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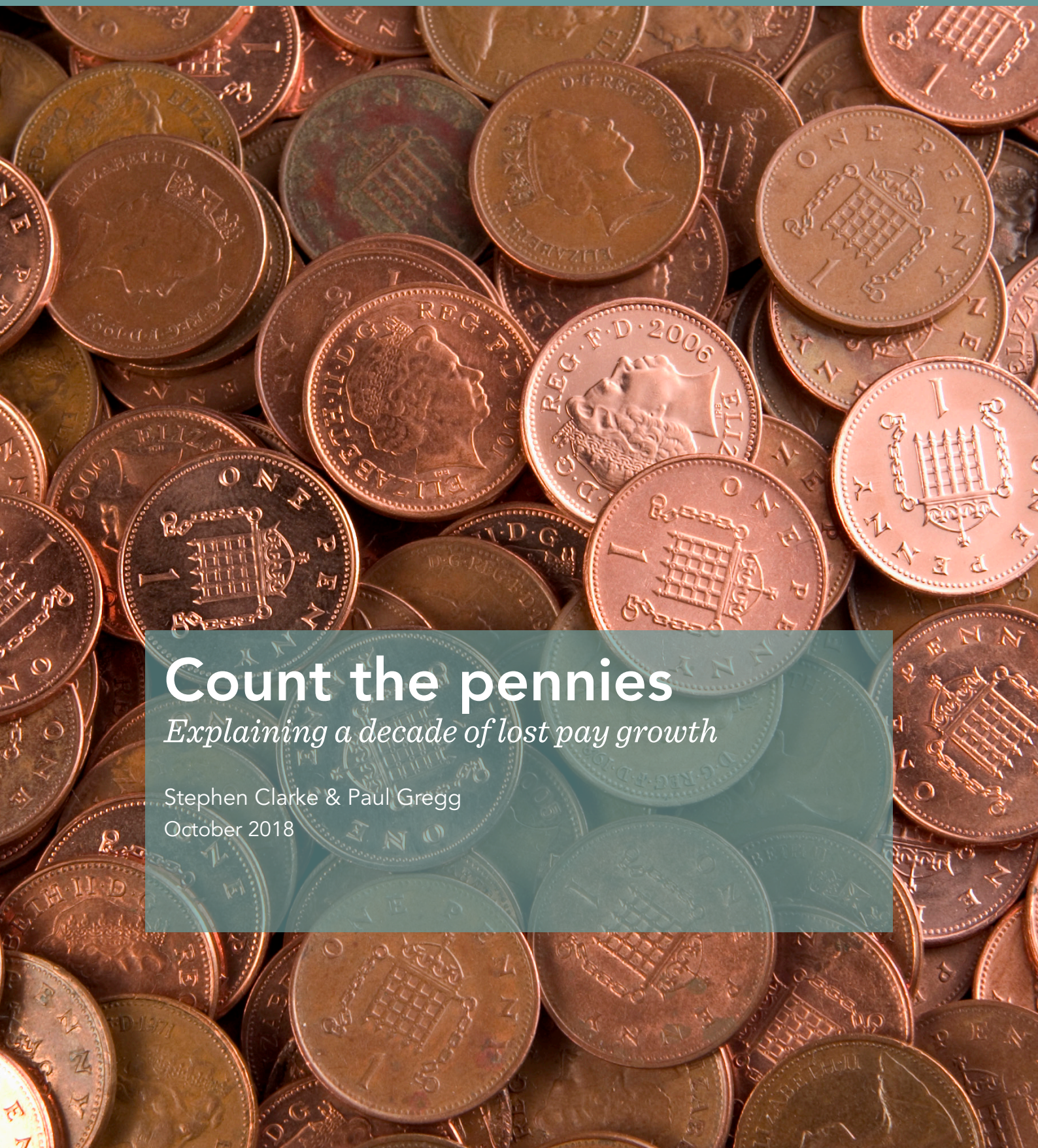

