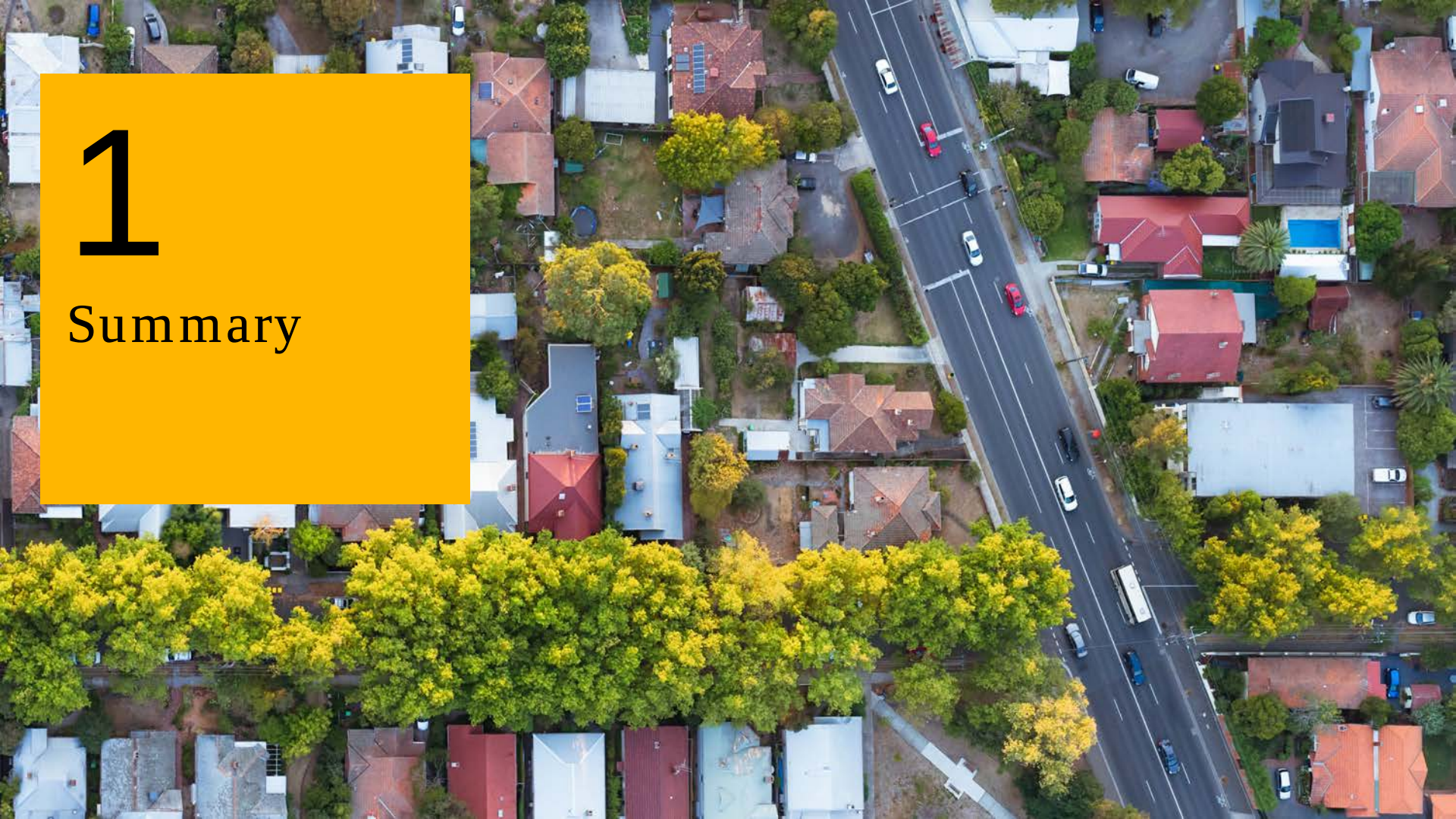
UK Economic Outlook

Not out of the woods yet
16 November 2023

pwc

Contents



1

Summary

Key points

1 We expect below-trend growth this year and next as monetary policy weighs on activity

Our modelling indicates that the UK economy will grow by around 0.5% in 2023 and 2024. This is below trend (around 1.5%) and the ambitious 2.5% growth target set by the Liz Truss government.

The primary reason for the UK's sluggish growth prospects is monetary policy. We estimate that so far the real economy has only felt around half of the impact from tighter financial conditions, relative to a situation where the Bank did not act. So although we avoided a recession, there is more pain to come.

From a regional perspective, London and Northern Ireland are expected to continue to grow at a faster rate than most of the rest of the UK. However, growth is likely to be relatively subdued across all regions.

2 Our modelling indicates that we will close the year with inflation at just under 5%

Headline inflation is due to fall relatively sharply in October, as the energy price cap is cut and last year's price rises drop out of the annual calculation.

Combine lower energy prices with an easing of overall inflation pressures and inflation should end the year under 5%. Absent any surprises, this means the government will reach its target to halve inflation by the end of the year. However, due to the continued persistence of services inflation, we are not expecting a full return to target until 2025.

Inflation has left its mark on households, businesses and the government. For households, we are expecting real earnings to be lower this year than where they were in 2006. This is equivalent to close to two decades of no real earnings growth.

3 We find strong evidence for a graduate earnings premium *and* a wellbeing premium

Our special article, focusing on undergraduate degrees, finds that all of the courses in our sample have a positive impact on earnings. The average graduate earns around 57% more than non-graduates with similar characteristics.

We also find strong evidence for a graduate wellbeing premium. The top performing courses increase life satisfaction by around 5%, providing the same boost to life satisfaction as just over £5,000 in additional earnings every year.

Our analysis indicates that higher earnings are clearly a key channel through which studying a degree affects wellbeing. However, there are also other factors at play. Many of the courses with the largest wellbeing premiums, such as education and sports sciences, have relatively low earnings premiums compared to other courses. Vocational courses in particular, such as nursing, score highly for wellbeing effects.

2

UK economic prospects: Not out of the woods yet

Section 2 – UK economic prospects: Not out of the woods yet

Introduction

Monetary policy tightening continues to dominate the UK economic narrative and is a key theme of this chapter. This is because we are starting to see the effects of tighter monetary policy on the labour market and the real economy more generally. Crucially, as we show in Figure 2.1 below, our modelling indicates that we have only felt around half of the cumulative impact of the tightening cycle on economic activity. That means we are not out of the woods yet.

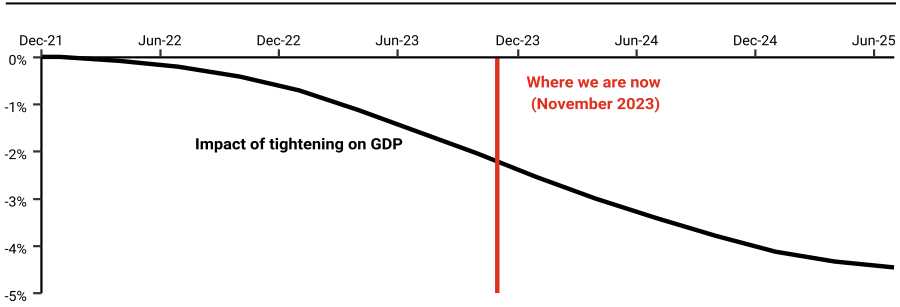
This chapter provides an overview of the outlook for the UK economy. It is split into three sections, covering economic growth, inflation and the labour market in turn:

2.1 Economic growth

2.2 Inflation

2.3 Labour market

Figure 2.1: PwC estimate of cumulative real GDP impact of policy tightening relative to no tightening



Sources: PwC analysis, Bank of England. Notes: Figure shows the estimated impact of policy tightening since the tightening cycle started based upon Bank of England estimates for Bank Rate multipliers.[1]

Key points

- **Monetary tightening to weigh on growth through 2023 and 2024.** Our analysis suggests that we have only felt around half of the impact from tightening so far. So a return to trend growth is not expected until 2025. From a regional perspective, we expect London and Northern Ireland to outperform most regions in 2023, though growth across all regions is relatively subdued.
- **Headline inflation to close the year under 5%.** Our modelling indicates that the government will reach its target to halve inflation by the end of this year. Even so, inflation will have left its mark. We expect real earnings to be lower this year than where they were in 2006. This is equivalent to close to two decades of no real earnings growth.
- **Private sector earnings growth is likely to remain elevated through most of 2023 and 2024.** Our modelling indicates record high earnings growth is being driven by labour market tightness. Though the labour market is cooling, on its current trajectory this implies that earnings growth will not return to more normal levels until late 2024 at the earliest.

2.1

Economic growth

Data revisions suggest economic growth during the pandemic period was stronger than previously thought, which means the UK no longer appears to be an international outlier

Large data revisions suggest UK output reached pre-Covid levels two years ago

The ONS recently announced revisions to UK economic growth over the 2020-21 period. Revisions to economic data are not uncommon, but due to the severity of the downturn they have significant implications for the UK's post-pandemic economic performance. The latest data suggests that the UK's recovery from the pandemic was much quicker than previously thought, with economic activity returning to pre-pandemic levels as early as Q4 2021.

This has turned the prevailing narrative of UK economic underperformance on its head. The latest estimates suggest UK real GDP is 1.8% larger than pre-pandemic levels, placing the UK in the middle-of-the-pack of its G7 peers (see Figure 2.3). The previous estimates had suggested that the UK was the only major economy where economic activity remained below pre-pandemic levels.

Lessons learned on economic statistics

GDP is currently the best tool we have for measuring economic activity. But for it to be useful, it needs to be accurate and timely.

These two features are often in conflict with each other. The approach favoured by the ONS is to release first estimates based upon partial information, and then to release revised estimates as more information becomes available. Revisions can also come through due to methodological changes, which in this case mostly relate to the treatment of public services output.

As a result of these changes, it is the view of the ONS that the UK now has "one of the most up-to-date sets of estimates for this period".[2] Our word of warning is to wait for the other economies to make corresponding changes to their GDP numbers before rushing to new conclusions about the UK's economic position.

This has limited implications for our growth prospects

As these revisions are backwards-looking, we do not expect that they will significantly affect the UK economic outlook. If anything, they may marginally dampen the UK's growth prospects, as they reduce the potential for bounce-back growth. We provide more insights into our views on the UK's growth prospects in the following pages.

Figure 2.2: Annual real GDP growth revisions (positive = upward revision; negative = downward)

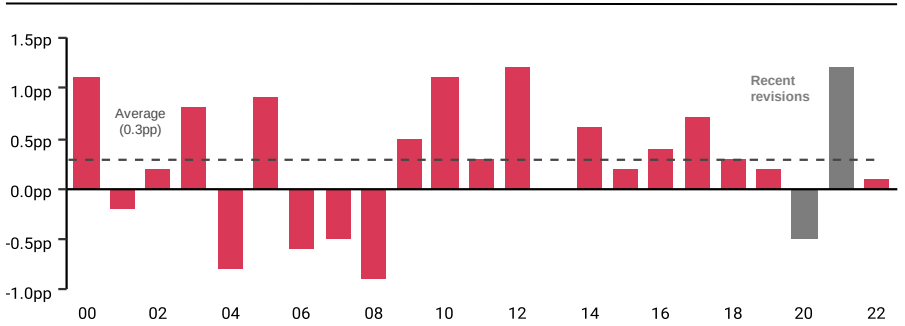
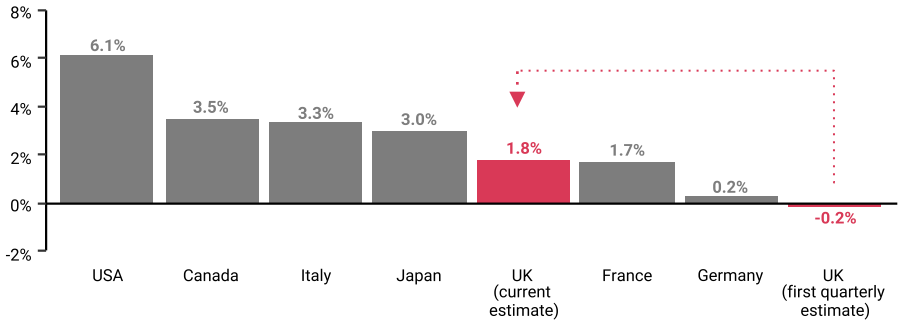


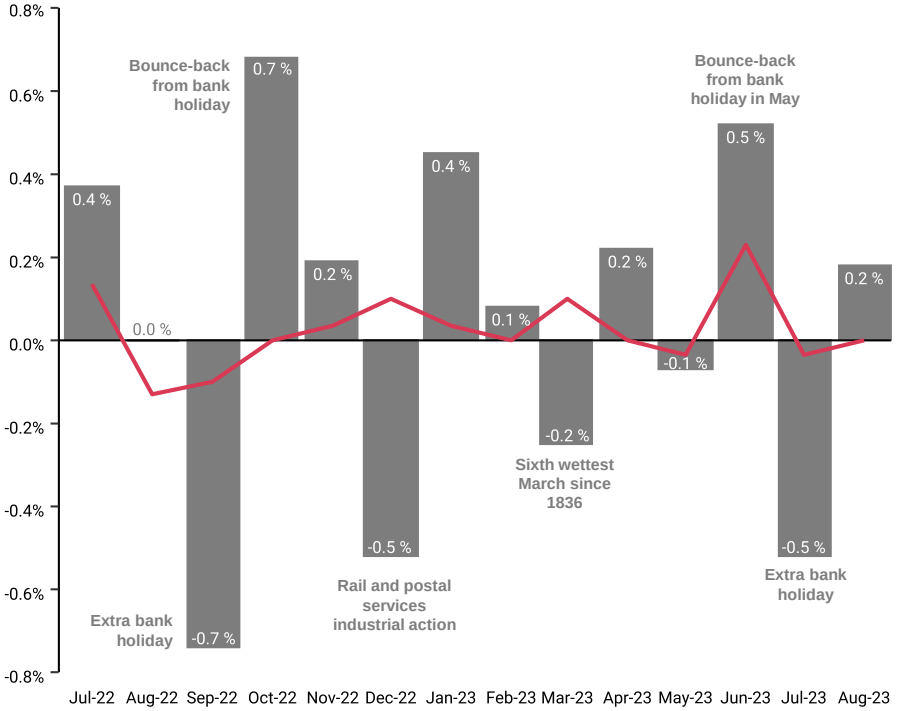
Figure 2.3: Change in real GDP, Q4 2019 to Q2 2023, by G7 economy



Sources: PwC analysis, ONS, Refinitiv Eikon, national statistics authorities, Istat. Notes: Figure 2.2 is equal to the difference between the latest estimate and the month 2 estimate. Figure 2.3 uses data from national statistics agencies via Refintiv Eikon and Istat for Italy, which were accessed on the 26 October 2023.

