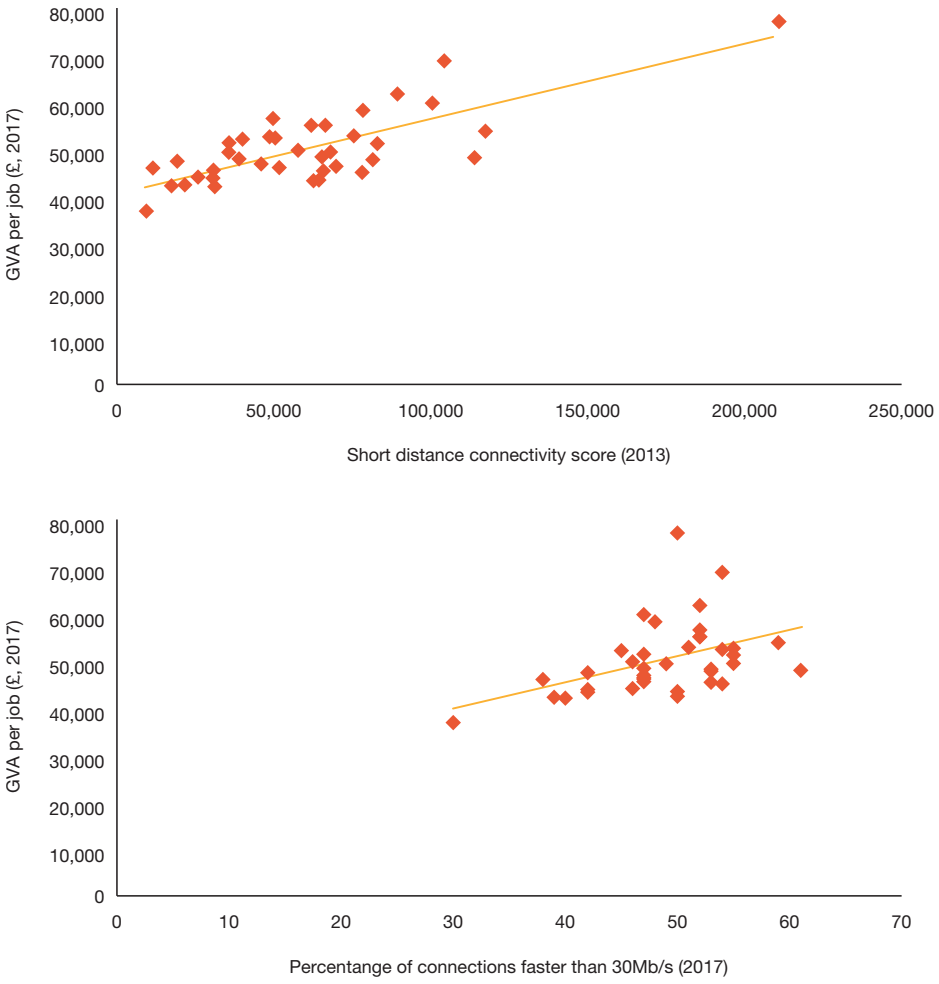
- physical and digital connectivity;
- the skills of the workplace population;
- business size;
- business investment and innovation; and
- industrial structure.

Better connected regions tend to also have higher productivity

At the heart of the case for greater connectivity is the idea of economies of agglomeration, which means that the co-location of firms and people facilitates opportunities for collaboration, competition and innovation, and so increases productivity. Venables (2007)[7] demonstrates that improvements in transport links can help support agglomeration, and that agglomeration effects can be intensified without necessarily increasing the physical concentration of firms and workers, but through improving transport connectivity. A study on the US by Leduc and Wilson (2012)[8] established that each $1 spent on highways in the US increased state annual output by $2.

By reducing the physical or virtual distances between firms, businesses are better able to collaborate with suppliers, access bigger and more diverse labour pools, and compete in bigger markets with other firms. For people, better connectivity means improved wellbeing by reducing commuting times, but also access to job and training opportunities in locations they may not have been able to reach before, thus improving matching between vacancies and jobseekers.

Figure 4.5 – GVA per job (2017) vs short-distance connectivity (2013) and GVA per job (2017) vs digital connectivity (2017) at the LEP level



Sources: ONS, PwC analysis

To examine the relationship between connectivity and productivity, we consider two measures of connectivity (as shown in Figure 4.5):

- A short-distance connectivity 'score', which PwC has calculated based on an area's access to the economic mass of other regions[9].

Specifically, this measures the level of connectivity between the geographical centre of a region and the boundary of other regions in the UK.

- The proportion of fixed broadband connections faster than 30 Mb/s, using data sourced from Ofcom[10].

7 Venables, A., Evaluating Urban Transport Improvements: Cost-Benefit Analysis in the Presence of Agglomeration and Income Taxation, Journal of Transport Economics and Policy, 41, issue 2, p. 173-188, 2007.
8 Leduc, S. and Wilson, D., Roads to Prosperity or Bridges to Nowhere? Theory and Evidence on The Impact of Public Infrastructure Investment, National Bureau of Economic Research Working Paper 18042, May 2012.
9 This measure of connectivity was developed by PwC in collaboration with Prof. Steve Gibbons at LSE to understand how well-connected areas are to other economic hubs in the UK. The higher the score, the greater the access to economic mass and the shorter distance over which businesses must travel to get the kind of access they need to supply chains, labour markets etc.
10 Ofcom, Connected Nations, 2017.

Differences in skill levels across regions show a strong correlation with the variation in productivity

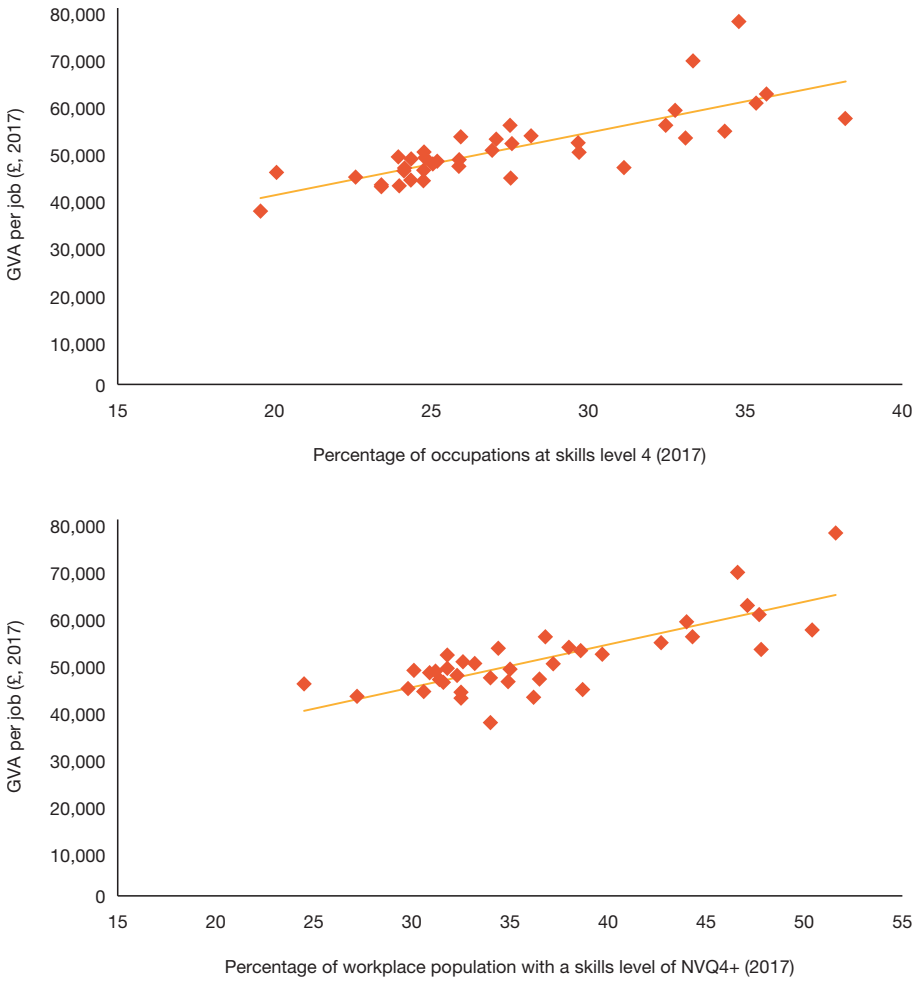
Regional deficiencies in workplace skills and regional variations in demand for skills may partly explain differences in productivity. Higher-skilled workers tend to be more productive and are better able to adapt to the use of new technology, or new production and management techniques that contribute to productivity.