Count the pennies
Explaining a decade of lost pay growth

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October 2018

Acknowledgements

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Executive Summary

The UK has experienced an almost unprecedented decade for people's pay packets. **Average weekly earnings, which stand at £489, are still around 3 per cent (£12) below where they were at the beginning of 2008. This means that the past 10 years have the dubious distinction of being the worst for pay growth since the mid-19th century.**

The recent squeeze on earned income has been well-remarked upon,[1] and has also been the subject of significant academic research.[2] This report attempts to explain this decade, drawing a distinction between two time periods within it:

» The **pay squeeze between 2009 and 2014**, when **real wages fell by 6.7 per cent**; and,

» The subsequent **poor pay recovery between 2014 and 2017**, during which **real wages grew at an annual rate of 0.7 per cent**, well below the average rate of 2.2 per cent between 2001 and 2006.

It is important to draw this distinction because outcomes in these two periods have both different drivers and lessons for public policy. This paper seeks to answer two specific questions about these distinct periods:

» Why did the UK see a pay squeeze during the crisis that was so much bigger than other major developed countries, and what were the implications of it?

» Why does wage growth remain so weak today despite unemployment returning to lows not seen since the 1970s?

[1] L. Elliot, 'The UK economy breaks more records – for all the wrong reasons', *Guardian*, 9 March 2017

[2] For example, see: P Gregg, S Machin & M Fernandez-Salgado, 'The Squeeze on Real Wages – and what it Might take to End it', *National Institute Economic Review,* 228(1), April 2014

The pay squeeze was the result of depreciation, inflation and the way in which the country adjusted to the crisis

When the effects of the financial crisis were first felt, the main concern amongst economists and policy makers was that the country would experience a rise in unemployment similar to that which occurred during the downturns of the 1980s and 1990s. In the event unemployment did rise, but not to the levels of the 1990s, and this was despite the fact that the downturn was a lot larger. It wasn't perhaps fully appreciated at the time but the UK's relatively benign unemployment experience (historically and compared to other countries) was the obverse of the country's pay squeeze.

A unique feature of the UK's crisis and ensuing recession was a large depreciation of sterling (of around 27 per cent). This happened because the British economy was more exposed to a downturn that emanated in the financial sector than other economies, and (not unrelatedly) the pound was arguably overvalued pre-crisis. **Depreciation fed through into higher domestic prices for imports, with consumer price inflation rising particularly sharply as a result. This meant that employers were able to adjust to lower output by allowing real wages to fall rather than cutting jobs.**[3] Around 70 per cent of employees experienced a decline in their real wages in the aftermath of the crisis.

The result was that the UK experienced a far more pronounced pay squeeze than other countries but a far smaller rise in unemployment. Our modelling suggests that **had inflation not risen as it did during the crisis, and therefore not allowed firms to adjust through declines in real wages, unemployment increases would have been more in line with the experience of other European countries and the US. Rough estimates suggest that an additional 800,000 people could have been out of work. Instead, the UK experienced a 2.5 percentage point reduction in the unemployment rate at the expense of a 5.7 percentage point increase in the size of the pay squeeze.**

While falling pay is never welcome, we might therefore take a sanguine view of the pay squeeze because it shared the pain adjustment more evenly across workers, whereas a more significant rise in unemployment would have affected those on low incomes more.

[3] Firms were also able to adjust by cutting hours.

The subsequent period of sluggish pay recovery, however, does not represent a necessary trade-off, but an unambiguously bad outcome for living standards.