UK economic growth remains subdued as monetary tightening continues to weigh on economic activity

Figure 2.4: Month-on-month (MoM) change in real GDP, and 3-month moving average of the MoM growth rate



UK Economic Outlook Sources: PwC analysis, ONS

UK economic activity remains subdued

Economic growth turned positive at the end of last year, with quarter-on-quarter growth ranging between 0.1% and 0.2% over the past three quarters (up to Q2 2023). This was marginally higher than our expectations in our April publication but still equates to a below-trend annualised growth rate of less than 1%.

In general, growth has been supported by the easing of global supply chain pressures and lower household energy bills than anticipated at the end of last year. However, high inflation, consecutive interest rate rises and industrial action in key sectors of the economy continue to weigh on economic activity. Despite fluctuations in monthly GDP (see Figure 2.4), the net effect is that the economy has flatlined, with real GDP growing by just 0.4% since December 2022.

The good news is that easing cost of living pressures have led to an uptick in consumer sentiment. Our latest Consumer Sentiment Survey suggests consumer sentiment has now reached its long-run average. This should gradually translate into higher consumer spending.

Despite weak overall growth, there are a number of sectors that performed strongly in the first half of the year, with the hospitality sector leading the pack

Most sectors grew in the first half of the year, even as the economy flatlines

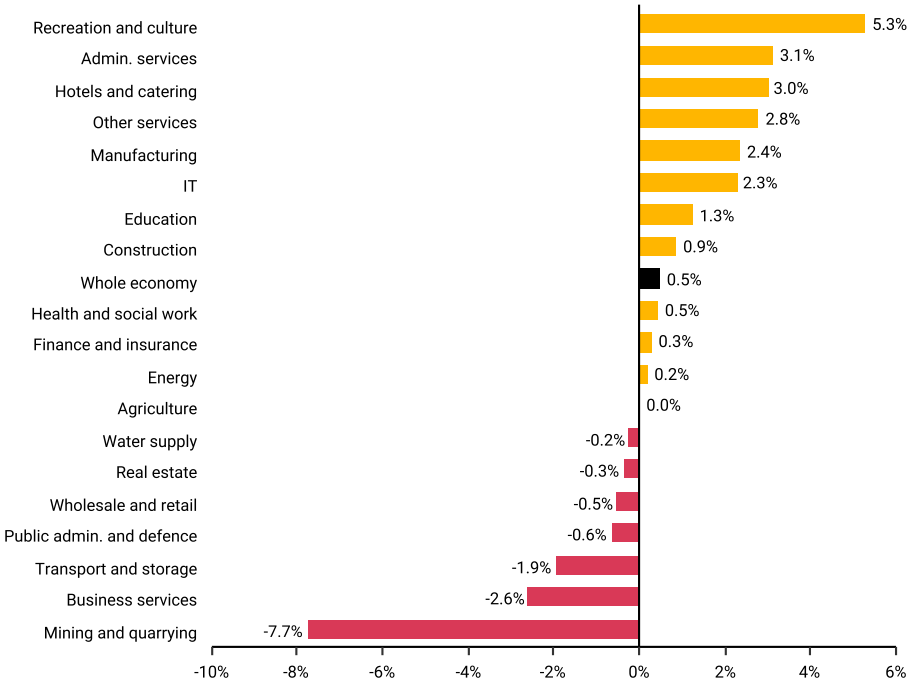
Our analysis on the previous page shows that the economy has broadly flatlined since the start of this year. But this masks significant sectoral differences. Eleven of the nineteen sectors recorded positive growth rates in H1 2023. We identify three key trends that we outline in turn below.

Bounceback in the hospitality sector. The two main hospitality sub-sectors (hotels and catering; recreation and culture) both recorded strong growth rates in the first half of the year. These sub-sectors have been buoyed by some easing in recruitment difficulties, rising consumer sentiment and lower cost of living pressures. The return of foreign tourists also helped to support demand over the summer months.

Business services activity slows. Though fee increases have maintained steady nominal revenue growth for the business services industry, in real terms activity in the sector contracted by 2.6%. This is relatively unusual as business services has historically been the country's third-fastest growing sector. In part, this reflects a return to more normal levels of demand after booming in 2021 and 2022. However, it also likely reflects the impact of higher input costs (particularly labour and energy), which has affected business spend on specialised services. The one area of growing demand is insolvency and restructuring services, which is seeing a pick-up in activity amidst rising corporate insolvencies.

Monetary policy tightening is weighing on real estate activity. Output in this sector declined by 0.3% in the first half of the year. As expected, the first casualty of higher mortgage rates has been transaction volumes (totalling 95,000 this August, compared to 110,000+ last August). This is because sellers typically opt to 'wait and see' rather than accept lower prices when selling properties. In addition, higher interest rates and a cooling labour market have all weighed on demand for properties. Meanwhile, commercial real estate continues to face challenges in terms of weakening demand for retail and office space in particular, but also structural changes (shift to online, hybrid working). There are also some signs of office space continuing to be repurposed for residential use, according to Bank of England agents.

Figure 2.5: UK real GVA growth, 2022 Q4 to 2023 Q2, by sector



Sources: PwC analysis, ONS, IHS Markit, Bank of England

Our main scenario sees economic growth remaining weak until the second half of 2024 as monetary tightening continues to weigh on activity

Figure 2.6: PwC main scenario real UK GDP projections, quarter-on-quarter growth

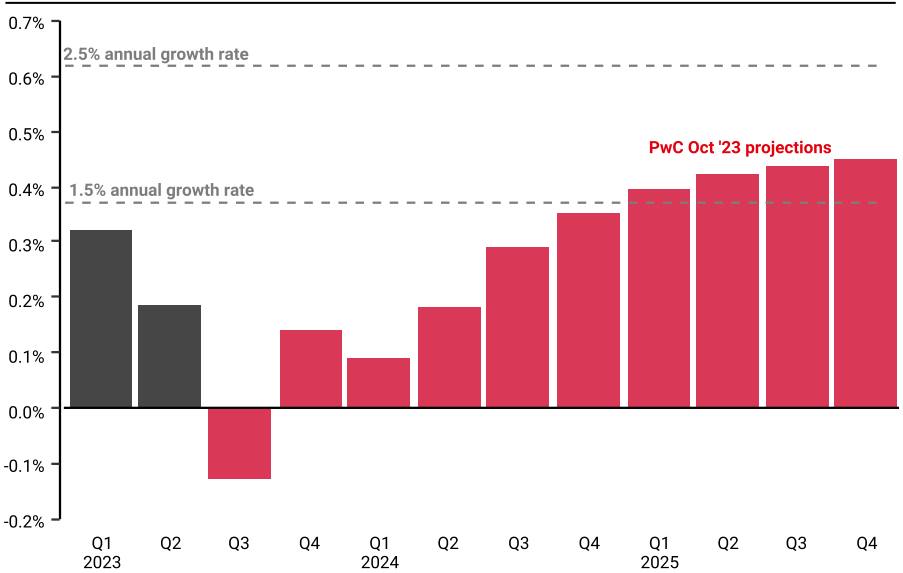


Table 2.1: PwC main scenario real UK GDP projections, average annual growth rate

	2023	2024	2025
Main scenario projections	0.5%	0.5%	1.5%

Subdued economic growth expected until the second half of 2024

We use econometric analysis to estimate main scenario projections for real GDP growth until the end of 2025 (see Appendix A for further details of our forecasting methodology). Our analysis implicitly assumes a continuation of relative policy certainty and limited volatility in global energy markets.

In our main scenario, we expect economic activity to contract by 0.1% quarter-on-quarter in Q3 2023. Economic growth is then expected to gradually pick-up, as the effects of monetary policy tightening on growth subsides and the squeeze on household incomes from high inflation eases in relative terms (see page 20 for our real earnings projections).

With this in mind, we expect real GDP to grow by around 0.5% both in 2023 and 2024. Though below trend, this is a marked improvement from consensus estimates of a recession six months ago, or our 0.1% base case expectation in April 2023 ("Subdued growth" scenario). By 2025, we expect there will be enough momentum in the economy for growth to return to its annual long-run trend rate of circa 1.5%. However, this still means we would fall short of the pre-pandemic long-run average (1.8% over 2000-19) and the ambitious 2.5% growth target set by the Liz Truss government.

These high growth targets will be difficult to achieve without significant structural changes to the UK economy, which address chronic underinvestment, skills mismatches and shortages, elevated economic inactivity rates and a significantly lower trade intensity. All of which help support low levels of labour productivity growth.

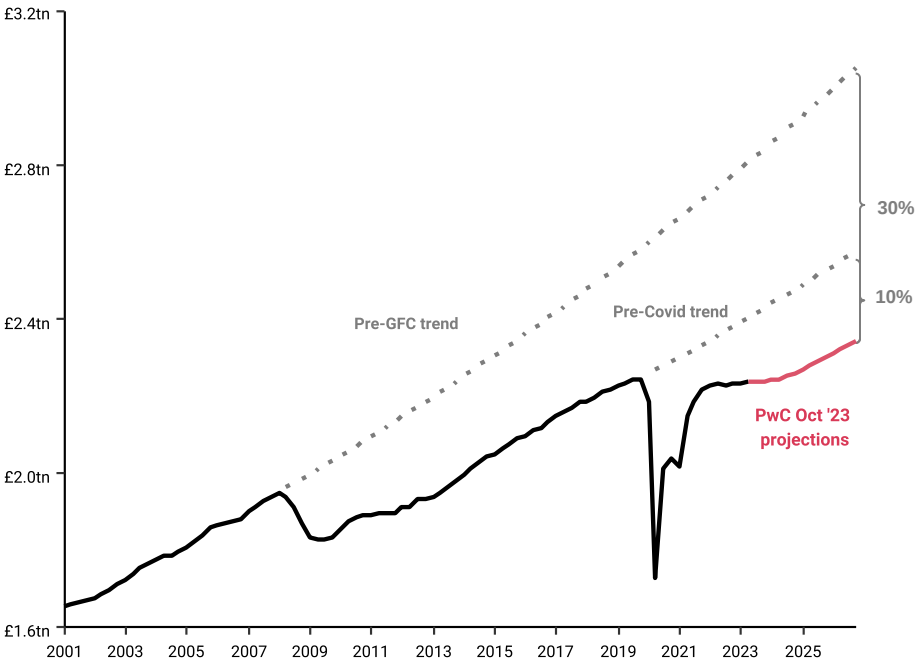
0.5%

Our main scenario projections for economic growth in 2023 and 2024, below the trend level of circa 1.5%.

Sources: PwC analysis, ONS, Refinitiv Eikon

A series of economic shocks have put the UK on a seemingly permanent lower growth trajectory

Figure 2.7: PwC quarterly real UK GDP projections, annualised



Weak overall picture for medium-term economic growth

The recent ONS data revisions have improved the UK's economic performance since the pandemic, but they have done little to improve the UK's overall economic standing. The cumulative effect of a series of economic shocks is starting to add up.

Starting with the Global Financial Crisis, our analysis indicates that the UK economy could have been just under a third larger by 2026 had it continued to grow at its pre-2008 pace (see Figure 2.7). This is roughly equivalent to adding another London to the economy.

Likewise, though the UK has now returned to pre-pandemic levels of output, it shows no signs of returning to its pre-pandemic trend. Our analysis indicates that by 2026 economic activity will be around 10% lower than where it could have been if the pandemic had never occurred. These growth shortfalls are not predetermined. According to the International Monetary Fund (IMF), the US economy is now even bigger than what they were forecasting before the pandemic.

Sources: PwC analysis, ONS, IMF, Refinitiv Eikon

London and Northern Ireland expected to be two of the fastest growing regions in 2023

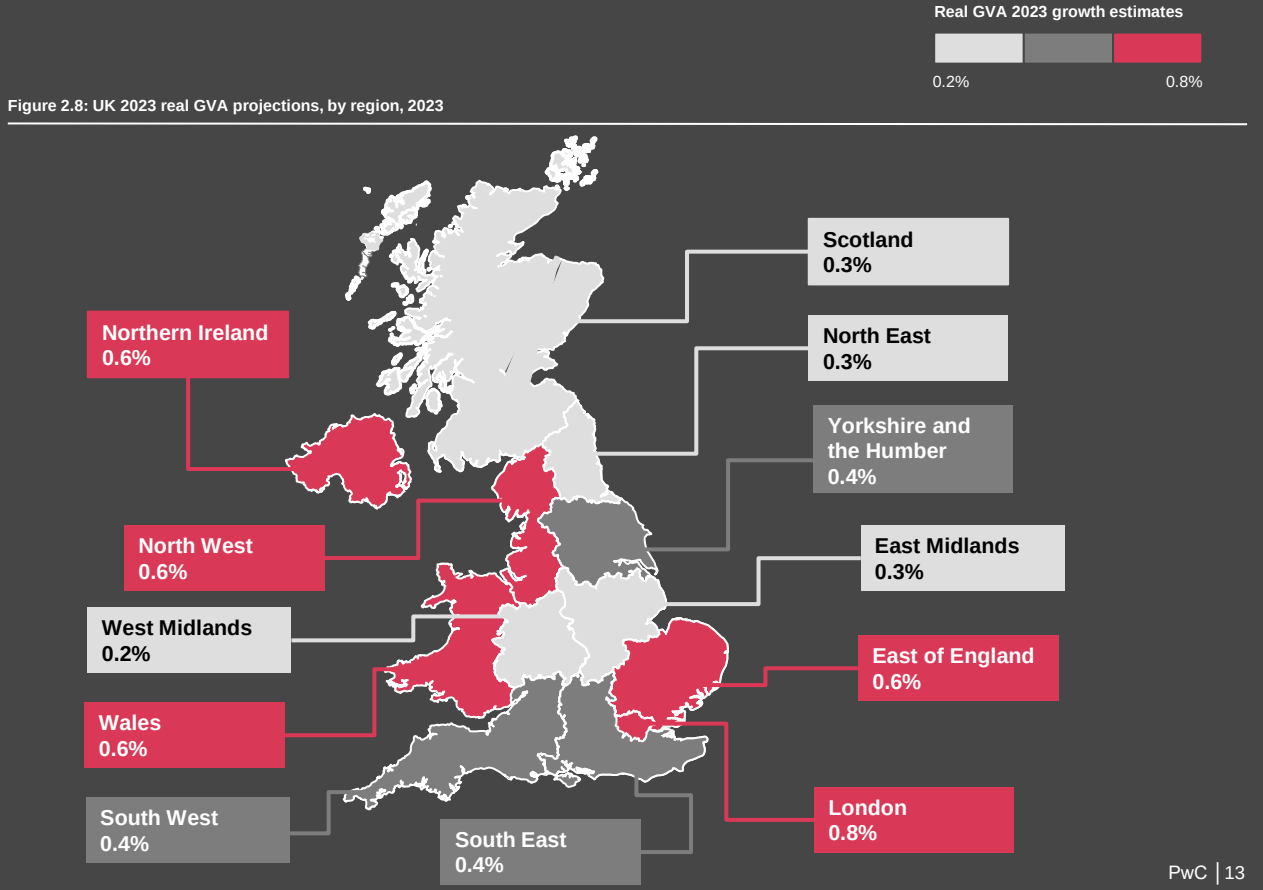
London and Northern Ireland set to record two of the fastest growth rates

We expect London to be the fastest growing region across the UK for this year, as activity picks up following a sluggish end to 2022. The capital is expected to benefit from strong performance in consumer-facing sectors. Northern Ireland is expected to be the UK's second-fastest growing region, as the region benefits from greater certainty provided by the Windsor framework and strong growth in the public sector.