We use two measures of skills (Figure 4.6):

- the proportion of workplace jobs whose skills are equivalent to at least skills level 4 (based on SOC2010); and
- the proportion of the residential working-age population whose educational attainment is equivalent to NVQ level 4 or higher.

As seen in Figure 4.6, we observe a strong positive correlation between skill levels and increased productivity.

Figure 4.6 – GVA per job vs occupational skill levels and GVA per job vs educational qualifications, at the LEP level, 2017



Sources: ONS, PwC analysis

There is some evidence to support the "long-tail" hypothesis, i.e. bigger firms tend to be more productive than SMEs

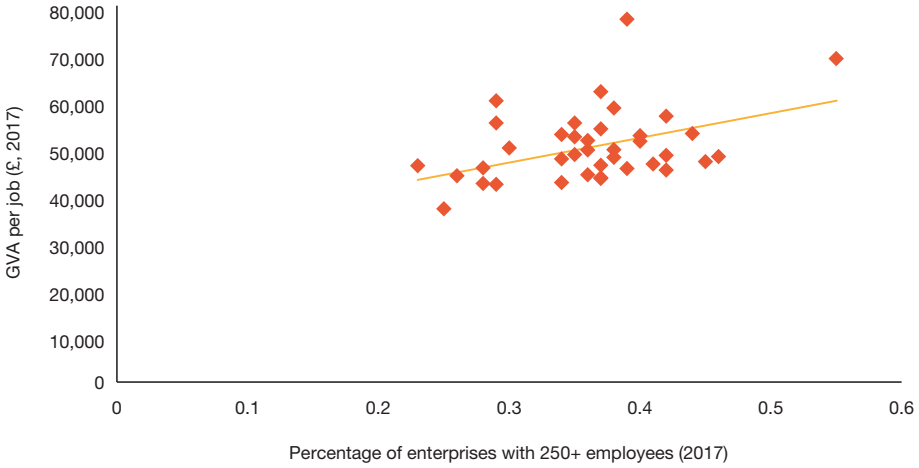
Another reason that might explain regional differences in productivity is the distribution of smaller firms that contribute to the "long-tail" of low productivity. Central to this hypothesis is the idea that larger firms are better able to invest in research and innovation and reap the benefits of those investments through greater economies of scale, while smaller businesses are on average slower to adopt new technology, less able to raise capital, and/or less likely to adopt more sophisticated management practices.

There is some evidence to support this "long-tail" hypothesis: analysis by Andy Haldane[11] at the Bank of England shows that the productivity gap between top- and bottom-performing businesses is larger in the UK than in France, Germany or the US.

To consider the impact of the distribution of enterprises across regions on productivity, we use a measure that captures the proportion of enterprises with greater than 250 employees from the UK Business Counts dataset within each LEP.

From Figure 4.7, we can see that there tends to be a positive correlation between the proportion of large businesses and local productivity. However, this relationship is not as strong as for the skills and connectivity measures.

Figure 4.7 – GVA per job vs enterprises with >250 employees at the LEP level, 2017[12]



Source: ONS

Regional disparities in investment levels and innovation could be one factor driving differences in regional productivity performance, but the association is not particularly strong

Numerous studies have linked the accumulation of R&D with economic output and growth[13]. R&D and innovation more broadly can have a transformative effect on business productivity, with evidence linking innovation to positive organisational growth[14]. The impact of a firm's own R&D can also lead to broader spillover benefits for firms in the same or related industries as it is imitated elsewhere. A study by the Institute of Fiscal Studies showed that while the private rate of return to firms from R&D investment is about 10-15%, the social rate of return (specifically for the UK manufacturing sector), can be as high as 100% when including benefits from upstream industries[15].

However, the latest ONS data on UK business investment show that it has fallen in five out of the last six quarters to Q2 2019[16]. As shown in Section 3, the UK's investment rate is one of the lowest in the OECD and its ratio of R&D spending to GDP has also been relatively low. But is this also a factor in regional productivity differences within the UK?

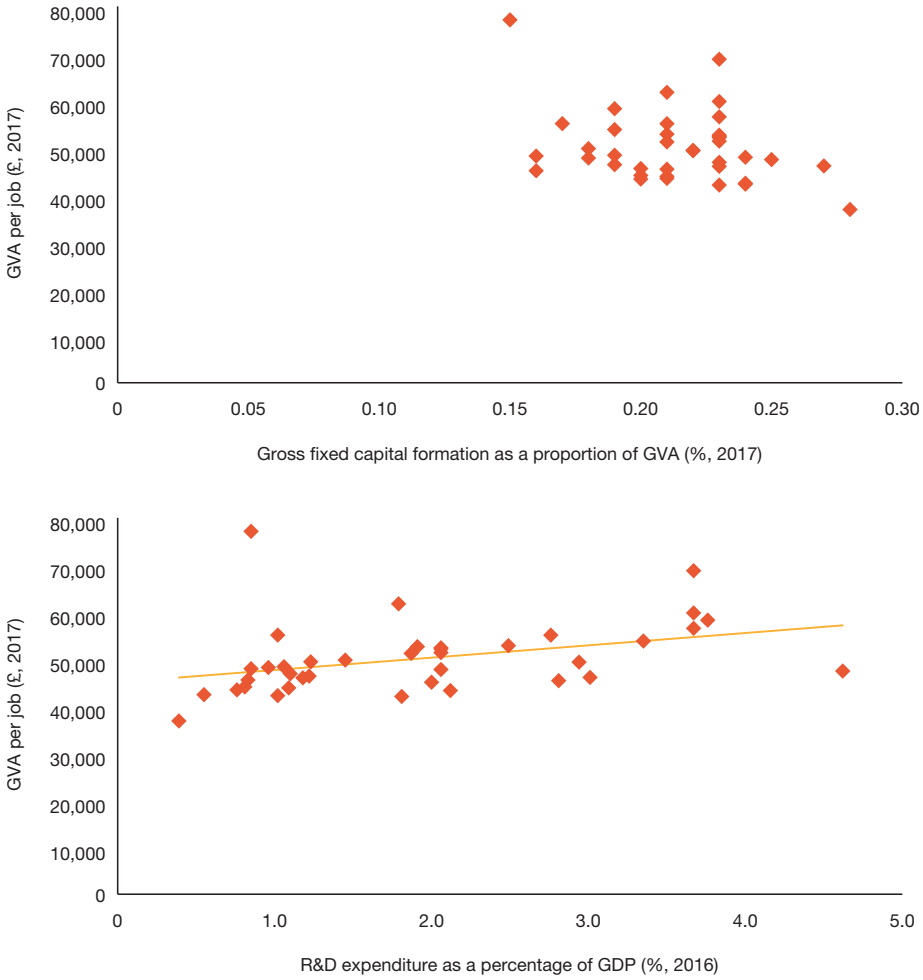
11 Haldane, A., The UK's Productivity Problem: Hub No Spokes, speech at the Academy of Social Sciences Annual Lecture, June 2018.
12 Our correlation analysis also found a positive correlation between microbusinesses and productivity.
13 See for example Griliches, Z., The search for R&D spillovers, Scandinavian Journal of Economics, vol. 94, pp. 29–47, 1992, and Aghion, P. and Howitt, P., A model of growth through creative destruction, Econometrica, vol. 60, pp. 323–51, 1992.
14 See for example: Oke, A., Innovation types and innovation management practices in service companies, International Journal of Operations and Production Management 27 (6), 564–587, 2007.
15 Griffith, R., How important is business R&D for economic growth and should the government subsidise it?, Institute for Fiscal Studies briefing note, October 2000.
16 ONS, Business investment in the UK: April to June 2019 revised results, 2019.