Poor productivity growth, heightened slack and a lower compositional boost explain why pay growth has been so poor since 2014

Depreciation-driven inflation explains why when real wages bottomed out in the middle of 2014 they were 7 per cent lower than in 2008. Yet this does not explain why, four years on, only half this gap has been closed with pay still 3 per cent lower. Again, economists and forecasters didn't expect this to be the case. Putting to one side the role of inflation in determining real wages for now, successive projections since 2014 have overestimated *nominal* wage growth. In March 2014 the Office for Budget Responsibility projected that nominal wages would grow at an average rate of 3.3 per cent per annum between 2014 and 2018; in March 2015 they projected average annual growth of 3.1 per cent; and in March 2016 3.2 per cent. In reality, nominal wages grew at an average rate of 2.2 per cent a year between 2014 and the first quarter of 2018. Although some of this reflects particularly poor pay growth in 2014, nominal wage growth has not risen significantly above 3 per cent, and nor does it look likely to do so in the near future.[4]

This is surprising given that employment has surged to record highs and unemployment is now at lows not seen since the 1970s. This poses the question; if slack has largely disappeared from our labour market then why have wage pressures not built? A wide range of possible explanations have been offered: the link between slack and pay growth has broken; there is now a fundamental disconnect between improvements in productivity and pay; or, that pay growth has returned to pre-crisis rates for those in continuous employment.

[4] Forecasts from March 2018 project that nominal wage growth will average 2.7 per cent per year over the next five years.

Our analysis suggests that most of these arguments about a fundamental change in our labour market are misplaced. Instead there are three main drivers of recent weak wage growth, the impacts of which are drawn out with a comparison of pay growth during 2014-17 to growth rates in the pre-crisis period. Of these three, two have lasting implications for why wage growth may remain slower in the years ahead than we experienced pre-crisis.

The first driver is the fact that changes in the composition of the workforce have had less of a positive effect since the crisis. Over time the workforce tends to become more educated, with more people working in higher-paying occupations. This tends to push up wage growth. However, such improvements have slowed since the crisis. This is largely because educational improvements have been less pronounced (at least compared to the 1990s and early 2000s), and so too have occupational improvements (which themselves derive partly from improvements in the qualifications of the labour force). **Comparing the rate at which compositional changes boosted wage growth before the crisis to their role since 2014, we estimate that this compositional slowdown has reduced the rate of real wage growth by 20 per cent.** More worryingly the occupational part of this weaker compositional wage boost may be far from a temporary phenomenon.

The second driver of sluggish wage growth is that – although on the surface the labour market appears tight – heightened slack since the crisis has weighed on pay. The weakening relationship between unemployment and pay growth has led some to suggest that this reflects a structural change, with wages not responding to slack as theory (and history) would suggest. However, this interpretation is wrong. Rather, unemployment has become an increasingly poor proxy for the amount of slack in the labour market. This is why, despite the unemployment rate reaching a 40-year low in early 2017, wage growth has not responded as expected.

To get a better picture of the total slack we broaden our definition. Since the crisis people have argued that the underemployed should be included in our conception of labour market slack. We go one further and include the underemployed and those in atypical forms of work who – like the unemployed – are actively searching for work. Using this measure we re-estimate the relationship between labour market slack and wage growth and find that the **greater levels of slack between 2014 and 2017 have reduced real wage**

growth from pre-crisis rates by approximately 20 per cent. However, the most recent data suggests that, on our broader measure of slack, we could soon be returning to pre-crisis levels. This issue cannot explain why wage growth remains so sluggish now.

Heightened slack and a slower compositional boost together explain at most 40 per cent of the slowdown in wage growth from the rates we were used to before the crisis. The most important factor, though, is slower productivity growth. The importance of improvements in productivity for real wage growth is as close as one can get to a fundamental law in economics; as Nobel Laureate Paul Krugman wrote, "productivity isn't everything, but, in the long run, it is almost everything".[5] This is not to suggest that the relationship only ever runs in one direction – firms can be incentivised to make productivity-improving investments if wages are rising, for example – but in the long run the rate of productivity growth sets the limits of possible wage growth.