…while the Midlands and Scotland lag behind.

The Midlands and Scotland are expected to grow at a relatively lower slower pace, in part due to their high exposure to the manufacturing sector, which has been hit by supply chain issues (which have largely recovered now), high energy prices, and changes to the UK's trading relationship with the European Union (EU). We expect that activity will start to pick up in 2024 once lower energy prices starts to feed through to all businesses in the sector. 35% of businesses reported to the ONS in early October 2023 that they were still being "affected by recent increases in energy prices", but this was down from 48% in January.[3]

Figure 2.8: UK 2023 real GVA projections, by region, 2023



Sources: PwC analysis, ONS, IHS Markit

2.2

Inflation

Headline inflation is down from its peak by around a third so far, with energy inflation doing most of the heavy lifting

Headline inflation down by a third as the UK narrows the gap with its peers

Consumer Price Index (CPI) inflation has fallen from a peak of 11.1% in October to 6.7% in September. This is broadly in line with our expectations (we expected 6.6% for Q3 2023 compared to 6.7% actual). This has helped the UK to narrow the inflation differential with its peers, with inflation as of September at 5.6% in France, 4.3% in Germany and 3.7% in the US.

However, the composition of headline inflation has been different to our initial projections. Energy inflation has accounted for almost all of the fall in headline inflation (see Figure 2.9). Meanwhile, services and core goods inflation have been more persistent than expected. This illustrates how large changes in global energy prices can lead to significant swings in the overall inflation rate, despite being a relatively small component of CPI.

On the next two pages, we focus on two key inflation components that have remained at high levels: services inflation and core goods inflation.

Figure 2.9: Contributions to change in headline inflation rate between October 2022 and September 2023, in pps

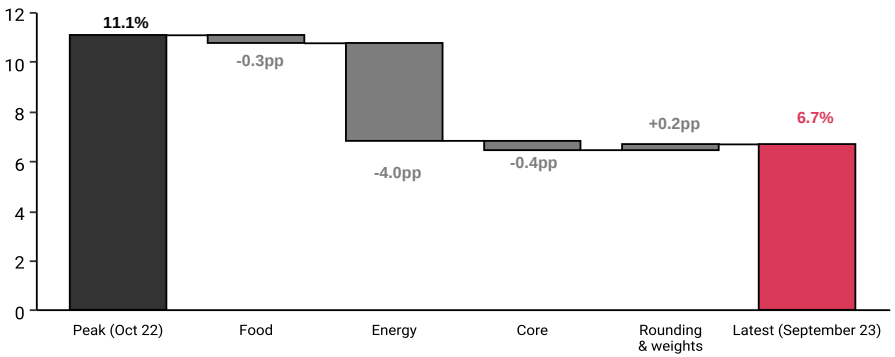
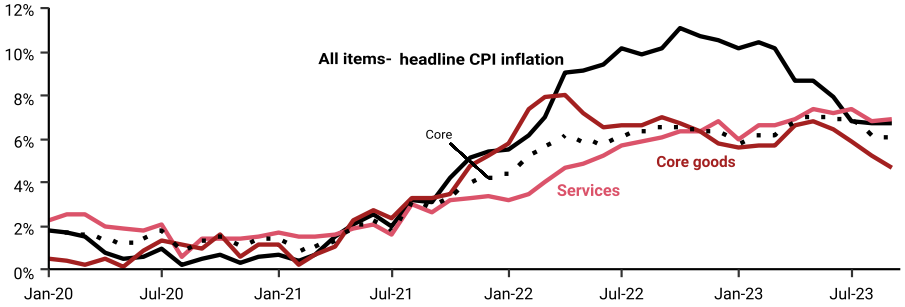


Figure 2.10: Various measures of consumer price inflation



UK Economic Outlook Sources: PwC analysis, ONS, US Bureau of Labor Statistics, Eurostat

-4.0pp

Reduction in energy inflation contribution from October 2022 to September 2023, assuming constant weights

We expect that services inflation will be closer to 6% by the end of this year, though it will take time to return to more normal levels due to high earnings growth

Services inflation remains elevated in the UK compared to its peers

Services inflation is a key focus for the Bank of England, at it is considered to be a useful indicator of domestic inflation pressures and thus inflation persistence. Services inflation was at 6.9% in September, which is significantly higher than its pre-pandemic level (circa 2.5%) and marginally higher than in the Eurozone (4.7%) and the US (5.7%).

This has been driven by a combination of high energy costs and labour costs. Many companies are on fixed-term energy contracts, so it takes time for falls to wholesale prices to feed through to all firms. Meanwhile, total pay growth was at 8.5% year-on-year in the three months to July 2023. This is far in excess of the circa 3% rate we would consider to be consistent with the Bank of England's 2% inflation target.

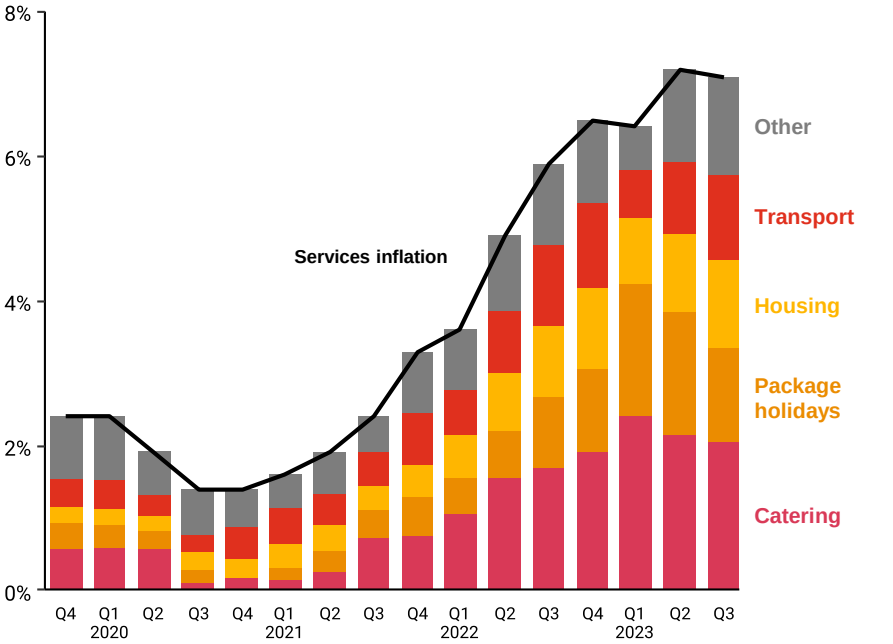
Hospitality inflation gradually easing as lower energy bills feeds through

Figure 2.11 breaks down services inflation into its main components. Inflation originating from the catering sector contributes just under a third of services inflation, as firms in the sector have been hit by the trio of rising food, energy and labour costs. However, catering inflation is gradually starting to come down, in part due to lower energy bills. Travel-related inflation has also picked up in recent months, but these categories are typically volatile and less informative about inflation persistence.

We expect that services inflation will gradually come down

Going forward, we expect that services inflation will be closer to 6% by the end of the calendar year. Lower energy prices are already feeding through to lower services inflation. Future slower earnings growth is likely to follow, albeit at a more moderate pace as contract renegotiations means that it takes time for these changes to pass-through to retail prices.

Figure 2.11: Services CPI inflation, by component



 Sources: PwC analysis, ONS

Core goods inflation is likely to continue to gradually edge down as cost pressures moderate for goods businesses

Core goods inflation is gradually declining to more normal levels

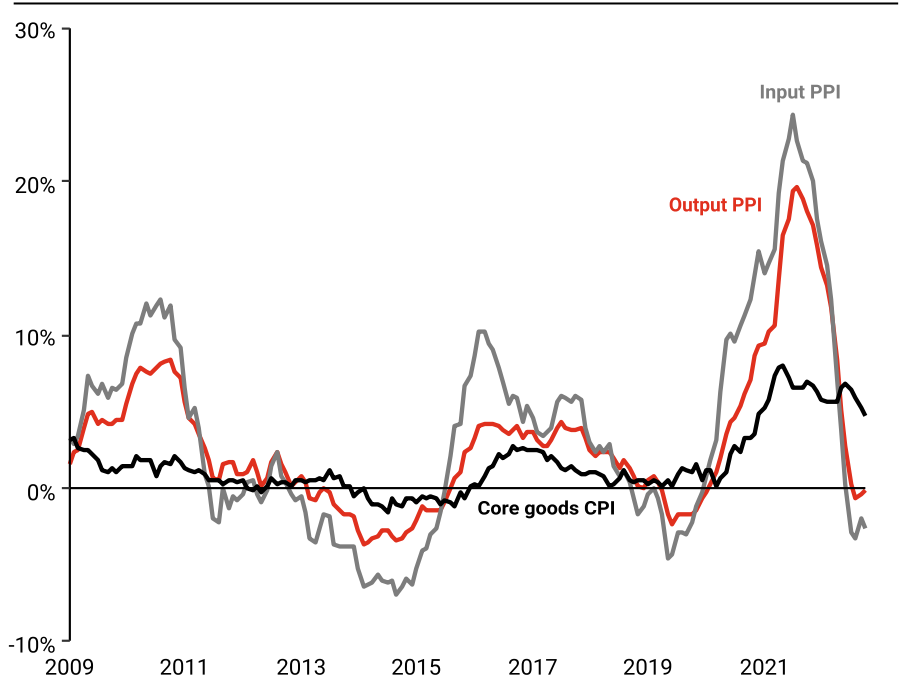
In a competitive market, we would expect to see a strong relationship between producer cost pressures and consumer prices. However, as Figure 2.12 shows, this relationship has broken down in recent months in the goods market.

Why has this happened? One theory is that the magnitude of the economic shock has slowed the transmission mechanism. For example, this could be because a higher proportion of firms have signed up to long-term fixed price contracts with their suppliers or energy providers.

Another theory is that the reconfiguration of supply chains globally has led to price pressures building up in the global trading system which is also affecting the UK economy.

Ultimately, we expect that core goods inflation will only defy gravity for so long, given easing cost pressures, improved supply chains and slowing demand. Though it seems clear this will be a gradual process.

Figure 2.12: Input Producer Price Index (PPI) inflation, Output PPI inflation and Core goods CPI inflation



Sources: PwC analysis, ONS. Notes: PPI stands for Producer Price Index. It captures changes in the prices of goods bought and sold by UK manufacturers including price indices of materials and fuels purchased (input prices) and factory gate prices (output prices).

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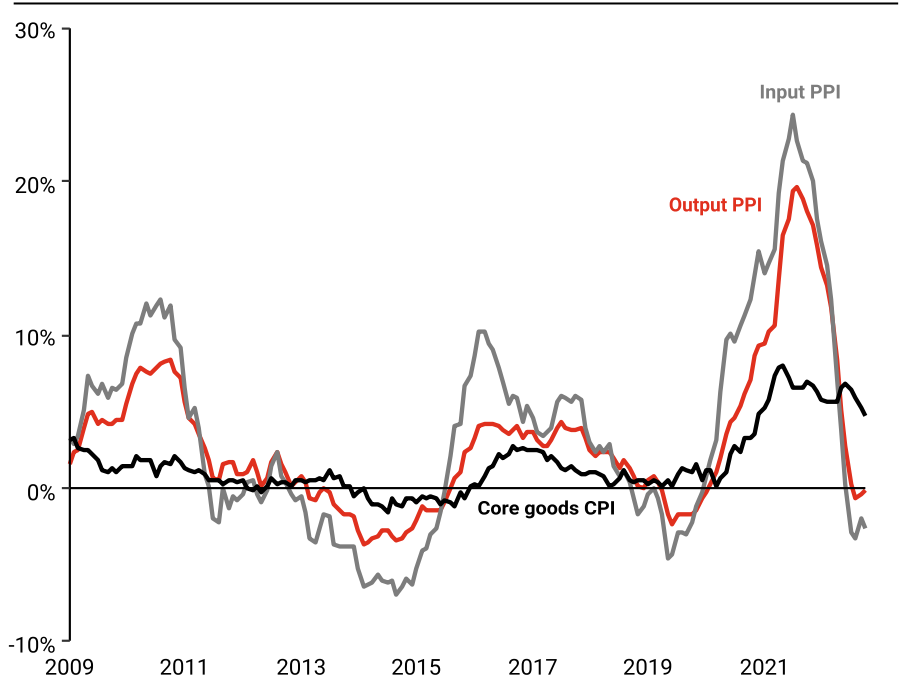


Sources: PwC analysis, ONS. Notes: PPI stands for Producer Price Index. It captures changes in the prices of goods bought and sold by UK manufacturers including price indices of materials and fuels purchased (input prices) and factory gate prices (output prices).