To test this, we compare the following measures of business investment and innovation with productivity using data for LEPs (see Figure 4.8):

- gross fixed capital formation as a proportion of GVA, as a measure of business investment; and
- the level of expenditure on research and development (R&D) as a proportion of GDP, as a measure of innovation.

Regional disparities in investment levels and innovation could be another factor driving differences in regional productivity performance, but the association does not appear particularly strong, perhaps because of limitations in the data available at local level. It may be that the degree of adoption of existing technologies and practices is the more important factor for productivity at a local level, but this is harder to measure. A new innovation may originate in one place, but it can lead to higher productivity in firms across the country (or even the world) if it is widely adopted. Of course, for UK productivity relative to other countries, investment and innovation remain critical, but this importance is harder to pick up in the local data.

Figure 4.8 – GVA per job (2017) vs business investment as a proportion of GVA (2017) and GVA per job (2017) vs business spending on R&D as a proportion of GDP (2016) at the LEP level[17]



Sources: ONS, Eurostat

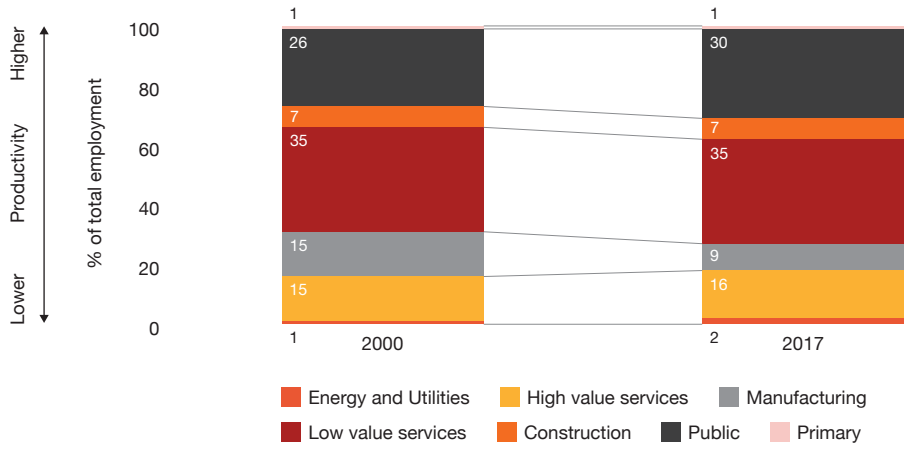
17 Please note that the data for business investment and innovation has been disaggregated from NUTS2 data due to a lack of data availability.

The composition of economic activity may explain some of the differences in productivity across regions

The change in industrial composition over time can partly explain trends in productivity. At the national level, Figure 4.9 shows that there has been a small but discernible shift in employment shares over the long-run, from relatively high productivity sectors, mainly driven by manufacturing, towards lower productivity sectors, such as the public sector, health and education sectors.

As in Section 3, we can apply a 'between-within' decomposition to understand if and where regional differences in productivity can be explained by different industrial structures.

Figure 4.9 – Employment shares by industry sector, 2000 vs 2017



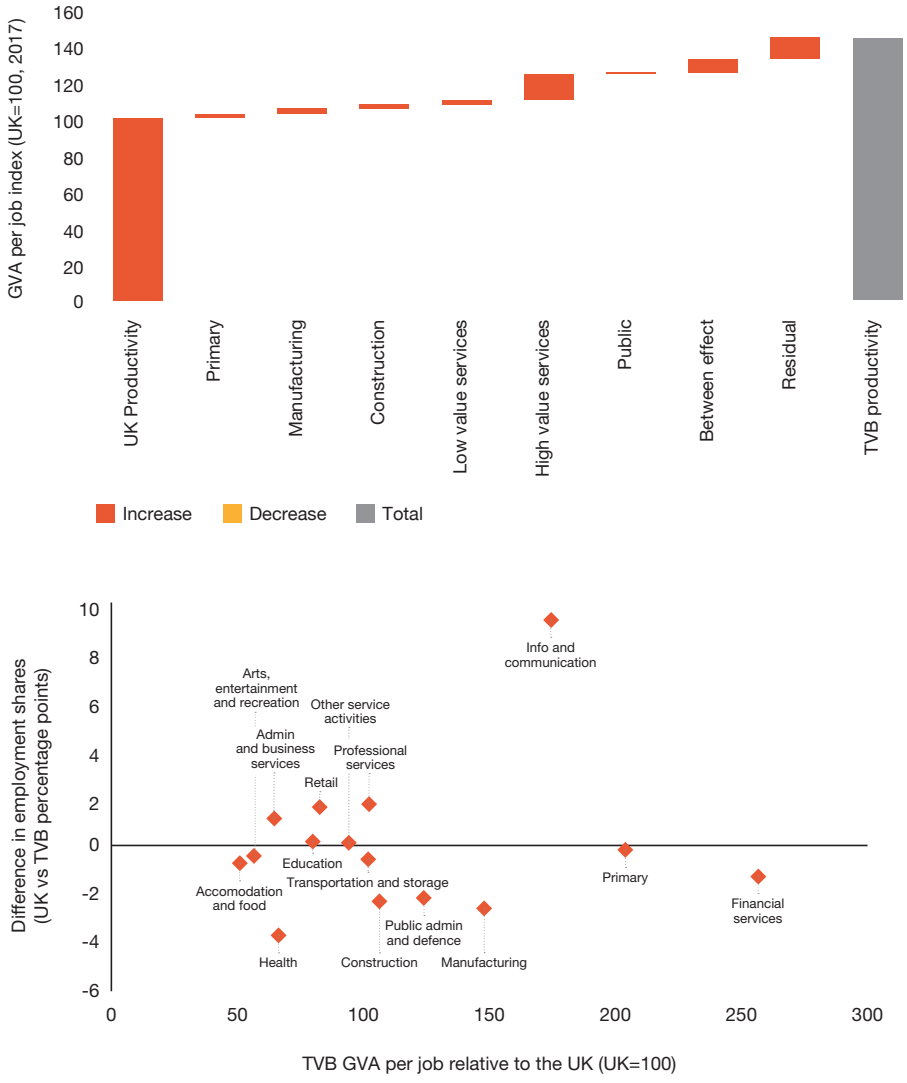
Source: ONS

Fig 4.10 compares UK with TVB Thames Valley Berkshire (TVB), which is the highest-performing LEP outside of London, and Cornwall and the Isles of Scilly (C&IS), the lowest-performing LEP. A decrease indicates a negative contribution to productivity, while an increase indicates a positive contribution to productivity.