Between 1979 and 2006 productivity increased at an average rate of 2.3 per cent per year and real wages increased by 2 per cent. Between 2014 and 2017 productivity rose at 0.8 per cent and real wages 0.6 per cent. We estimate that if productivity had grown at pre-crisis rates between 2014 and 2017, real wage growth would have been 0.6 percentage points higher. Quantified on the same terms as the effects of a lower compositional boost and heightened slack set out above, we find that **slower productivity growth explains approximately 40 per cent of the slowdown in real wage growth in the pay recovery period, compared to pre-crisis levels.**

The combined effects of slower productivity growth, smaller compositional effects and heightened slack leave 20 per cent of the difference between 2014-17 and early-2000s real wage growth unexplained. It is likely that over the period other forces were at play, including a larger share of compensation being paid in non-wage forms.

One factor that dominated our explanation of the 2009-14 pay squeeze period but has not featured in our analysis of the pay recovery is the role of inflation. That is because over 2014-17 as a whole, annual inflation was similar to pre-crisis rates. More importantly expectations of trend inflation have not changed materially. However, limiting our analysis only to the latest year, the post-referendum depreciation of sterling caused a sharp rise in inflation,

[5] P Krugman, *The Age of Diminished Expectations*, MIT Press, 1997

which pushed real wages into negative territory again in 2017 – echoing the phenomenon seen in the post-crisis pay squeeze.

What pay's past can tell us about pay's future

At the end of the worst period of pay growth since the mid-19th century we have a good understanding of its underlying drivers. Looking ahead, much of what we have learnt is instructive as to the prospects for, and threats to, future pay growth. Three conclusions stand out.

The first is that **we should have a broader understanding of what constitutes labour market slack than we had in the past.** Unemployment may have served as a good proxy in a world in which the vast majority of people worked full time, 8 hours a day, 5 days a week. But in a world in which part-time work is far more prevalent, many more people work in atypical forms of employment, or hours worked vary significantly week to week, we need to measure the potential labour supply of those in employment as well as those out of work. Doing so should give a better handle on the state of the labour market.

The second conclusion relates to the relationship between wages and inflation. Wage growth and the *level of inflation* are obviously interlinked, with changes in labour costs being a major driver of price changes. But **the relationship between wages and *imported inflation shocks* – such as those occurring in 2008 and 2016 – appears to have weakened.** It used to be the case that wages were much more responsive to inflation. For example a ratchet effect on wages in response to rising inflation was a key concern in the 1970s and early 1980s. Today, nominal wages do not appear to respond to imported inflation shocks: following the two recent devaluations of sterling, import prices rose, thereby boosting inflation and eroding real wages. Most recently the post-referendum devaluation of 12 per cent pushed up prices by 4 per cent over 2017 and 2018, with no response from earnings. While it is welcome that wage-price spirals are no longer common, **the fact that exchange rate risk now falls more swiftly onto the shoulders of workers and their wages is a major change to how our labour market works.**

Finally, this analysis confirms that **the biggest challenge facing the UK at present is not that wages no longer grow with our national output, but that our wages are held back by a failure to grow that output: we need**

to restart productivity growth. Encouragingly, there is now something of a consensus about which sectors and firms are responsible for the slowdown in productivity. Less encouraging is the fact that we are far from a consensus about the best way to address the problem.

The importance of rising to this task should not be understated. For example, **between 1945 and 2002 real wages doubled, on average, every 29 years, yet on current rates of pay growth real wages won't double again until 2099.** Navigating the country's departure from the EU is, unsurprisingly, seen as the biggest challenge we face at present. But converging on a vision of how the UK economy flourishes post-crisis and post-Brexit – and how improvements are transmitted to families via pay packets – should be the priority going forward.

Section 1: A decade of lost pay growth

2018 marks a decade on from the bankruptcy of Lehman Brothers Bank, an event that many see as signalling the beginning of the financial crisis. Less remarked upon – but arguably more important for people's living standards here in the UK – is that 2008 was also the year in which real average weekly earnings peaked at £501 (in today's money). Real average weekly earnings are now £489, around 3 per cent lower than they were a decade ago. Such a decade of lost earnings growth is unprecedented in modern times and is a calamity that few would have predicted when the crisis hit.