Box A: Geopolitical instability in the Middle East presents a near-term risk to the UK economic outlook

Energy prices have spiked in response to heightened instability in the region

The current situation in the Middle East, which is first and foremost a humanitarian crisis, has presented a new risk to the global economic outlook. From a global perspective, there is a risk that the conflict could lead to higher energy prices, higher inflation and slower growth.

The Middle East accounts for close to a third of global oil production and one fifth of natural gas production.[4] As a result, instability in the region raises the chance of disruptions to global energy supply. This heightened uncertainty raises the risk premium in oil and natural gas markets.

Since the conflict started earlier this month, sterling-dominated Brent crude oil futures have spiked by around 5%, while natural gas futures have increased by 21%. In part, this is due to the shutdown of a major natural gas field supplying Egypt. At full capacity, Egypt's liquified natural gas (LNG) plants produce nearly 5% of the European Union's gas consumption. Energy prices could rise further if other major energy producers are brought into the conflict.

Risks to the UK inflation outlook

For the UK, the main risk is that geopolitical instability in the Middle East derails the progress the Bank of England has made to return headline inflation to target. In the April 2022 edition of this publication, we showed how shocks to global energy prices can add as much as two to four percentage points to UK headline inflation.[5]

The latest UK natural gas and power futures curves as of late October 2023 currently point to a rise in the household energy price cap of 10% in January 2024 and 4% in April 2024, before gradually declining. This is in part due to heightened geopolitical instability in the Middle East. As a result, our main scenario projections indicate headline inflation could increase by around one percentage point in early 2024.

On the next page, we outline our main scenario projections for headline inflation over the next two years, taking into account recent developments in the Middle East.

Figure 2.13: UK natural gas futures prices, p/therm

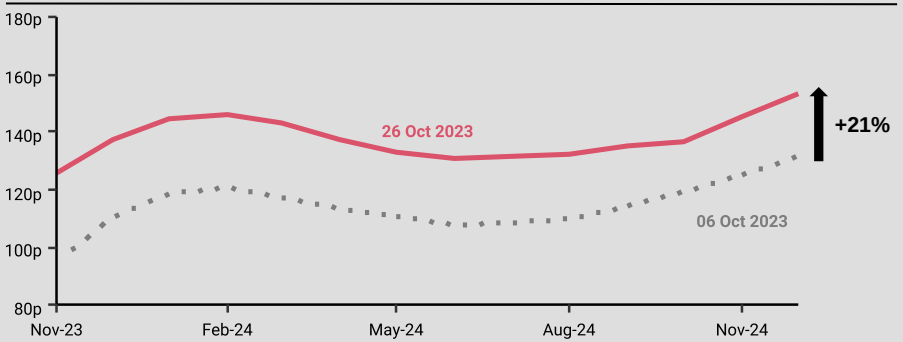
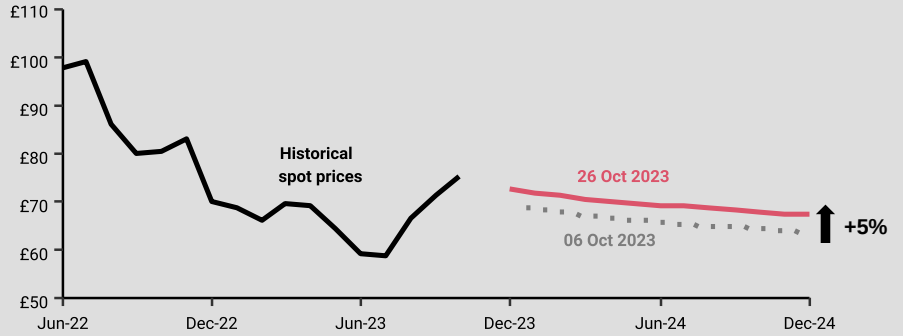


Figure 2.14: Sterling-denominated brent crude oil spot prices (black) and futures prices, £/barrel



Sources: Refinitiv Eikon, BP, PwC analysis. Notes: +21% and +5% refers to the average increase in natural gas and brent crude oil futures until December 2024.

In our main scenario, we project that the government will meet its target to halve inflation by the end of this year

Inflation is expected to fall below 5% by the end of the year

In our main scenario projection, we expect headline inflation will close the year at around 4.6% in Q4 2023. This is higher than we expected in our last publication (3.5%) but still comfortably below the government's target of 5.4% for Q4 2023.

We expect most near-term deceleration of headline inflation will be driven by lower energy inflation, as the household energy price cap is cut in October and previous rises drop out of the annual calculation. We estimate this will take around 1.5pp off headline inflation.

Recent falls to PPI inflation indicate that food and core goods inflation will also moderate over the coming months, albeit to a lesser extent. Based upon the PPI curves, it seems likely that food and drinks inflation will end the year under 10%, down from 13.6% now but still considerably above the circa 1.4% rate pre-pandemic.

However, the path back to target is unlikely to be all plain-sailing. Currently, our modelling indicates that there will be another small spike in headline inflation at the start of the 2024, due to rising energy prices. The latest natural gas and power futures curves as of late October 2023 point to a rise in the household energy price cap of 10% in January and 4% in April, before gradually declining. As we explain on the previous page, this is in part due to heightened geopolitical instability in the Middle East.

Services inflation will also take time to come down while earnings growth remains strong. Our analysis later in this chapter suggests that earnings growth is likely to remain at high levels until late 2024 at the earliest. As a result, a full return to the 2% inflation target is unlikely to be achieved until 2025.

Figure 2.15: UK Consumer Price Inflation, main scenario projections from 2023 Q3

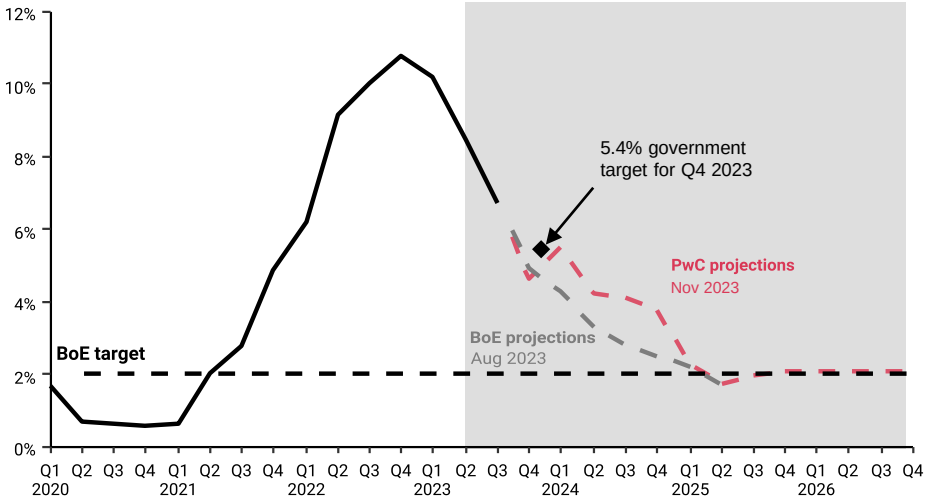


Table 2.1: PwC main scenario real UK CPI projections, average annual growth rate

	2023	2024	2025
Main scenario projections	7.5%	4.4%	2.0%

Sources: PwC analysis, ONS, Ofgem. Notes: HMT define this target in the Spring Budget 2023 as CPI inflation in Q4 2023 being half of its level in Q4 2022. CPI inflation was 10.7% in Q4 2022, so Rishi's pledge to halve inflation equates to a target of 5.4% in Q4 2023.

The living standards squeeze is nearly over, but we don't expect to see strong real earnings growth until 2025

Real earnings growth is likely to be low or negative in 2023 and 2024

In the three months to July, the year-on-year growth of nominal earnings surpassed headline inflation. Does this mark the end of the cost of living crisis?

Our main scenario projections opposite shows that real earnings have turned a corner. Our current modelling points to a 0.6% fall to earnings in 2023, followed by a slight rise in 2024 (0.3%). This means that consumer spending is unlikely to take off any time soon. But it may start to pick-up gradually as households see inflation come down and thus feel more comfortable to dip into their excess savings.

Two years of high inflation combined with our long-term productivity challenges have left their mark on living standards. We expect real earnings to be lower on average this year than in 2006. This is equivalent to no net earnings growth for 17 years, with the average worker's earnings around £17,000 lower (in 2022 prices) than where they could have been. We do not expect earnings to grow meaningfully in real terms until at least 2025, once inflation has turned a corner.

Figure 2.16: Annual real average weekly earnings growth, main scenario projections from 2023

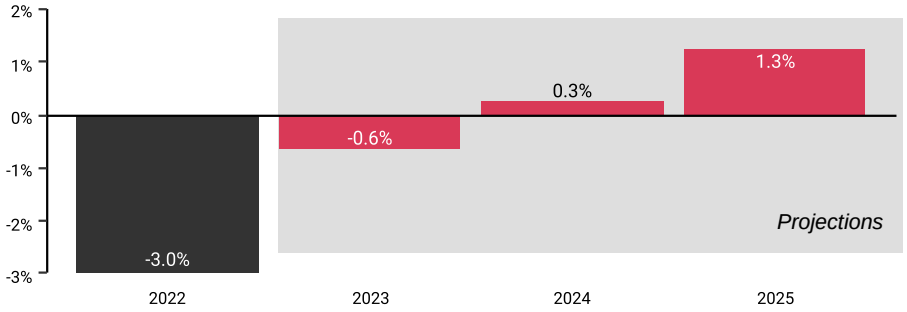
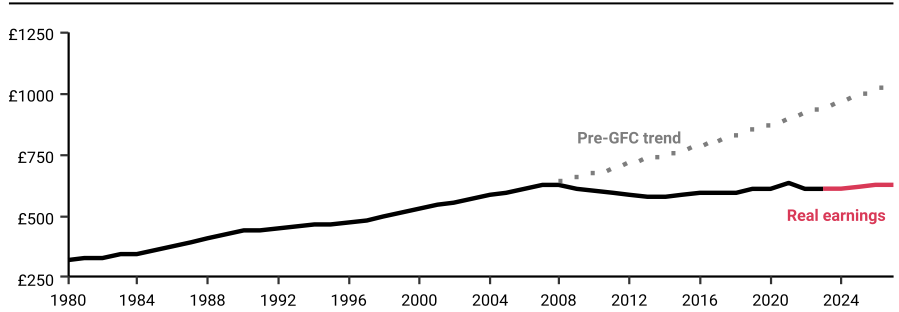


Figure 2.17: Actual and projected real average weekly earnings vs continuation of pre-GFC trend



"We expect real earnings to be lower on average this year than in 2006. This is equivalent to no net earnings growth for 17 years"

Sources: PwC analysis, ONS, IHS Markit, HM Treasury

We expect that interest rates will be closer to their pre-pandemic levels than their current levels over the long-term

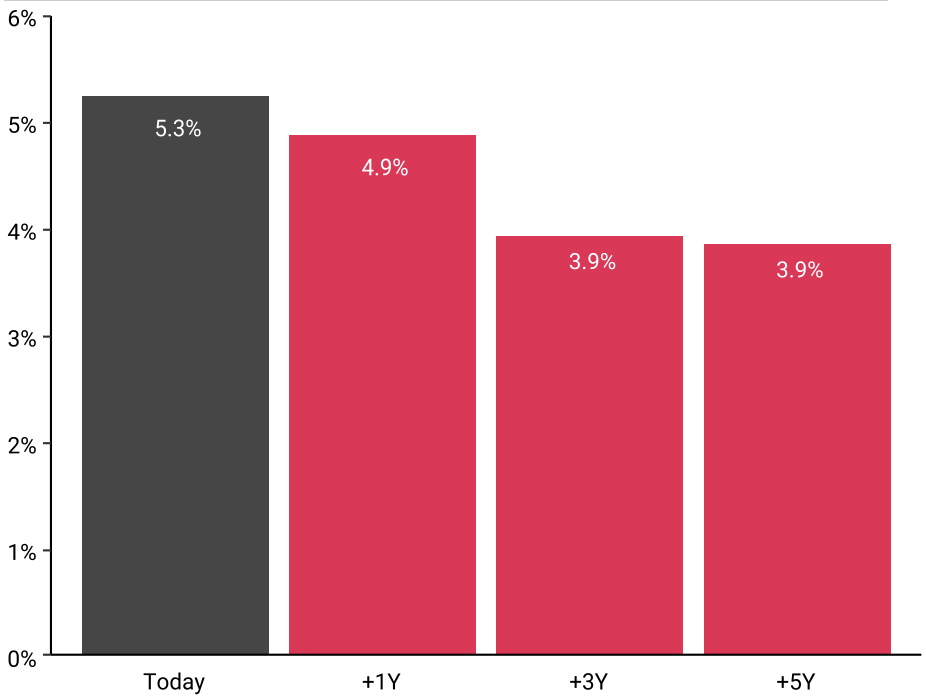
Long-term interest rates to remain low

Financial markets are currently pricing in a long-term interest rate of around 4%. This is lower than its current level (5.25%) but still significantly higher than pre-pandemic (around 0-1%). How likely is it that interest rates will remain this high?

Since the mid-1980s, real interest rates have been on a downwards trajectory in the UK and other advanced economies. Research by the IMF indicates that this was driven by falls to trend nominal interest rates, due mostly to weak productivity growth and demographic ageing.[7]

Ultimately, these challenges have not gone away. Demographic ageing is close to an inevitability for the advanced economies. It also seems reasonable to assume that productivity growth will remain modest, unless there are significant structural changes to the UK economy. For these reasons, it is our view that the medium to longer-term level of nominal interest rates is likely to be closer to its pre-pandemic level (in the range of 1-3%) than its current level of around 5%.

Figure 2.19: Bank of England policy rate vs financial market expectations (as of 2 November 2023)



Sources: PwC analysis, Bank of England, IMF

Box B: Our modelling indicates that the average mortgagor could see their annual mortgage payments increase by around £3,000 a year

Mortgage rates have risen sharply but it will take time to feed through

Mortgage rates have risen since our April publication. For instance, the average rate on a two-year fixed mortgage at 75% LTV has risen from around 4.6% to 5.6% as at 31 October 2023. This reflects the pass-through of higher expectations for the Bank Rate to banks' funding costs.

However, it will still take time for this to filter through to all mortgagers. We estimate that around one in three mortgaged households have yet to see their mortgage rates change since the Bank of England started hiking rates in late 2021. This is equivalent to around 1.2 million households.

£3,000

Our estimate for the average increase in annual repayments for households coming off a fixed term mortgage.