The following analysis indicates where the differences in productivity come from: the 'within effect' shows us where productivity differences are as a result of differing productivity levels within a sector and the 'between effect' gives us an indication of the proportion of the productivity differential between two regions that can be attributed to the composition of economic activity.

There is an almost 40 percentage point gap in productivity between TVB and the UK. Most firms located in TVB across sectors are generally more productive than the average UK firm. However, it is the performance of the high value-added services sector (which includes financial services and professional and scientific services) in TVB that stands out. These sectors have above average productivity in most parts of the UK, but are particularly productive in TVB. The outperformance of this sector, relative to the UK average, explains around 14 percentage points of the gap in aggregate performance between the UK and TVB.

Figure 4.10 – Decomposition of productivity differences and employment composition by industry sector and productivity – UK vs Thames Valley Berkshire, 2017[18]



Note: The X-axis shows productivity in each industry in the UK, relative to the average for the UK economy as a whole.

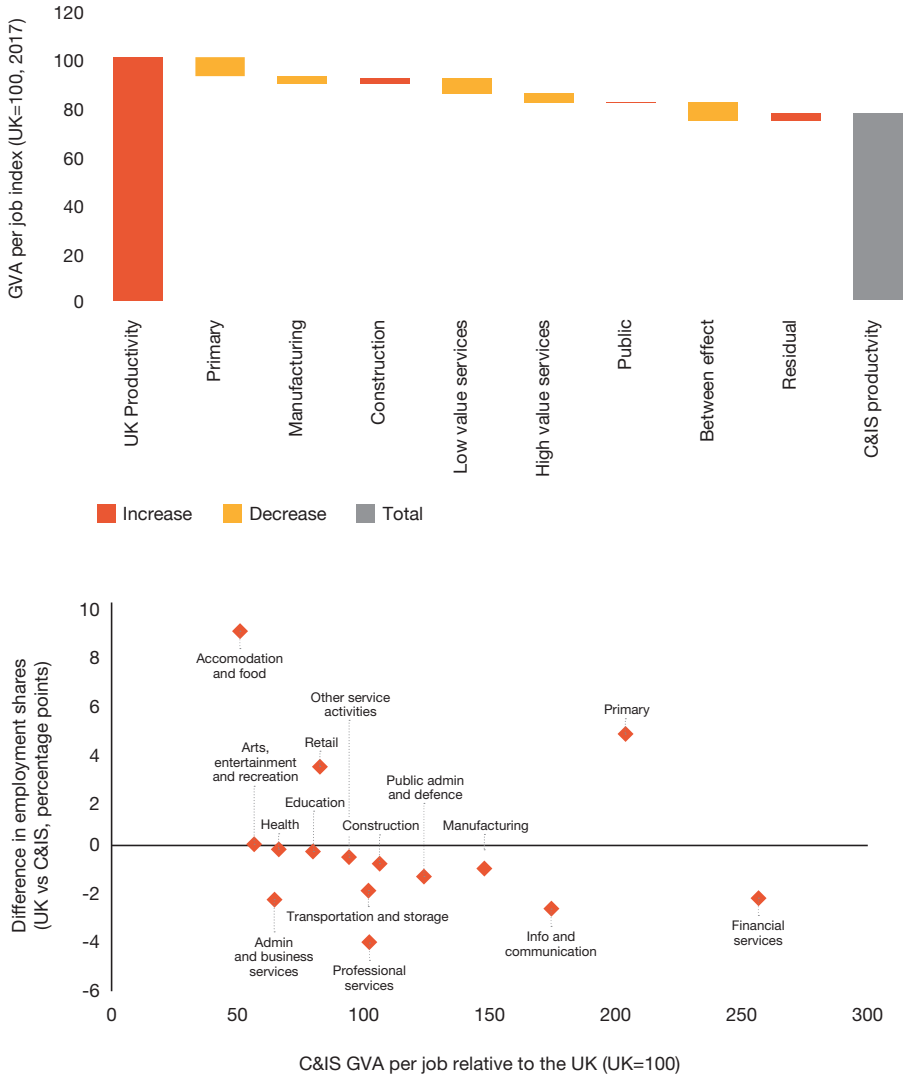
Sources: ONS, PwC analysis

18 Primary services include: Agriculture, mining, energy and utilities; Low value services include: Retail and wholesale, accommodation & food services, transportation and storage, administration and business services and arts, entertainment and recreation services; High value services include: Information and comms, Financial and insurance services, professional and scientific services and other services; Public includes: Public administration and defence, Education and Health and social care services.

The ‘between effect’, contributes to 7 percentage points of the productivity differential[19]. The scatter plot in Figure 4.10 shows that TVB has relatively bigger employment shares in higher productivity sectors, such as information and communications and professional services.

At the other end of the spectrum, Figure 4.11 presents the same decomposition for C&IS. It shows that most sectors – apart from construction and public services – are less productive than the UK average. In addition, the Cornwall LEP is also over-represented in terms of the share of employment in lower productivity sectors, such as the agriculture, retail and tourism-driven sectors such as accommodation and food services.

Figure 4.11 – Decomposition of productivity differences and employment composition by industry sector and productivity – UK vs Cornwall and Isles of Scilly, 2017[20]



Note: The X-axis shows productivity in each industry in the UK, relative to the average for the UK economy as a whole.

Sources: ONS, PwC analysis

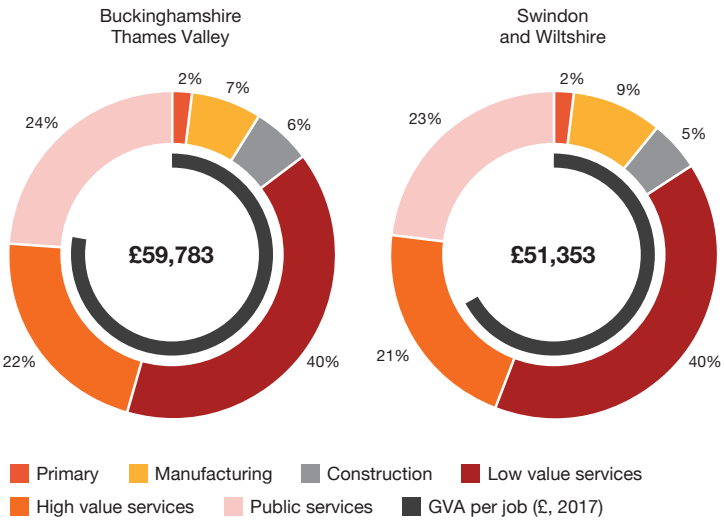
19 In the right hand panel, each industry sector is represented by a dot: dots above the x-axis are where TVB has a larger employment share than the UK, dots below where the TVB has a lower share. The sectors are ordered by their relative productivity; the further to the right, the more productive an industry is.

20 Primary services include: Agriculture, mining, energy and utilities; Low value services include: Retail and wholesale, accommodation & food services, transportation and storage, administration and business services and arts, entertainment and recreation services; High value services include: Information and comms, Financial and insurance services, professional and scientific services and other services; Public includes: Public administration and defence, Education and Health and social care services.