This report reflects on this decade and attempts to explain it. In particular it sets out to do two things. First, it explains why real earnings fell by around 7 per cent between 2009 and 2014. Second, it explains why in the following four years pay has grown (on average) at a third of the rate at which it grew in the early 2000s. In so doing this report draws an important distinction – one perhaps not recognised enough – between the pay squeeze and the sluggish recovery. The two are distinct, driven by different things, and provide different lessons for the UK economy. Bringing these lessons together, the report concludes by reflecting on what the last decade can tell us about the next one.

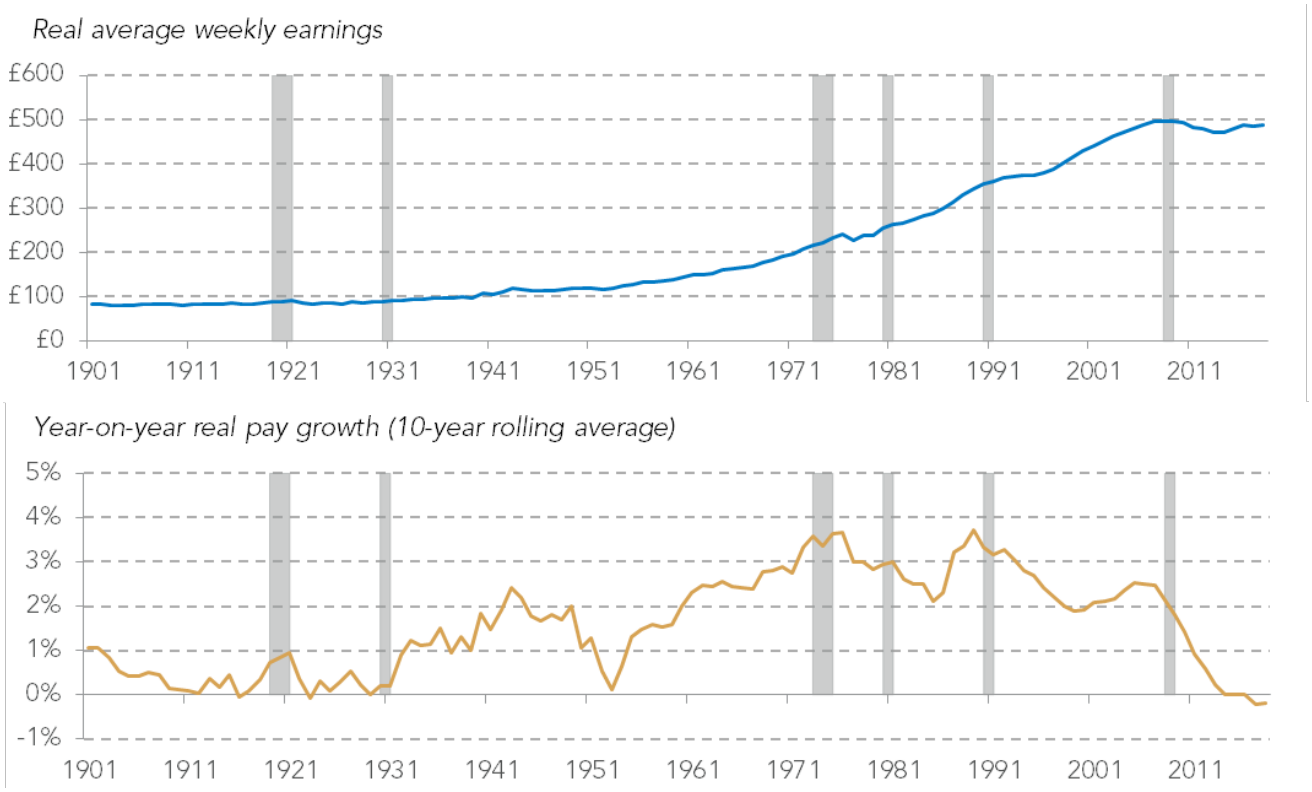
Introduction

Real average weekly earnings are still £12 lower than they were in April 2008. This represents one of the biggest challenges facing living standards in the UK. The poor performance of pay in the past decade is often discussed, yet less remarked upon is the fact that this is the result of two distinct phases. First, the sharp fall in real earnings that followed the financial crisis: real average weekly earnings declined by 6.7 per cent between April 2008 and March 2014. Second, the relatively slow pace of wage growth since: nominal wages have grown at an average annual rate of 0.7 per cent since March 2014, compared to an average of 2.2 per cent