We expect that the average household re-fixing their mortgage rate will see their annual repayments increase by 43%, equivalent to around £3,000. Though a significant rise, it is worth noting that overall consumer prices have risen by around one-fifth in the past two years. While nominal earnings have risen by 14% over the same period.

Overall economic impact is limited

Only around 30% of households have a mortgage, and the vast majority of these are on a fixed rate. As a result, the aggregate rise in mortgage interest payments each quarter is relatively small relative to total household consumption. Mortgages are also held disproportionately by higher-income households, who have higher savings buffers and so are relatively well-placed to absorb negative shocks to their incomes.

The remaining 70% of households are made up of owner-occupiers without a mortgage (40%) and renters (30%). It is likely that landlords will at least pass on some of increase in borrowing costs to renters, but the 40% of owner occupiers without a mortgage will remain largely unaffected.

Figure 2.20: Number of fixed rate mortgages coming up for renewal by quarter, Q1 2023 to Q3 2023

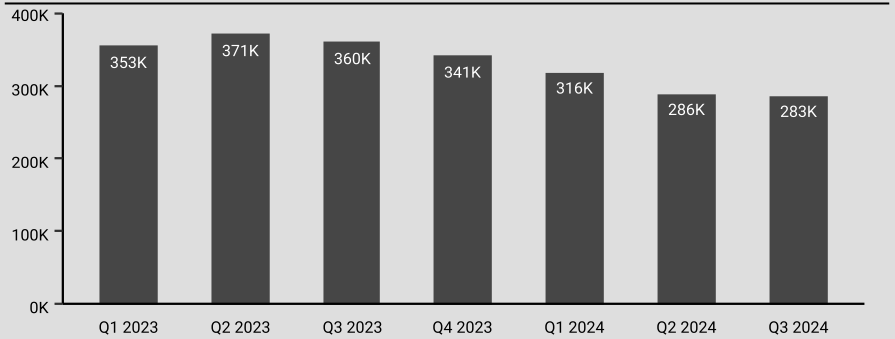
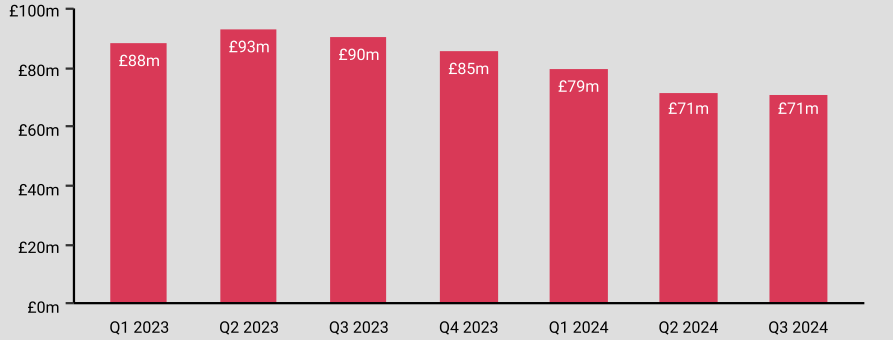


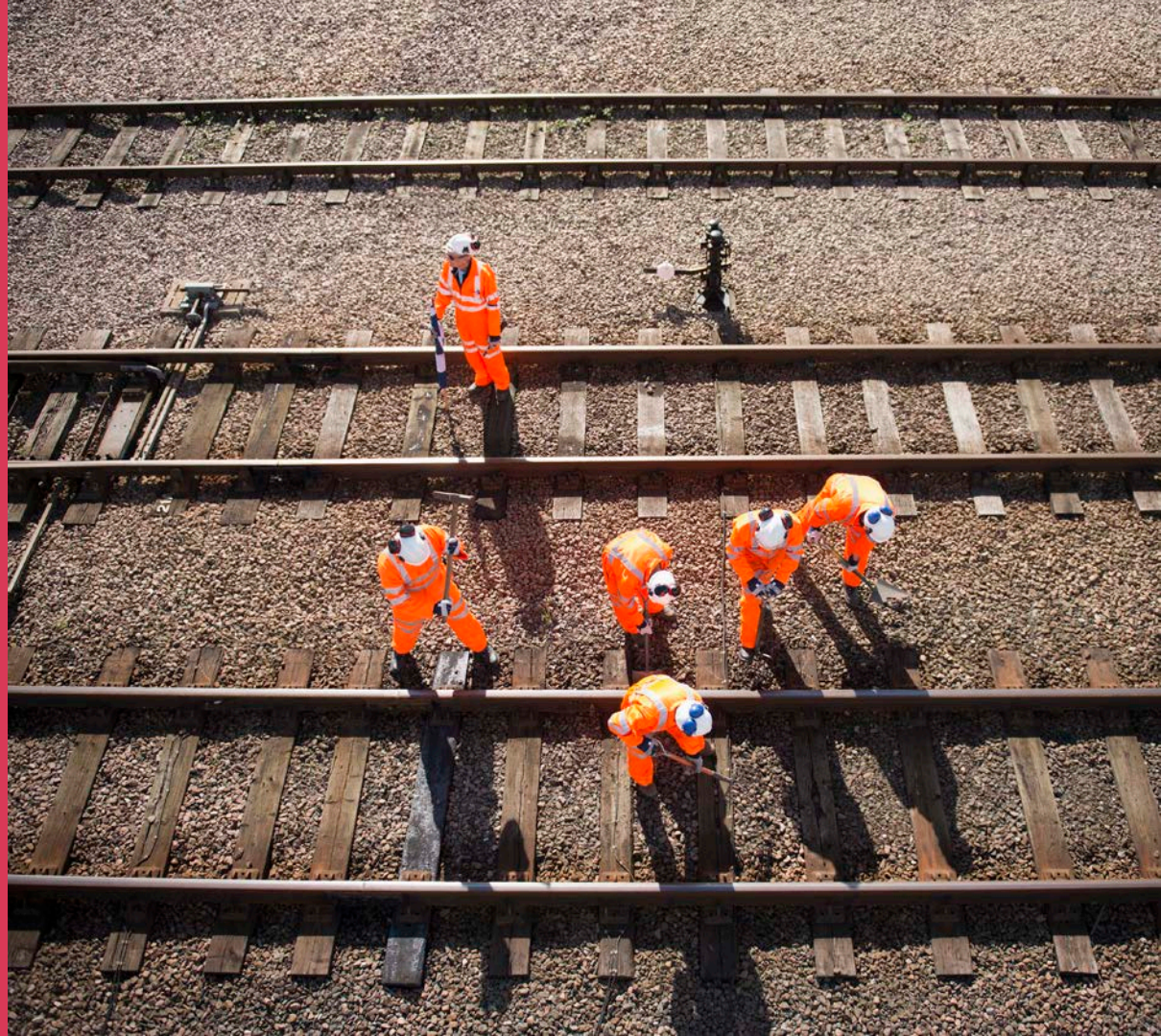
Figure 2.21: Expected quarterly rise in aggregate mortgage interest payments for households coming off a fixed term



Sources: PwC analysis, Bank of England, Moneyfacts, Rightmove, Knight Frank, ONS. Notes: The standard mortgage repayment formula used to estimate monthly costs assumes a 25-year repayment period for a capital and repayment mortgage. Based on the latest average 2Y fixed mortgage rate (6.12%) accessed via Rightmove as at 23rd October 2023.

2.3

Labour market



The labour market is cooling in response to rate rises but so far there is limited evidence of this translating into lower pay growth

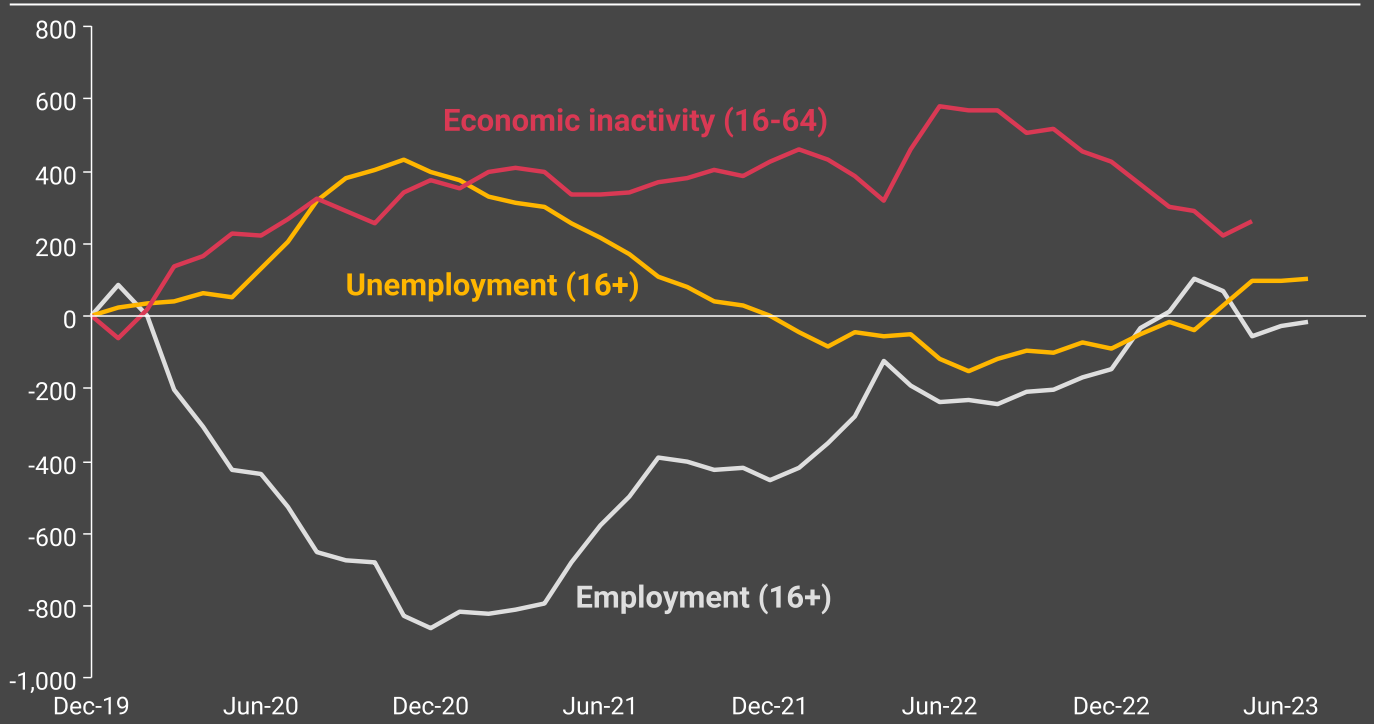
There are now clear signs that the labour market is cooling

All of the main indicators suggest that monetary policy tightening is starting to ease some of the pressures in the labour market. Employment fell by 207,000 in the three months to July 2023, relative to the previous three month period. This is the largest fall on record outside of a recession. At the same time, unemployment increased by 159,000.

Working-age inactivity also picked up by 63,000 over the same period, following a series of mostly consecutive declines since mid-2022. This was primarily due to a sharp rise in long-term health conditions, which reached another record high. We explore these trends in more detail further in the report.

Despite clear signs the labour market is cooling, earnings growth remains at high levels. Annual nominal regular pay grew by 7.8% in the three months to August 2023, which is an all-time high since comparable records began in 2001. Later in this chapter, we use econometric analysis to unpick what is driving current earnings pressures.

Figure 2.22: Change in UK unemployment, employment and economic inactivity, from pre-pandemic levels, in 000s



Sources: PwC analysis, ONS

The unemployment rate is ticking up gradually as interest rate rises slow labour demand

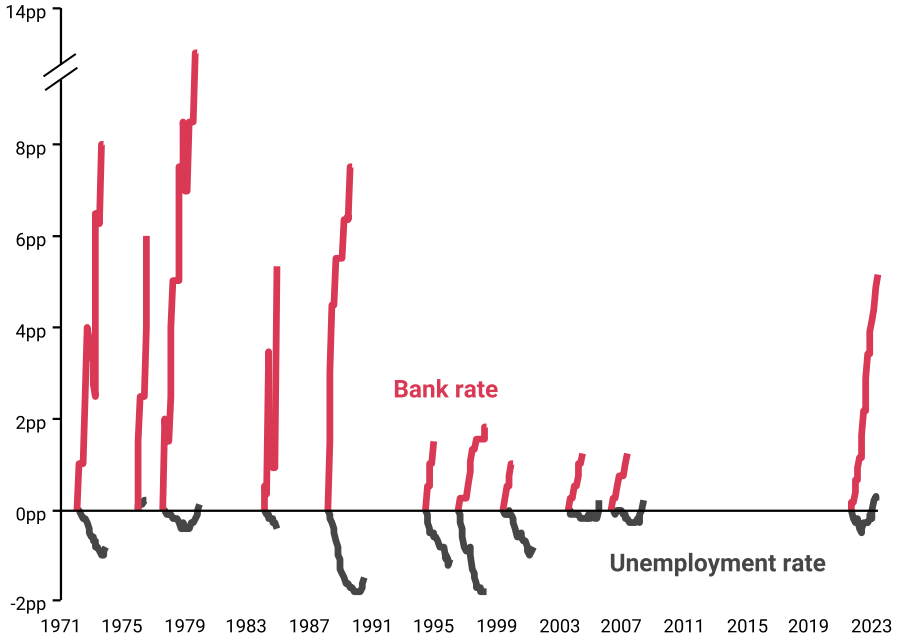
As expected, the unemployment rate is rising, but at a slow pace

The Bank of England raised rates 14 consecutive times to bring the base rate to 5.25%. This is the sharpest rate tightening cycle since the 1980s. However, so far, the corresponding rise in unemployment has been relatively muted. The unemployment rate has edged up from 4.0% in late 2021 to 4.3% as of the three months to July 2023.

The impact has been felt much more acutely on vacancies, a proxy for labour demand, which are now down around a quarter from their peak. As a result, the vacancies-to-unemployment ratio has fallen from a peak of 1.1 (equivalent to more than 1 vacancy per unemployed person) to around 0.7 now.

This supports the hypothesis of some Federal Reserve officials that, with vacancies so high, it may be possible to introduce slack into the labour market without significantly raising unemployment.[8] As overall demand for labour moderates, this should make it easier for businesses to fill open positions, and thus ease earnings pressures. We show later in this chapter there is only initial evidence this is starting to happen.