Industrial structure does play a role, but it alone is insufficient to explain all productivity differences. To illustrate this point, we compare two more similar LEPs: Buckinghamshire Thames Valley (BTV) and Swindon and Wiltshire (S&W). The composition of employment (based on the same high-level industry breakdown) across these two LEP areas is fairly similar, as shown in Figure 4.12.

However, BTV outperforms S&W's productivity levels by around 16%. The reasons for this are discussed in more detail in Box 4.1, with the key being BTV's higher share of technology companies and other high value services activities relative to S&W.

Figure 4.12 – Share of employment and productivity for Buckinghamshire Thames Valley and Swindon and Wiltshire, 2017



Sources: ONS, PwC analysis

Box 4.1 – Explaining the differences in productivity between BTV and S&W

To explain this gap, we apply a similar decomposition to explain the productivity gap between BTV and S&W.

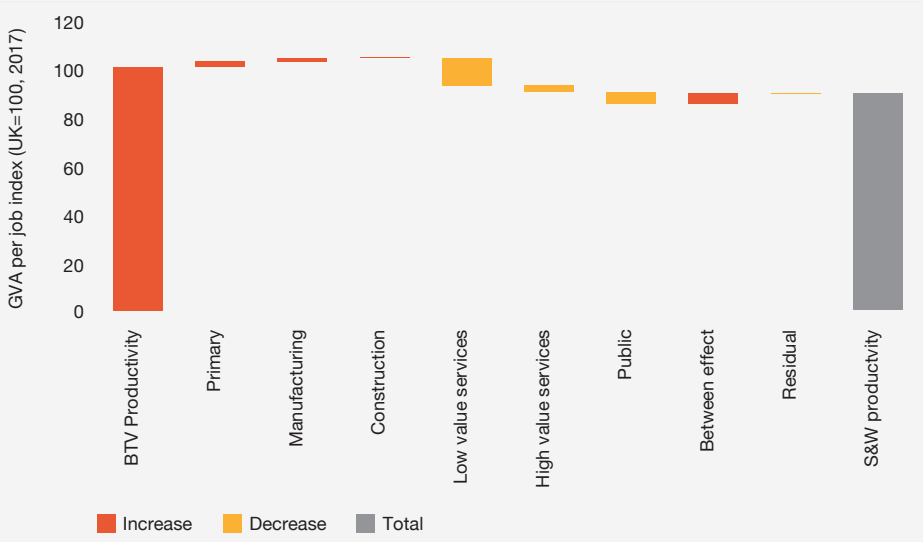
S&W lags behind BTV in terms of productivity, particularly within the services sectors, as well as public services. The decomposition shows that c.19 percentage points of the productivity differential between these two LEPs can be attributed to the service sectors.

Some of these differences may be attributed to economic activities in S&W tending towards less productive sub-sectors (especially within the low value-added services sector), such as accommodation and food services.

The largest sectors by employment in Swindon and Wiltshire[21] are in the public sector, including health and education, followed by professional and financial services.

In contrast, BTV is home to high tech and engineering clusters, such as Silverstone and Westcott Venture Park, that are located in the region, meaning that BTV is in a region with one of the highest shares of employment in high-tech services in Europe.

Figure 4.13 – Decomposition of productivity differences – Buckinghamshire Thames Valley vs Swindon and Wiltshire, 2017



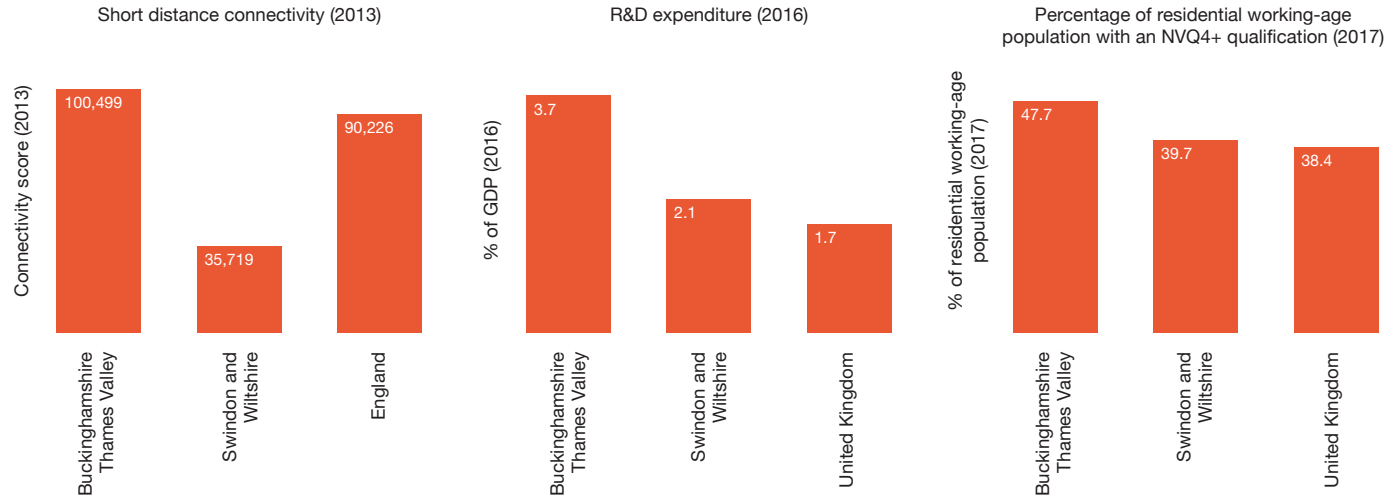
Sources: ONS, PwC analysis

While S&W also hosts clusters of Advanced Manufacturing, with employers such as Dyson Technologies and Honda operating in the area, the region's natural capital also lends itself to a thriving tourism sector and related services. But these also tend to have lower labour productivity.

We find that the 'between effect' (i.e. the composition of economic activity) exerts a small positive contribution in favour of S&W, which partly offsets some of the negative contribution from the services sectors. But industry structure is only a small part of the story here.

21 SWLEP, Swindon and Wiltshire's Local Economic Assessment, 2018.

Figure 4.14 – Short distance connectivity (2013), R&D expenditure as a percentage of GDP (2016) and percentage of working age population with an NVQ 4+ (2017), Buckinghamshire Thames Valley vs Swindon and Wiltshire



Sources: PwC analysis, Eurostat, Nomis

These findings suggest that differences in industrial structure offer only a partial explanation for regional differences in productivity. What is more, differences in the structure of a local economy only beg further questions about why particular industries have flourished in some places and not others. This turns the spotlight back to the differences in skills, connectivity, and investing in innovation which are the fundamental factors behind economic performance.

For example, within connectivity, BTV has strong connectivity linkages with Heathrow Airport and other major cities along the Oxford-Cambridge arc, which allows it to engage in highly-productive economic activity such as professional, scientific and technical services[22]. It is also 78 minutes from the UK's economic centre (London) by public transport. In contrast, S&W is, on average, just over two hours from London by public transport. Similarly, BTV performs slightly better than S&W in terms of business spending on R&D, as well as the share of the residential adult population that are highly skilled.

22 Buckinghamshire Thames Valley, Local Industrial Strategy Economic Evidence base, 2019.

Which variables have most explanatory power for regional productivity differences?

We have also carried out a more formal multivariate regression analysis to identify more precisely the relative importance of possible drivers of differences in regional productivity at the LEP level.