between 2001 and April 2008. The two phases have different drivers – what caused the squeeze is not what has caused pay growth to be so sluggish. Furthermore, although the first period involved a significant decline in living standards, in all likelihood it lessened the increase in unemployment. By contrast, sluggish pay growth since 2014 has been unambiguously bad, which is why restarting growth is one of the most significant challenges the country faces.

To get some sense of the scale of the impact of the last decade it is useful to put it in a historical context. Using official data along with historic data compiled by the Bank of England,[6] we can estimate real average weekly earnings back to the turn of the 20th century. The top panel of Figure 1 shows that, at least since the 1930s and outside periods following recessions (shown by the grey bars), real earnings have grown relatively consistently.

[6] Source: Bank of England, *A millennium of macroeconomic data*

Figure 1: The last decade has been the worst for real earnings for over a hundred years



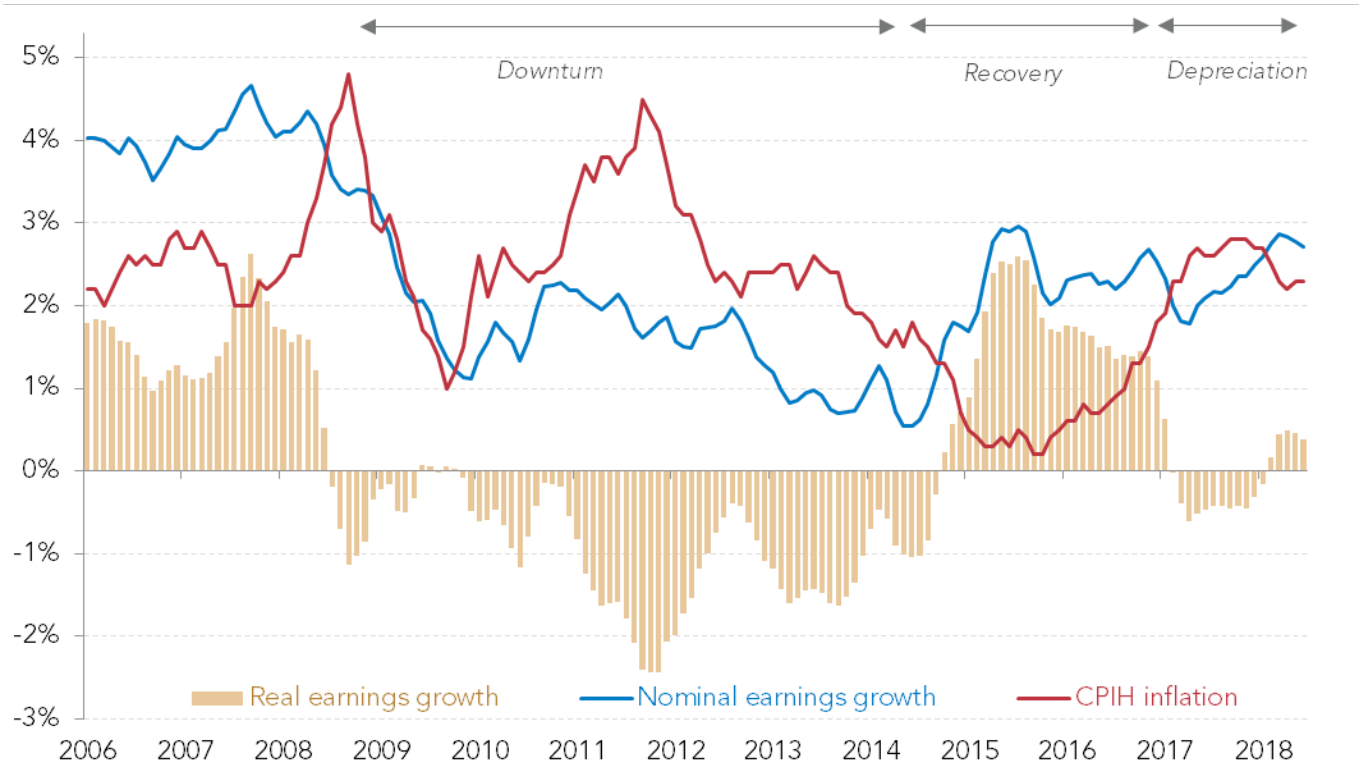
Notes: Series deflated using CPIH inflation (2005-18), CPI (1988-05) and RPI (1901-88).
Source: ONS, Monthly Wages and Salaries Survey (2001-18); ONS, Annual Survey of Hours and Earnings & ONS, New Earnings Survey (1975-2001); Bank of England, A millennium of macro-economic data (1901-75).