Fig 2.23: Cumulative change in the Bank Rate and unemployment rate during tightening cycles, percentage points



Sources: PwC analysis, ONS, Refinitiv Eikon

Vacancies are falling back at a more rapid pace, particularly in the consumer-facing sectors which experienced acute pressures

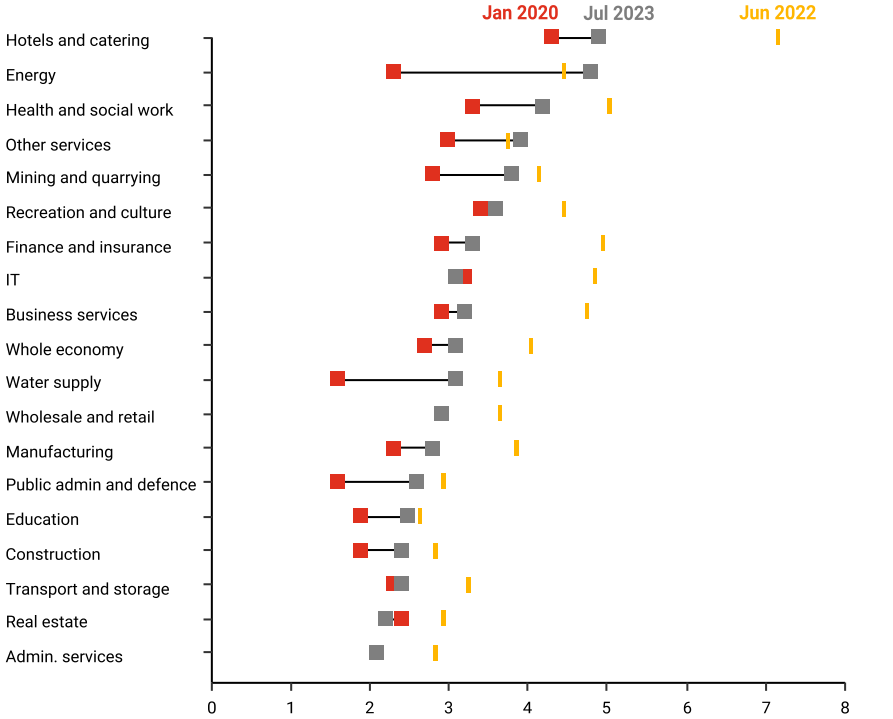
The strongest sign of slowing labour demand is rapidly falling vacancies

The number of vacancies posted has declined by a quarter of a million over the past year, equivalent to a 24% fall. At the same time, according to Bank of England surveys, the proportion of firms that are finding it “much harder” to recruit is now at 20%, down from a peak of 65% in 2022.

Figure 2.24 shows the vacancy rate before, during and after the pandemic in each sector. What is evident from the chart is that vacancies are fallingly the fastest in the consumer-facing sectors (incl. hotels and catering; recreation and culture; wholesale and retail), where labour shortages were particularly acute.

Vacancies have also fallen back in public sector dominated industries but to a lesser extent than in the private sector. The vacancy ratio declined by 4% in education, 10% in public administration and defence, and 16% in health and social work. This compares to a 23% decline across the economy as a whole. However, we expect that these gaps could start to narrow now that public sector earnings growth is catching up with the private sector.

Figure 2.24: Vacancy rate (job vacancies per 100 employee jobs), by sector, seasonally adjusted



Sources: PwC analysis, ONS, Bank of England

Inactivity due to long-term sickness has reached a new record high of 2.6 million, with the only saving grace being rising female labour force participation

Post-pandemic economic inactivity remains one of the UK's greatest economic and social challenges

Working-age inactivity picked up by 63,000 in the three months to July 2023. Though a relatively small rise over the quarter, this masks a significant increase of almost 130,000 amongst young people (16-24), likely due to higher numbers of students.

The main area of concern remains long-term sickness. The number of people out of work due to long-term sickness has risen by almost 500,000 over the course of the pandemic to reach a new record high of 2.6 million. There are also no signs its growth is tailing off, with an additional rise of 50,000 over the past quarter.

> "Having been a strong tailwind for two centuries, **health is now a strengthening headwind to UK economic growth**, for perhaps the first time since the Industrial Revolution"
>
> **Andy Haldane**
> former Bank of England
> Chief Economist

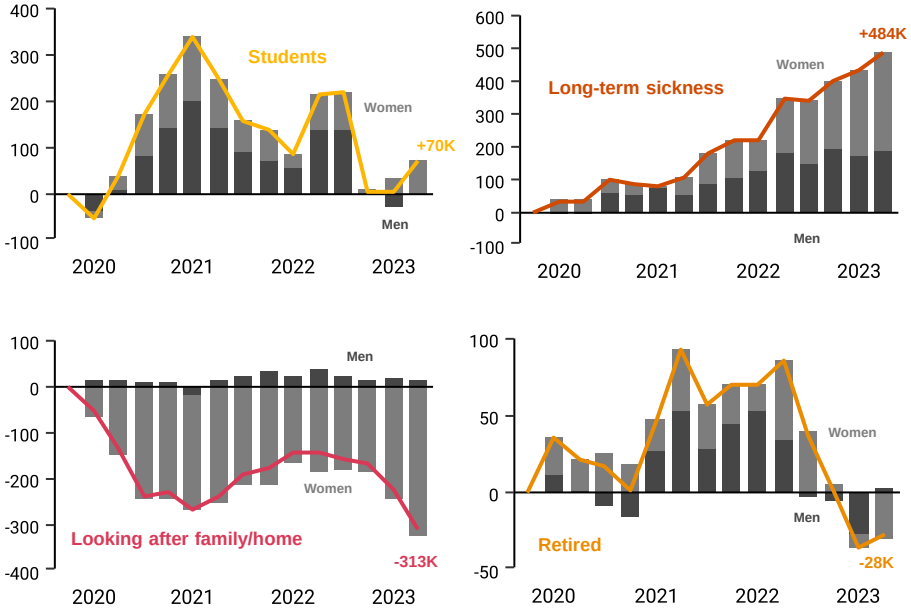
Our prior analysis from the Golden Age Index shows that there is a strong link between NHS waiting times and the employment rate of older workers, which is a major driver of post-pandemic inactivity. As at September this year, one in five adults aged between 50-65 that left work since the pandemic were currently on an NHS waiting list for medical treatment.

Increased female labour participation is a continued bright spot

The number of people out of work looking after their family/home is the one segment of inactivity that has persistently declined since the start of the pandemic, falling by around 300k. Women account for the lion's share of this decline.

Since records began in the 1970s, the rate of female participation has been on an upward trajectory in the UK and other advanced economies. The share of women in the UK labour market rose from around 60% in the 1970s to just under 80% now. However, female participation continues to lag behind men. Our recent Women in Work report highlights that high costs of childcare remain a significant barrier to female employment in the UK.

Figure 2.25: Change in economic inactivity relative to Nov-Jan 2020 levels in 000s, by quarter and reason



Sources: PwC analysis, ONS. Notes: These four charts are not exhaustive. There are three additional reasons given for being economically inactive ('temporary sickness', 'discouraged workers' and 'other'). However, these have not been significant drivers of inactivity trends in recent months.

Our modelling suggests that private sector average earnings growth is likely to remain at relatively high levels in the short term

Labour market tightness is the main driver of current earnings pressures

Public sector earnings grew 12.5% in the three months to August, while in the private sector earnings grew by 7.1% over the same period, significantly above historic trends (see Figure 2.26).

We use econometric modelling to identify which factors are driving private sector earnings growth, following a similar approach to the Federal Reserve and the Bank of England.[9] Our modelling indicates that it is labour market tightness, rather than household inflation expectations, which is the primary driver of current average earnings growth. This implies that earnings growth will remain elevated while labour markets remain tight.

The labour market is clearly cooling, but worker shortages are likely to persist while levels of long-term sickness remain high. On its current trajectory, the unemployment- to-vacancies ratio (our proxy for labour market tightness) will not return to more normal levels until late 2024 at the earliest. This suggests the path back to 'normal' earnings growth will be gradual.

Figure 2.26: Annual regular earnings growth, by three-month period, private and public sector

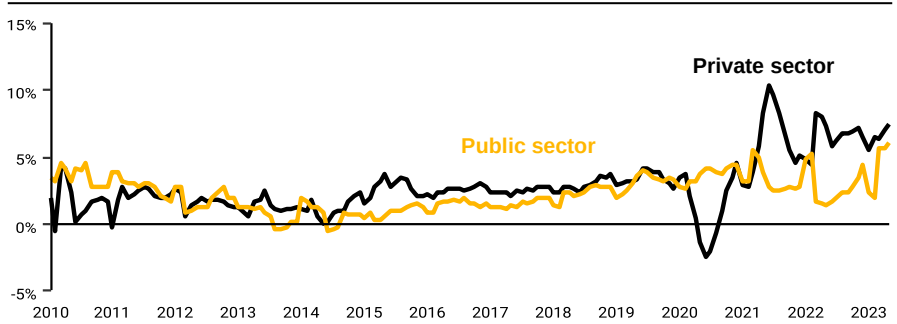
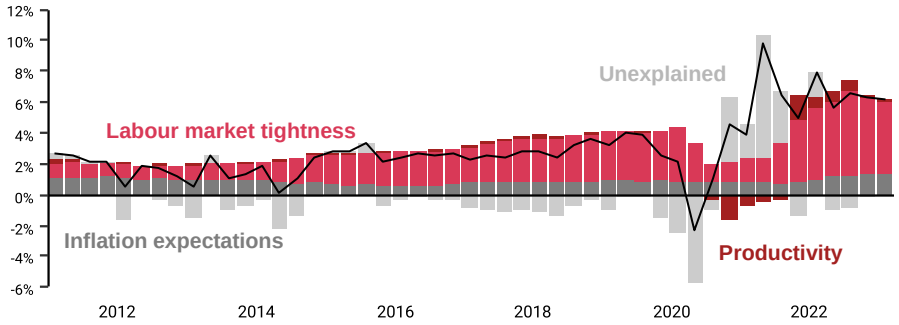


Figure 2.27: Modelled contributions to annual private sector total earnings growth, seasonally adjusted



Sources: PwC analysis, ONS, Bank of England. Notes: Modelling is broadly based on an approach used by Yellen in 2017. We regress earnings growth on labour market tightness (v/u ratio), household inflation expectations and productivity growth.

3

Does studying an undergraduate degree make you wealthier and happier?

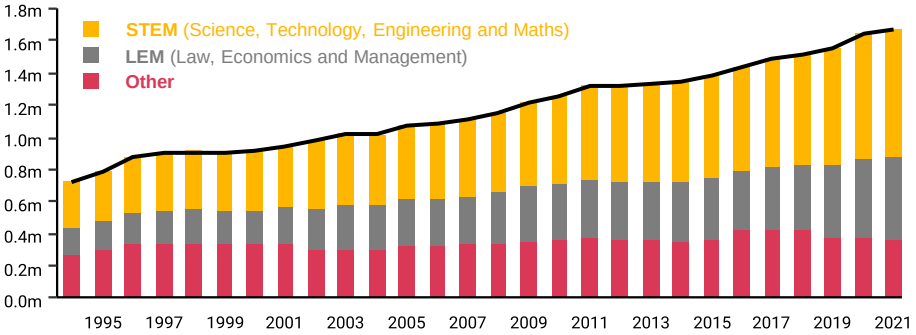
Section 3 - Does studying an undergraduate degree make you wealthier *and* happier?

Introduction

In 1999, the UK government set a target for at least 1 in 2 young people to participate in higher education. Since then, there has been a rapid expansion of the sector, as Figure 3.1 below illustrates. As a result, the proportion of young people enrolled in higher education hit 50% for the first time in 2017/18. This means it is more important than ever for undergraduate degrees to generate value both for the students and wider society. This chapter adds to the evidence base on the topic by evaluating the earnings and wellbeing benefits to individuals who study and are awarded an undergraduate degree relative to non-graduates.

We structure the article as follows: After we outline our methodology, we present our headline estimates for the impact on earnings and wellbeing of being awarded a degree by field of study. Finally, we bring together both parts of the analysis to provide a holistic view of the value generated by each of the undergraduate courses.

Figure 3.1: Number of full-time students studying an undergraduate degree in the UK for the first-time



UK Economic Outlook Sources: PwC analysis, Higher Education Statistics Agency (HESA)

Key points

- **All of the undergraduate degrees in our sample boost earnings.** Our econometric analysis shows that graduates from all of the undergraduate courses in our sample have higher earnings than their counterparts without a degree, while controlling for other factors. The average graduate earns around 57% more than non-graduates with similar demographic characteristics.
- **We also find strong evidence for a graduate wellbeing premium.** Most undergraduate courses also have a positive impact on self-reported life satisfaction. The top performing courses increase life satisfaction by around 5%, providing the same boost to life satisfaction as just over £5,000 in additional earnings every year.
- **Higher earnings are a key channel through which studying a degree affects wellbeing, but there are also other factors at play.** Many of the courses with the largest wellbeing premiums, such as sports sciences and education, have relatively low earnings premiums compared to other courses. Vocational courses in particular, such as nursing, score highly for their wellbeing premiums.

We conduct a holistic assessment of the value provided by undergraduate degrees, looking at earnings and wellbeing effects

Different approaches to assessing the value of undergraduate degrees

Typically, undergraduate degrees are evaluated based on their unadjusted outcomes-- this usually includes financial considerations such as the share of people that enter employment after graduating as well as the average earnings of graduates. However, there are two main limitations to this approach, which we outline below.

First, this type of analysis often does not capture the non-financial impacts of undergraduate degrees. When students are asked for their most important reasons for "wanting to go to university", many of the factors they list are not related to their finances. For instance, close to 6 in 10 students report that their passion for the subject was one of their top three reasons for wanting to go to university. While around 1 in 5 said they wanted to experience university life and have a good time.[10] Prior research by PwC also shows that education has a key role to play in driving future health outcomes.[11] Assessing courses based only on their financial outcomes is therefore likely to not account for the non-financial factors that are also important for future workers.

Second, as these are *unadjusted* outcomes, there is a risk that the analysis will be skewed by demographic differences between courses. For instance, many of the courses with the poorest unadjusted financial outcomes have a high share of female students. As a result, it is not clear whether these courses have poorer unadjusted outcomes due to the market dynamics on workers in that particular field of study or because of the gender pay gap.