To do this, we regress productivity on key drivers for which adequate local data are available, namely skills, connectivity and investment in R&D and innovation, and business size. The technical annex contains more details of our modelling methodology and results.

We find that two variables reliably have statistically significant impacts on relative local productivity:

- **Workplace skills**, measured by the share of professional and managerial occupations in the local area, has a statistically significant impact on the productivity of the local area. A 1 percentage point increase in this measure, results in a 2% increase in productivity.
- **Physical connectivity** also matters. A 1% increase in the short-distance connectivity score boosts productivity by 0.06%. To put this into perspective, if Cornwall and the Isles of Scilly could improve its short distance connectivity score to match the score of the Heart of the South West LEP (an increase of c. 85%), its productivity would increase by around 10%, or £4,600 per job.

The lack of significance for the innovation driver might suggest that while it is important to create new inventions or innovations, it is the adoption of new technology (or diffusion) that is more important for the relative productivity ranking of different regions. But this is not easy to measure at local level as precisely as needed for this kind of formal regression analysis.

While the other drivers have not appeared to be significant in our multivariate regression analysis, our univariate analysis of these drivers show that they are individually positively associated with productivity. However, when taken together, our analysis shows that better workplace skills and greater physical connectivity appear to be the most important factors associated with higher local productivity levels.

One might also expect the local level of educational attainment to matter for productivity, as the young people that live and grow up in the local area may then tend to move into jobs in the same locality after leaving school or university. As a result, LEPs that are able to produce highly qualified young people should be more productive as these young people enter the workforce.

We include 'Attainment 8' as a measure of educational attainment. Attainment 8 is the average score for pupils' in eight English Baccalaureate subjects taken at GCSE within a local area. When educational attainment is included in our model, it is statistically insignificant, but the workplace skills variable remains significant.

This may reflect the fact that young people tend to be relatively mobile, often moving to a new city for university, and then migrating to another in search of job opportunities[23]. These patterns of mobility potentially weaken the link between local educational attainment and productivity, meaning that the ability of local areas to attract and retain high-skilled workers after they finish their school or university education matters more for local productivity.

23 See Centre for Cities, The great British brain drain: an analysis of migration to and from Liverpool, January 2017.

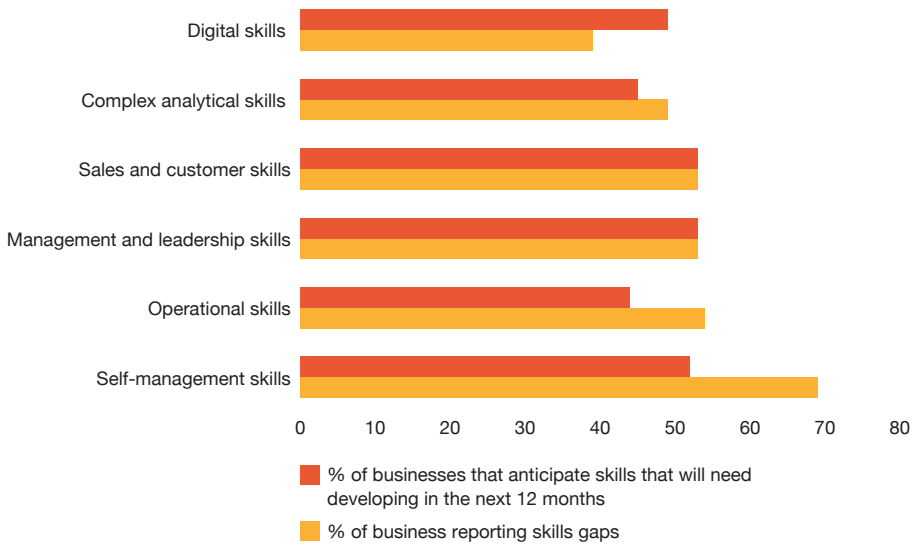
4.3 – How can the UK boost productivity for regions that lag behind?

Our analysis shows that local factors, particularly connectivity and workplace skills matter for productivity. Following the National Industrial Strategy, LEPs in England have developed, or are in the process of developing, local strategies that will promote the coordination of local economic policy and national funding. They will establish new ways of working between national government, local councils and businesses to identify priorities to improve skills, increase innovation and enhance infrastructure and business growth.

Particularly for workplace skills, our results imply that continuing skills development over people's working lives to improve their productivity could have a positive impact on regional productivity performance. The continued upskilling of UK workers and the development of our education system to support the education of our young people should be fundamental for policymakers as a means of boosting both local and national productivity.

While the results for the impact of local education attainment from our regression analysis suggest that local areas could make up for any educational attainment gap somewhat by attracting skilled workers from other areas, this does not mean that local areas should neglect the development of young people's skills in schools and through vocational training. It does, however, reinforce the need to ensure that there are plentiful job opportunities to attract highly skilled young people, supported by a conducive living and working environment (as our most recent Good Growth for Cities report explores[24]). If job opportunities are scarce, young people will seek better fortunes elsewhere.

Figure 4.15 – Profile of skills gaps, 2017



Source: Department for Education, Employers skills survey 2017

Businesses also have a critical role to play, particularly to help address skills gaps and shortages in the labour force. The UK Employers Skills Survey, a study led by the Department for Education based on the responses of over 87,000 employers, provides some insight into the skills challenges that UK employers face within their existing workforces and recruiting[25]. More than one-third of UK businesses reported experiencing a skills gap or skills shortage vacancy in 2017. Businesses also report that the majority of hard-to-fill vacancies are caused, at least partly by a lack of skills, qualifications and experience among applicants.

Figure 4.15 summarises some of the key skills in which businesses report experiencing gaps. Ares with the most acute skills gaps include "soft skills" such as self-management and leadership skills (which have reported gaps of 69% and 53% respectively).

While digital skills are expected to increase in importance in the short-term, it is notable that interpersonal skills, such as management and leadership skills, and sales and customer skills, may be even more important in the future job market. This is not altogether surprising, as people skills can have a big impact on the ability of staff to adapt to the workplace and work effectively with others towards a common goal. In contrast to digital skills, which employees will need to constantly renew as these skills could become obsolete quickly with technological change, human skills are also likely to be more enduring and less vulnerable to future automation[26].

24 See PwC, Good Growth for Cities, November 2019.
25 Department for Education, Employers skills survey 2017, August 2018.
26 PwC research shows that 30% of jobs are at risk from automation by the mid-2030s.

Businesses can support this through workplace training and upskilling. This is especially critical given that PwC's recent global skills survey shows that the desire of UK employees to learn new skills is not being met adequately by business at present[27]. Training existing employees is, however, only part of the overall solution: businesses also need to join forces with schools, colleges, universities and policymakers to link curricula to jobs of the future.

Our analysis also shows that connectivity, particularly physical connectivity, matters to relative local productivity. The UK's National Industrial Strategy[28] includes infrastructure as one of the five foundations of productivity, supported by a projected pipeline of public and private investment of around £600 billion and public infrastructure investment in the next decade. The investment in local infrastructure could help boost the connectivity of a place (and consequently its productivity). To support connectivity between cities, LEPs could work in collaboration to strengthen intra-region connectivity. One such example is the Oxford-Cambridge arc, which is supported by four LEPs with ambitions to boost east-west transport connectivity through the East West Rail and Expressway[29]. As the government and others have recognised, more such initiatives are also needed in other parts of the country, such as the North of England, which often have less well-developed transport infrastructure.