Our approach captures both financial *and* non-financial impacts of undergraduate degrees

Our approach addresses both of these limitations. First, we assess both the financial *and* non-financial impacts of studying an undergraduate degree using the following two variables as proxies:

- Gross hourly earnings (proxy for financial impact)
- Self-reported life satisfaction (proxy for non-financial impact)

Second, throughout our analysis we leverage econometric modelling to evaluate the *adjusted* outcomes of graduates relative to non-graduates. This enables us to hold constant a selection of personal and work-related characteristics (e.g. gender) that the literature has shown also affect earnings and wellbeing. Doing so, we estimate the:

- Graduate earnings premium: gross earnings of working-age graduates relative to non-graduates with similar personal & work-related characteristics.
- Graduate wellbeing premium: Self-reported life satisfaction of working-age graduates relative to non-graduates with similar personal characteristics.

Our analysis still has some limitations. First, as we estimate the impact on gross earnings, we do not account for the costs of provision to the individual (either upfront or via student finance). Though the advantage of our approach is that our analysis will not be affected by future changes to tax policies.

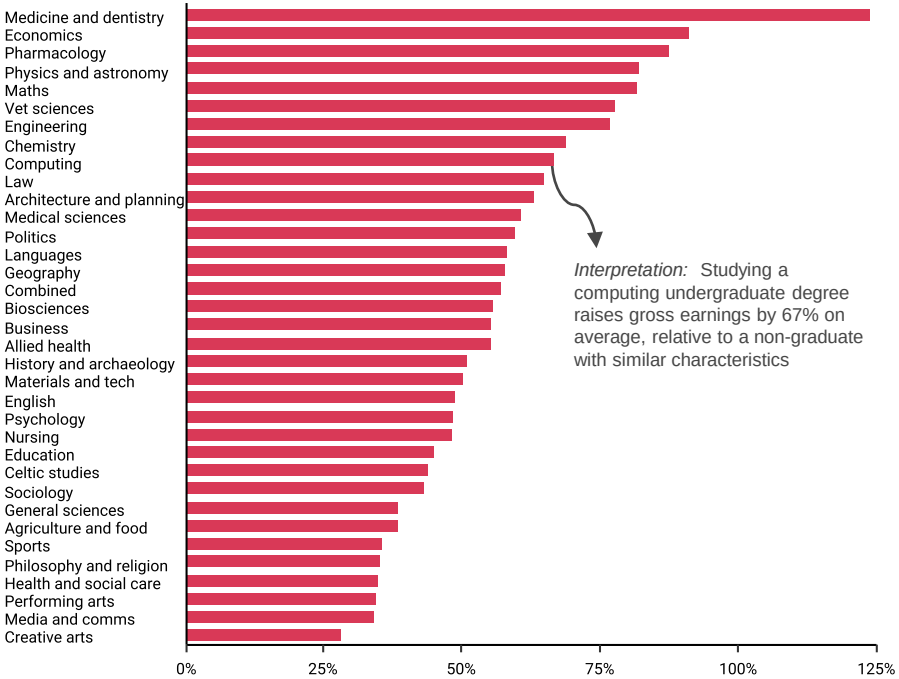
Second, we estimate the effect of studying an undergraduate degree on the individual, rather than wider society. We do not estimate the potentially positive economic and social externalities that could arise from more people studying degrees (e.g. higher GDP growth, cultural contribution).

We show our key findings in the following pages.

Sources: PwC analysis, Times Higher Education

Our econometric analysis shows that all of the courses in our sample raise the earnings of graduates relative to non-graduates, all other things remaining equal

Figure 3.2: The average impact of undergraduate degrees on the gross earnings of working-age graduates, relative to non-graduates with similar personal and work-related characteristics (graduate earnings premium)



All courses lead to higher future earnings

We use econometric analysis to calculate the graduate earnings premium, i.e. gross earnings of working-age graduates relative to non-graduates with similar personal and work-related characteristics (see appendix for further details).

Our results show that all of the undergraduate courses in our sample result in higher earnings for graduates. The earnings premium is substantial, with the average graduate earning around 57% more than non-graduates with similar characteristics.

These findings are consistent with the existing literature. For instance, the rank order of courses is broadly similar to estimates by the Institute for Fiscal Studies.[12] The primary difference is we focus on the impact on gross earnings (i.e. before payroll deductions), so that the results are not affected by future changes to tax policies.

STEM courses tend to generate the largest earnings premiums

We find that the undergraduate degrees that generate the highest earnings premiums are either STEM, LEM or Medicine allied. For instance, medicine and dentistry graduates have an earnings premium of 124% relative to non-graduates. This means that graduates from these courses earn more than twice as much on average as their counterparts with similar personal characteristics that do not have a degree.

These earnings differentials suggest that in some cases it could be advantageous for prospective students to consider alternative courses, where appropriate for their skillset and interests. For instance, switching from creative arts to english could potentially raise graduate earnings by 16%.

However, it is important to note that these findings could be a reflection of the career choices of graduates, rather than the merit of the courses themselves. For instance, creative arts students may choose to work in industries or occupations where earnings are lower on average than those chosen by english graduates.

This analysis has provided strong evidence for a “Graduate earnings premium” across all of the courses in our sample. Though as we explained earlier in the chapter, non-financial benefits are also valued by students. To this end, on the next page we complement this analysis with an estimate of the “Graduate wellbeing premium”.

Sources: PwC analysis, ONS. Analysis was carried out in the Secure Research Service, part of the Office for National Statistics.

We also find strong evidence for a graduate wellbeing premium, including for many of the courses with relatively lower earnings premiums

We supplement our analysis with an estimate of the wellbeing effects

We also use econometric analysis to calculate the graduate wellbeing premium, i.e. self-reported life satisfaction of graduates relative to non-graduates with similar personal and work-related characteristics (see appendix for further details).

Undergraduate degrees generally have a positive impact on life satisfaction

28 of the 35 courses we evaluate boast a positive graduate wellbeing premium. This means that working-age graduates from these courses report better levels of life satisfaction than their counterparts without an undergraduate degree with similar demographic characteristics. In other words, it indicates that studying an undergraduate degree generally has a positive impact on wellbeing.

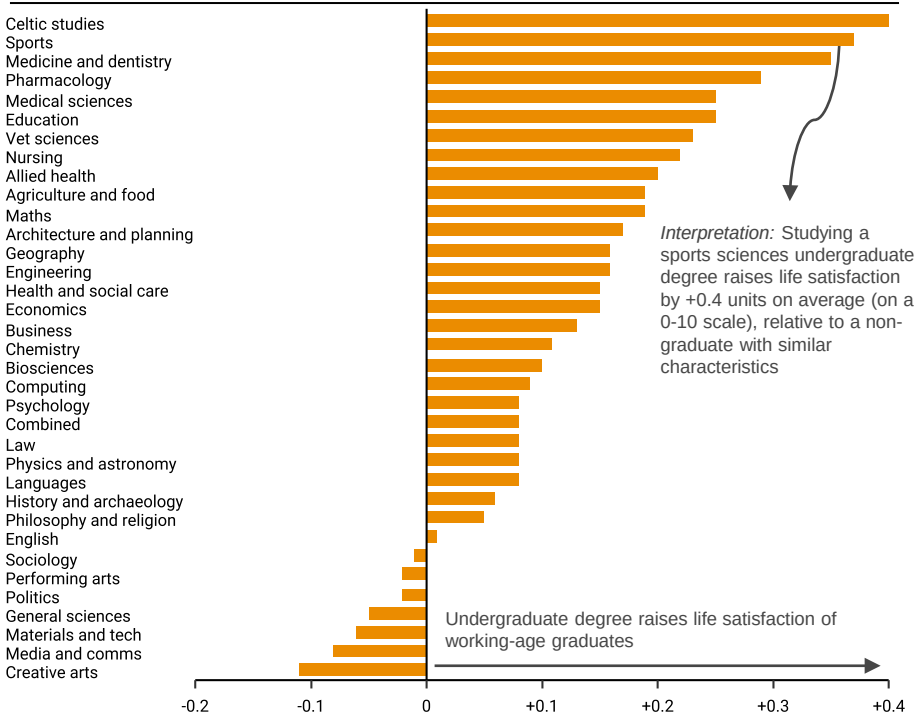
These life satisfaction effects are relatively substantial in some cases. Overall, they range from around -0.1 to +0.4 units (on a 0-10 scale, where 10 = completely satisfied), with an average wellbeing premium of +0.1 units relative to non- graduates. For the top performing courses, this is equivalent to around a 5% boost to life satisfaction for the average person (as at FY23). This provides the same boost to life satisfaction as just over £5,000 in additional earnings every year.

Vocational courses score highly, particularly those that are medicine allied

Many of the courses with the highest wellbeing premiums are vocational or medicine allied. They also generally lead to employment in public sector dominated industries. This includes both courses with high earnings premiums (e.g. medicine and dentistry) and relatively lower earnings premiums (e.g. education, nursing). This could indicate that public sector workers gain a greater sense of life satisfaction from their degrees and careers than private sector workers.

As expected, generally courses that have high earnings premiums also have high wellbeing premiums. This is likely due to the well established link between earnings and wellbeing in the economic literature.[13] However, there are some nuances to this finding which we discuss in more detail on the next page.

Figure 3.3: The average impact of undergraduate degrees on self-reported life satisfaction of working-age graduates on a 0-10 scale (graduate wellbeing premium), where 0 = not at all satisfied and 10 = completely satisfied



Sources: PwC analysis, ONS. Analysis was carried out in the Secure Research Service, part of the Office for National Statistics.

Higher earnings are a key channel through which studying an undergraduate degree affects wellbeing, but there are also other non-financial factors at play

Earnings clearly a key driver, but there are other factors at play

In Figure 3.4, we plot the graduate earnings premiums (from page 5) against the graduate wellbeing premiums (from page 6). Overall, there is a 0.4 correlation between the two estimates. This suggests that higher earnings are an important channel through which studying an undergraduate degree affects the wellbeing of graduates.

However, there are clearly other factors at play, which are not related to financial effects. Many of the courses with the largest wellbeing premiums, such as education and sports sciences, have relatively low earnings premiums compared to other courses. This indicates that there are other channels, outside of earnings, through which studying an undergraduate degree can impact overall wellbeing.

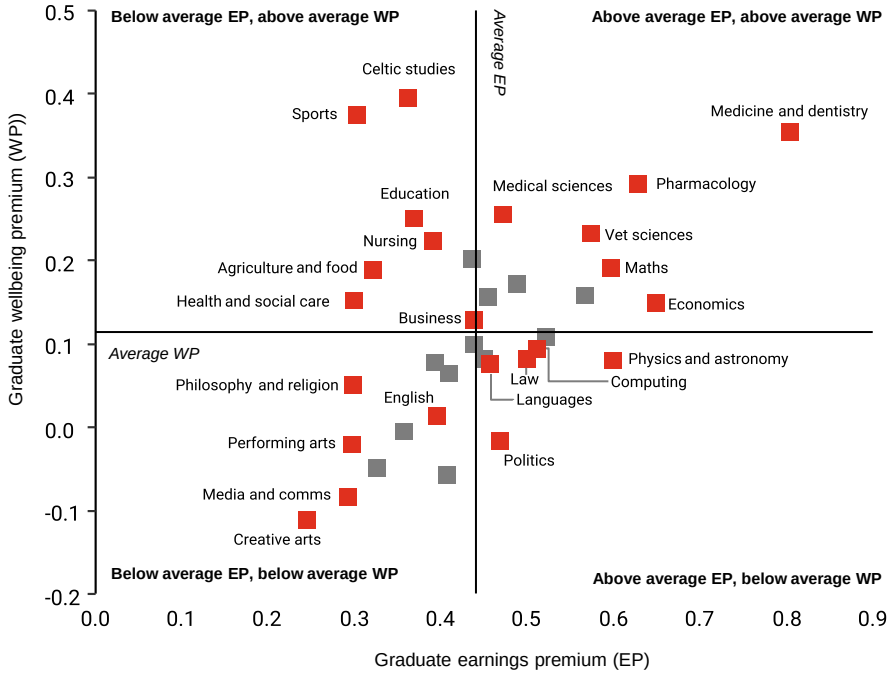
Occupation also plays an important role

Though many large employers now accept a wide variety of undergraduate degrees, the choice of course still plays an important role in shaping careers, which has knock-on implications for wellbeing. For instance, as we highlighted in the last page, vocational courses that lead to employment in the public sector generally have higher life satisfaction effects. This is true both for courses with high earnings premiums (e.g. medicine and dentistry) and lower earnings premiums (e.g. nursing, education).

At the other end of the spectrum, there are also a number of courses with high earnings premiums that have low or negative life satisfaction effects. Examples include politics, computing and law. Our analysis suggests that politics graduates may even have marginally poorer life satisfaction than non-graduates with similar characteristics. This could be a reflection of the careers they choose to go into.

These findings present an opportunity for employers to increase the attractiveness of their overall employee proposition. For instance, employers that primarily recruit graduates from courses with high earnings premiums and low wellbeing premiums may need to work on improving non-financial factors (e.g. team culture).

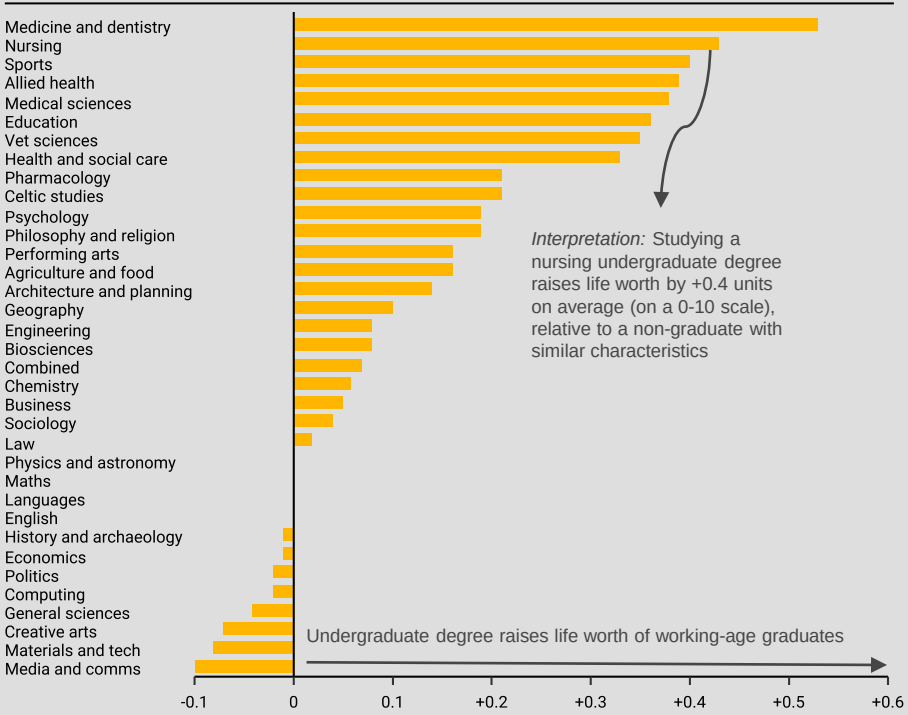
Figure 3.4: Graduate earnings premium (EP) vs graduate wellbeing premium (WP)



Sources: PwC analysis, ONS. Analysis was carried out in the Secure Research Service, part of the Office for National Statistics.