Another important issue is the need to improve the adoption rate of new technologies across the country. Research by the CBI suggests that, while the UK's best performing firms are highly innovative, best practices must reach a greater range of businesses through the adoption of proven technologies and ideas[30]. A survey by the ONS also shows that most UK firms are yet to adopt more sophisticated technologies for e-commerce and to improve organisational efficiency[31]. The UK Innovation Survey published by BEIS also shows there are clear benefits from increasing the rate of innovation at the firm level, but doing this consistently across the country will take sustained long-term efforts by both government and business.

4.4 – The potential prize from closing the regional productivity gap

Our analysis shows that there is a wide range of policy levers that local and central government can use to deliver local improvements in productivity. Businesses can also do their part by contributing to the skills and innovation agenda.

The prize for getting this right is potentially large. If LEPs and countries that are currently performing below the UK average can close 50% of the gap in productivity performance with the UK median, it could boost UK GVA by around £83 billion, equivalent to nearly 4% of GDP. At the NUTS1 level Yorkshire and the Humber could see the largest percentage increase (13.5%), followed by Wales (10.7%).

27 PwC, The Upskilling Hopes and Fears research, September 2019.
28 Department for Business, Energy and Industrial Strategy, National Industrial Strategy, 2017.
29 The four LEPs include the Oxfordshire Local Enterprise Partnership (OxLEP), Buckinghamshire Thames Valley Local Enterprise Partnership (BTVLEP), South East Midlands Local Enterprise Partnership (SEMLEP), and the Business Board of the Cambridgeshire and Peterborough Combined Authority.
30 CBI, From Ostrich to Magpie, November 2017.
31 ONS, Information and communication technology intensity and productivity, October 2018.

Figure 4.16 – GVA per job and potential GVA per job if productivity uplift was attained in the NUTS 1 regions, 2017

Sources: ONS, PwC analysis

Figure 4.17 – GVA per job and potential GVA per job if productivity uplift was attained for the bottom 10 LEP regions, 2017

Sources: ONS, PwC analysis

If LEPs were to benefit from this work to raise productivity to close the gap with the UK average, it would have the greatest impact on Cornwall and the Isle of Scilly; with a potential productivity increase of almost 24% (equivalent to £8,752). Significant gains could also accrue to areas like The Marches, Heart of the South West and Greater Lincolnshire (see Figure 4.17).

Such a significant increase in productivity would improve the UK's economic prosperity and its comparative performance across advanced economies, as well as addressing the significant geographical income inequalities across the UK. Moving in this direction will be one of the key challenges for future UK governments as they look beyond Brexit.

Technical annex: econometric analysis of the drivers of regional productivity

We use a simple cross-sectional regression approach to understand the relative importance of the various drivers that influence regional productivity. We estimate the model parameters using the standard ordinary least squares (OLS) econometric technique using data on all 38 LEPs.

Table 4.1 sets out the variables we included in our modelling specification.

The primary skills measure we use relates to the share of occupations within the LEP that fall within the SOC definition of skill level 4, which is comprised of professional occupations and high-level managerial positions in business or government.

In our second model, we also test the importance of educational attainment as a measure of local educational attainment levels. To do this, we included the UK Government's Attainment 8 scores for LEPs[32].

Technical annex model 4.1

$$\ln\text{Productivity}_j = \beta_o + \beta_1\text{Skills}_j + \beta_2\ln(\text{Connectivity}_j) + \beta_3\text{Digital}_j + \beta_4\text{R\&D}_j + \beta_5\text{Business size}_j + \mu$$

Technical annex table 4.1: Variables included in our modelling specification

	Variable	Definition	Data source
Dependent variable	$\ln\text{Productivity}_j$	Log of productivity (GVA per job) for LEP_j	ONS
Explanatory variables	Skills_j	Percentage of workplace adult population working in an occupation with a skill level 4 (SOC) for LEP_j	Nomis, ONS
	$\ln\text{Connectivity}_j$	Log of short distance connectivity 'score' for LEP_j	PwC analysis
	Digital_j	Percentage of fixed broadband connections with speeds of >30Mb/s for LEP_j	Ofcom Connect Nations
	$\text{R\&D}_j$	The level of R&D expenditure as a percentage of GDP for LEP_j	Eurostat
	Business size_j	Percentage of large businesses (250+ employees) for LEP_j	Nomis, ONS
	$\ln\text{Attainment8}_j$	Log of LEP_j's average Attainment 8 score	Department for Education

Source: PwC analysis

Technical annex model 4.2

$$\ln\text{Productivity}_j = \beta_o + \beta_1\text{Skills}_j + \beta_2\ln(\text{Connectivity}_j) + \beta_3\text{Digital}_j + \beta_4\text{R\&D}_j + \beta_5\text{Business size}_j + \beta_6\ln(\text{A8}_j) + \mu$$

32 This score is measured by calculating the average score for pupils' eight English Baccalaureate subjects taken at GCSE within the local area.

The results from our analysis are shown in Table 4.2.

To test the relationship between productivity and individual drivers, we also test each of the individual variables in isolation using a univariate regression, again using the OLS approach, based on the following specification:

Through our series of univariate regressions, we have found that all of the variables individually appear to have a statistically significant relationship with productivity (at the 1% significance level), as shown in Table 4.3. However, our multivariate analysis is more powerful in indicating which of the variables has greater explanatory power.

Technical annex table 4.2: Log-linear coefficients for explanatory variables of productivity, 2017

	Model 1	Model 2
Dependent variable	**Log of productivity**	**Log of productivity**
Percentage of level 4 occupations (SOC)	2.043***	1.660***
ln(short distance connectivity score)	0.062**	0.052*
% of fixed broadband connections >30Mb/s	-0.055	0.082
ln(average Attainment 8 score)		0.484
Constant	9.516***	1.777***
N	38	38
VCE	OLS	OLS
Adj R squared	0.739	0.743
RESET p value	0.059	0.035

*** Statistically significant at the 1% level, ** statistically significant at the 5% level, * statistically significant at the 10% level

Source: PwC analysis

Technical annex model 4.3

$$\ln\text{Productivity}_j = \beta_o + \beta_1 \text{Skills}_j + \beta_2 \ln(\text{Productivity driver}_j) + \mu$$

Technical annex table 4.3: Univariate regressions

	Univariate regressions
Dependent variable	**Log of productivity**
ln(percentage of level 4 occupations (SOC))	0.707***
ln(short distance connectivity score)	0.147***
ln(% of fixed broadband connections >30Mb/s)	0.532***
ln(R&D expenditure as a proportion of GDP)	0.102***
ln(% of large enterprises (250+ employees))	0.326***
ln(average Attainment 8 score)	2.082***
N	38
VCE	OLS

*** Statistically significant at the 1% level, ** statistically significant at the 5% level, * statistically significant at the 10% level

Source: PwC analysis

Appendix A
Outlook for the global economy

Table A.1 presents our latest main scenario projections for a selection of economies across the world.

In 2019, the world economy is expected to grow by around 2.8% (based on GDP at market exchange rates), slowing down significantly from last year. In our main scenario for next year, we expect global growth to grow at a similar rate to this year assuming no further intensification of global trade tensions. Should these worsen, however, then global growth could be even slower as this would hit business confidence further, with a knock-on impact on global investment. The manufacturing sector in the UK and elsewhere would be particularly exposed to any such global economic events given its high dependence on trade.

Focusing on the US, we expect growth of around 2.5% in 2019, down from 2.9% last year. US economic activity continues to be propped up by recent interest rate cuts and loose fiscal policy, with the federal budget deficit expected to exceed the $1 trillion mark by the end of next year. Nonetheless, we expect some further slowdown to growth of around 1.8% in 2020, which is more in line with its potential growth rate. Meanwhile, the Chinese economy is expected to grow by just under 6% in 2020.