Box C: We also find that most undergraduate degrees have a positive effect on self-reported life worth

Figure 3.5: The impact of studying undergraduate degrees on self-reported life worth of working-age graduates on a 0-10 scale, where 10 = things they do in life are "completely worthwhile" and 0 = "not at all worthwhile"



Most undergraduate degrees also have a positive impact on life worth

We have shown that undergraduate degrees generally have a positive impact on earnings and life satisfaction. However, life satisfaction is just one measure of wellbeing. We add to our analysis in this box by assessing the impact of undergraduate degrees on self-reported life worth, where a score of 10 indicates that the respondent says the things they do in life are "completely worthwhile"

Our findings suggests that studying an undergraduate degree also has a notable impact on life worth. Overall, the life worth effects range from around -0.1 to +0.5 units (on a 0-10 scale, where 10 = completely worthwhile), with an average effect of +0.1 units. For the top performing courses, this is equivalent to around a 7% boost to life worth for the average person (as at FY23)

Interestingly, the link between the life worth estimates and the earnings premiums (correlation coefficient of +0.1) is less strong than with life satisfaction (+0.4 correlation). This implies that the earnings channel, through which studying an undergraduate degree affects wellbeing, is less important when it comes to life worth.

This may explain why some of the arts and humanities courses score relatively highly for their life worth effects. For instance, performing arts has the 13th highest life worth effect (+0.2 units), despite having the third lowest earnings premium.

Arguably to an even greater extent than with the life satisfaction estimates, we find that many of the vocational courses that generally lead to employment in public sector dominated industries account for most of the courses with the highest life worth effects. For instance, nursing has the second highest life worth effect, compared to the eight highest life satisfaction effect. It is intuitive that people working in the medical field have a sense that the things they do in life are worthwhile.

Sources: PwC analysis, ONS. Analysis was carried out in the Secure Research Service, part of the Office for National Statistics.

4

Summary and conclusions

Summary

Tightening cycle pause provides glimmer of hope but growth outlook remains weak

The UK economy has flatlined in recent months. Despite large monthly fluctuations, real GDP has only grown by 0.4% since December 2022. The primary culprit for this sluggish growth outlook is monetary policy tightening. Our analysis indicates that the cumulative impact of the hiking cycle on GDP so far is just over 2%, relative to a counterfactual where the Bank did not act.

The Bank of England's decision to keep rates on hold provides the first signal that we are nearing the end of this inflation episode. However, due to the large share of households on fixed rate mortgages, this will take time to feed through to real activity across the entire economy including the housing market.

Our analysis indicates that only around half of the impact of the hiking cycle on GDP has come through so far. Partly because of this reason, we expect economic growth to remain below-trend through 2023 and 2024, at around 0.5% a year.

As expected, inflation is falling, but it could take until 2025 to return to target

Headline inflation is now down around one-third from its peak last October.

However, so far energy inflation has done virtually all of the heavy lifting. Services inflation, which the Bank of England pays close attention to, has proven to be more persistent. This is in part due to continued high earnings growth.

Our modelling indicates that inflation will fall below 5% by the end of this year, in large part due to lower household energy prices. This means the government will reach its target to halve inflation. Even so, inflation will have left its mark. We expect to close the year with real earnings lower than where they were in 2006. This is equivalent to almost two decades of no net growth in real earnings.

We find evidence for a graduate earnings *and* wellbeing premium

There has been a rapid expansion of the higher education sector over the past couple decades. Today, more than 1 in 2 young people go into higher education. This means it is more important than ever that degrees are generating value both for the students themselves and wider society more broadly. Our special article sets out to add to the evidence base on the topic.

We find that all of the undergraduate degrees in our sample have a positive impact on earnings. Our econometric analysis shows that graduates from all of the courses in our sample have higher earnings than their counterparts without a degree. The average graduate earns around 57% more than non-graduates with similar demographic characteristics.

We also find strong evidence for a graduate wellbeing premium. Most undergraduate degrees also have a positive impact on self-reported levels of life satisfaction. The top performing courses increase life satisfaction by around 5%, providing the same boost to life satisfaction as just over £5,000 in additional earnings every year.

Our analysis indicates that higher earnings are a key channel through which studying a degree affects wellbeing. However, there are also other non-financial factors at play. Many of the courses with the largest wellbeing premiums, such as education and sports sciences, have relatively low earnings premiums compared to other courses. Vocational courses in particular, such as nursing, score highly for their wellbeing premiums.

5

Appendix

Appendix A – Our approach to projecting UK national real GDP

Model structure

There are several classes of models that are commonly used to project forward macroeconomic aggregates, such as real GDP growth. We implement a Vector Autoregression (VAR) model, given they provide excellent short-term forecasting performance in a relatively simple framework. These models rely on empirical relationships between variables, often not imposing an assumption-based structure on these variables. Other models (e.g. structural simultaneous equations, DSGEs) are more resource intensive to maintain, require many assumptions, or tend not to forecast as well.

Mixed frequency data

Given the fast-moving nature of the economy, it is important that any forecasting model can use the latest-breaking data releases. Monthly data released through a quarter can pin-down real GDP forecasts far before official quarterly estimates are published by the ONS.

As a result, we utilise mixed-frequency data in our model. While our real GDP growth variable is quarterly, we can incorporate monthly series into our model. There are several approaches to this in the literature; we follow Ghysels (2016) and McCracken et al. (2021) in splitting monthly series into three quarterly series and 'stacking' these series together to estimate a VAR at quarterly frequency.

For example, stacking in terms of 'economic time' puts together the quarterly real GDP variable (y), with three quarterly series made from a monthly variable (x), relating to the first, second, and third month of each quarter respectively.

$$Y_t = [x_{t,1}, x_{t,2}, x_{t,3}, y_t]$$

A model is then estimated where the components of this vector depend on p lagged values of these series.

$$Y_t = \alpha + \beta_1 Y_{t-1} + \cdots + \beta_p Y_{t-p} + \epsilon_t$$

By stacking the series this way, we can impose actual data points released part way through the quarter to construct a 'conditional' forecast, using the framework of Waggoner and Zha (1999). This allows us to incorporate information through the quarter, constantly refining the forecast.

Bayesian estimation

Including multiple monthly series means the number of parameters to be estimated grows large very quickly. We therefore use the Bayesian methods, including the hierarchical prior selection methods of Giannone et al. (2015).

Variable selection

We collected data on over 100 macroeconomic series. To select the most suitable variables for our model, we conducted several 'live data' backtesting exercises, testing performance of various models in out of sample forecasts. Chosen variables include the BoE base rate, unemployment rate and consumer spending.

Scenario construction

Bayesian estimation recovers the entire posterior distribution of our model parameters, therefore giving a distribution of GDP forecasts. This gives an indication by percentile, of the range of possible outcomes for real GDP. We construct our downside scenario by combining points on this distribution of forecasts, with expert judgement and our scenario narrative. Given certain values for our initial negative shocks, we then use the conditional forecasting feature of our model to construct a path where growth returns to trend.

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McCracken, M., et al. (2021), 'Real-time Forecasting and Scenario Analysis Using a Large Mixed-Frequency Bayesian VAR', International Journal of Central Banking

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 Sources: Refinitiv Eikon, PwC analysis

Appendix B – Evaluation of earning and wellbeing returns to undergraduate degrees - Methodology

Scope of analysis

We use econometric analysis to estimate the earnings and wellbeing returns to undergraduate degrees. Our analysis holds constant a selection of personal and work-related characteristics in order to try to isolate the impact of the undergraduate degree on earnings and wellbeing.

To streamline the analysis, we group specific undergraduate courses into wider course classifications following Level 2 Common Aggregation Hierarchy (CAH) groupings, as developed by HESA.

Data source

We use data from the Annual Population Survey over the 2013 to 2022 period. This is the largest ongoing household survey in the UK, based on interviews with randomly selected households. The survey covers individual and household responses to questions on a diverse range of topics, including personal characteristics, labour market status, work characteristics, education and health. We restrict our sample to working-age people (16-64).

Model structure

We implement a Pooled Ordinary Least Squares regression. This enables us to increase our sample size, by using ten years of data, so that we produce robust estimates for relatively granular degree courses. In total, we estimate three regressions:

- Earnings
- Life satisfaction
- Life worth

In each case, we control for a selection of personal and work-related characteristics that the literature has shown to be linked to earnings and wellbeing. For more details on our regression specifications, please refer to the following page.

Limitations

First we do not control for ‘ability’, which could add upwards bias to our estimates for the earnings regressions. This limitation is widely covered in the academic literature. The hypothesis is that individuals with higher ability are more likely to end up in higher education. Thus, estimates for the returns to higher education are likely to be upwards biased.

Second, as we use gross earnings as a proxy for the earnings effects, we do not account for the costs of provision of undergraduate degrees to the individual (either upfront payment of fees or via student finance). The advantage of our approach is that our analysis will not be affected by future changes to tax policy.

Sources: PwC analysis, ONS. Notes: This work contains statistical data from ONS which is Crown Copyright. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

Appendix B – Evaluation of earning and wellbeing returns to undergraduate degrees - Regression specifications

Earnings

For the earnings returns, we adopt the following model:

[1] $\ln E_i = \alpha + \beta_1 \mathbf{D}_i + \beta_2 \mathbf{X}_i + \mathbf{Q}_t + \mathbf{Y}_t + e_i$

where $\ln E_i$ denotes the log hourly earnings of individual *i*, $\mathbf{D}_i$ denotes a vector of undergraduate degree course dummies, $\mathbf{X}_i$ denotes a vector of personal and work-related characteristics (see below for full list), $\mathbf{Q}_t$ denotes a vector of quarterly dummies, $\mathbf{Y}_t$ denotes a vector of year dummies, and e_i denotes a random error term.

The full list of personal and work-related characteristics that we control for are listed below:

- Experience (proxied by age minus time since they left education)
- Experience squared
- White dummy
- Female dummy
- Born in the UK dummy
- Married/cohabiting dummy
- Bad health dummy
- Apprenticeship dummy
- Full-time dummy

Wellbeing

For the wellbeing returns, we adopt two separate models for life satisfaction and life worth. They all use broadly the same specification:

[1] $\ln W_i = \alpha + \beta_1 \mathbf{D}_i + \beta_2 \mathbf{X}_i + \mathbf{Q}_t + \mathbf{Y}_t + e_i$

where $\ln W_i$ denotes the wellbeing of individual *i* (life satisfaction, life worth), $\mathbf{D}_i$ denotes a vector of undergraduate degree course dummies, $\mathbf{X}_i$ denotes a vector of personal characteristics (see below for full list), $\mathbf{Q}_t$ denotes a vector of quarterly dummies, $\mathbf{Y}_t$ denotes a vector of year dummies, and e_i denotes a random error term.

In each specification, wellbeing is self-reported on a scale from 0 to 10, where 10 denotes completely satisfied/worthwhile and 0 denotes not at all satisfied/worthwhile.

The full list of personal characteristics that we control for are listed below:

- Age
- Age squared
- Female dummy
- Born in the UK dummy
- Married/cohabiting dummy
- Bad health dummy
- Religious dummy
- Number of children

We also carry out a series of tests to ensure the robustness of the results, including different regression specifications, time periods, etc. These robustness tests had an effect on the magnitude of the results but the broad patterns were the same.

Appendix B – Evaluation of earning and wellbeing returns to undergraduate degrees - Course list

We group specific undergraduate courses into wider course classifications following Level 2 Common Aggregation Hierarchy, (CAH) groupings as developed by HESA. The full list of courses covered by our analysis is listed below, alongside the short names we use throughout the article.

Full course name	Short name
Agriculture, food and Related Studies	Agriculture and food
Allied Health	Allied health
Architecture, Building and Planning	Architecture and planning
Biosciences	Biosciences
Business and Management	Business
Celtic Studies	Celtic studies
Chemistry	Chemistry
Joint honours	Combined
Computing	Computing
Creative Arts and Design	Creative arts
Economics	Economics
Education and Teaching	Education
Engineering	Engineering
English Studies	English
General, Applied and Forensic Sciences	General sciences
Geography, Earth and Environmental Studies	Geography
Health and Social Care	Health and social care
History and Archaeology	History and archaeology
Languages and Area Studies	Languages
Law	Law
Materials and Technology	Materials and tech
Mathematical Sciences	Maths
Media, Journalism and Communications	Media and comms
Medical Sciences	Medical sciences
Medicine and Dentistry	Medicine and dentistry
Nursing and Midwifery	Nursing
Performing Arts	Performing arts
Pharmacology, Toxicology and Pharmacy	Pharmacology
Philosophy and Religious Studies	Philosophy and religion
Physics and Astronomy	Physics and astronomy
Politics	Politics
Psychology	Psychology
Sociology, Social Policy and Anthropology	Sociology
Sport and Exercise Sciences	Sports
Veterinary Sciences	Vet sciences

Endnotes

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Authors

Jake Finney
Manager, Economist

Gora Suri
Senior Associate, Economist

Tommy Etheridge
Senior Associate, Economist

Adam Deasy
Senior Associate, Economist

Tessa Wilkinson
Associate, Junior Economist

With additional thanks to Neil Scott and Natalie Stafford-Johnson for their support with the analysis and production of the report.

Economics Leadership

Simon Oates
Partner, Economics Leader

Barret Kupelian
Director, Chief Economist

Philip Dobson
Director, Public economics

Daniel Jacobson
Director, Regulation

Jason Calvert
Director, Impact assessments

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