Economic activity in the Eurozone has been sluggish in 2019 on the back of a slowing German economy. However, we project a modest recovery in 2020 given the boost from monetary and fiscal loosening that is expected to support economic activity.

We project mixed levels of economic performance across emerging economies. However, there are some bright spots especially in India and Indonesia, which are expected to expand by an average rate of around 7% and 5% respectively in 2019-20.

Table A.1: Global economic growth and inflation prospects

	Share of world GDP (%)	Real GDP growth (%)		Inflation (%)	
	2018 at MERs	2019p	2020p	2019p	2020p
United States	24.2	2.5	1.8	2.0	1.9
China	15.8	6.2	5.8	2.4	2.5
Japan	5.9	0.9	0.3	0.9	1.3
United Kingdom	3.3	1.2	1.0	1.8	1.5
Eurozone	14.2	1.1	1.4	1.2	1.5
France	3.3	1.3	1.4	1.2	1.4
Germany	4.7	0.6	1.3	1.6	1.8
Greece	0.3	2.1	2.2	0.4	0.8
Ireland	0.4	4.2	3.5	1.0	1.5
Italy	2.4	0.1	0.6	0.8	1.2
Netherlands	1.1	1.7	1.6	2.3	1.8
Spain	1.7	2.3	2.0	0.7	1.0
Poland	0.7	4.3	3.0	2.2	3.5
Russia	1.9	1.2	1.8	4.6	3.5
Turkey	0.9	0.3	3.0	14.6	12.8
Australia	1.7	2.2	2.3	1.7	2.0
India	3.2	7.3	7.5	4.2	4.8
Indonesia	1.2	5.0	5.1	3.2	3.5
South Korea	1.9	2.5	2.8	1.4	1.6
Brazil	2.2	1.2	2.2	4.3	3.9
Canada	2.0	1.6	1.8	1.7	1.9
Mexico	1.4	0.4	1.3	3.7	3.0
South Africa	0.4	0.6	1.1	4.3	5.1
Nigeria	0.5	2.3	2.5	11.3	11.4
Saudi Arabia	0.9	0.1	1.9	2.7	2.8
Global (Market Exchange Rate ("MER")	100	2.8	2.7	2.2	2.3
Global (Purchasing Power Parity ("PPP") rate)	-	3.3	3.3	2.7	2.8
G7	45.9	1.8	1.4	1.7	1.7
E7	26.7	4.8	5.0	3.4	3.3

Source: PwC main scenario projections for 2019 and 2020; IMF for GDP shares in 2018 at market exchange rates (MERs).

These projections are updated regularly in our Global Economy Watch publication, which can be found at www.pwc.com/gew

Appendix B
UK economic trends: 1979-2018

Annual averages	GDP growth	Household expenditure	Manufacturing output growth*	Inflation (CPI**)	3 month interest rate (% annual average)	Current account balance (% of GDP)	PSNB*** (% of GDP)
1979	3.7	4.8			13.7	-0.6	-4.2
1980	-2.0	0.1			16.6	0.5	-3.9
1981	-0.8	0.3			13.9	1.5	-3.0
1982	2.0	1.2			12.2	0.6	-2.3
1983	4.2	4.4			10.1	0.2	-3.0
1984	2.3	2.5			10.0	-0.5	-3.3
1985	4.1	5.1			12.2	-0.3	-2.5
1986	3.2	6.0			10.9	-1.0	-2.0
1987	5.4	5.1			9.7	-1.6	-1.3
1988	5.7	7.3			10.4	-3.5	0.6
1989	2.6	3.9		5.2	13.9	-4.1	0.6
1990	0.7	1.0		7.0	14.8	-3.1	-0.6
1991	-1.1	-0.6	-5.0	7.5	11.5	-1.3	-2.6
1992	0.4	1.0	-0.1	4.2	9.6	-1.5	-5.6
1993	2.5	2.9	1.5	2.5	5.9	-1.3	-6.7
1994	3.8	3.2	4.7	2.0	5.5	-0.5	-5.7
1995	2.5	2.2	1.5	2.6	6.7	-0.7	-4.6
1996	2.5	3.8	0.9	2.4	6.0	-0.6	-3.3
1997	3.9	4.8	1.6	1.8	6.8	0	-1.9
1998	3.6	4.3	0.3	1.6	7.3	-0.5	-0.3
1999	3.4	4.6	0.3	1.3	5.4	-2.5	0.8
2000	3.4	4.7	1.8	0.8	6.1	-2.3	1.5
2001	3.0	3.5	-1.3	1.2	5.0	-2.1	0.1
2002	2.3	3.2	-2.4	1.3	4.0	-2.1	-2.2
2003	3.3	3.4	-0.5	1.4	3.7	-1.8	-3.6
2004	2.4	3.2	1.9	1.3	4.6	-2.3	-3.5
2005	3.2	2.5	0.1	2.1	4.7	-1.9	-3.4
2006	2.8	1.8	2.4	2.3	4.8	-2.8	-2.9
2007	2.4	2.6	0.6	2.3	6.0	-3.3	-2.7
2008	-0.3	-0.5	-2.9	3.6	5.5	-3.9	-5.6
2009	-4.2	-3.1	-8.6	2.2	1.2	-3.3	-10.4
2010	1.9	1.1	4.5	3.3	0.7	-3.2	-12.2
2011	1.5	-0.1	2.4	4.5	0.9	-1.8	-7.4
2012	1.5	1.6	-1.1	2.8	0.8	-3.4	-7.7
2013	2.1	3.0	-1.1	2.6	0.5	-4.8	-6.0
2014	2.6	2.5	2.9	1.5	0.5	-4.7	-5.6
2015	2.4	2.9	-0.1	0.0	0.6	-4.9	-4.5
2016	1.9	3.8	0.2	0.7	0.5	-5.2	-3.3
2017	1.9	2.3	2.2	2.7	0.3	-3.5	-2.5
2018	1.4	1.6	0.4	2.5	0.6	-4.3	-2.3
Average over economic cycles****							
1979 - 1989	2.8	3.7			12.2	-0.8	-2.2
1989 - 2000	2.4	3.0		3.2	8.3	-1.5	-2.4
2000 - 2014	1.9	2.0	-0.1	2.2	3.3	-2.9	-4.8

* Pre-1991 figures for manufacturing output growth are not currently available on a consistent basis ** Pre-1997 data estimated
*** Public Sector Net Borrowing (calendar years excluding public sector banks) **** Peak-to-peak for GDP relative to trend
Sources: ONS, Bank of England

Contacts and services

Economics

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The present report was written by John Hawksworth, Jing Teow, Alex Tuckett, Natasha Reilly and Thanh Dinh.

For more information about the technical content of this report please contact:

John Hawksworth
john.c.hawksworth@pwc.com

or

Jing Teow
yong.jing.teow@pwc.com

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Competition Economics	Nick Forrest	+44 (0)7803 617 744
Economic Regulation	Alastair Macpherson	+44 (0)7703 546 424
	Daniel Jacobson	+44 (0)7803 455 617
Economic modelling and appraisal	Jonathan Gillham	+44 (0)7714 567 297
	Barret Kupelian	+44 (0)7887 885 139
	Jing Teow	+44 (0)7525 281 974
Total impact measurement and management	Mark Ambler	+44 (0)7740 023 382
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