While Figure 1 puts the recent period in perspective, it disguises the fact that the squeeze since 2009 has been the result of two forces and a number of distinct phases. Figure 2 shows that the squeeze on real earnings is the result of both the significant downturn, broadly lasting between 2009 and 2014, and then a relatively sluggish recovery, halted recently by the rise in inflation that followed the EU referendum. The downturn was a period in which both nominal pay growth fell – reflecting the significant downturn in the economy – and inflation rose as the depreciation of sterling pushed up import prices. The recovery was a period in which nominal pay growth rose – albeit to levels well below those of the 2000s – and real pay growth was boosted by extremely low inflation caused in part by an appreciation of sterling, but also by a fall in the price of oil. The depreciation covers the most recent period (since early 2017) when real pay turned negative once again. During this period inflation rose above nominal pay growth as the post-referendum devaluation caused the prices of imported goods and services to rise. As this inflation shock has subsided, real (if meagre) pay growth has returned.

The data in Figure 1 and Figure 2 provide a sense of what the current slowdown in wage growth could mean for living standards if these growth rates endure. Since the Second World War real earnings have doubled each generation, an average of 28 years. However based on current rates of pay growth earnings will not double again until into next century.

Figure 2:
The last decade is composed of a sharp downturn and then sluggish recovery

Annual growth in earnings and inflation; UK



Source: ONS, Average Weekly Earnings; ONS, Consumer Price Inflation

The structure of this report

In the rest of this report we answer two questions. First, why the UK suffered a far deeper squeeze in real pay (both historically and compared to other countries) between 2008 and 2014. Second, why wage growth has been so sluggish since. Subsequent sections are organised as follows:

- Section 2 deals with the pay squeeze of 2009-14, who was most affected by it and why it occurred.
- Section 3 turns to the recovery and depreciation phases. In particular, we address the question of why wage growth been so sluggish despite the fact that unemployment has been so low.
- Section 4 explains why wage growth is so low now and what the outlook for the future could be.

Section 2: The squeeze

Many theories have been ventured for why the UK suffered a particularly severe pay squeeze, at least compared to other countries and other periods in history. In this section we tackle some of the most prominent of these, before setting out our explanation.

In short, the UK did not suffer a more pronounced squeeze because the crisis particularly affected one group of people or sector of the economy. At least in terms of the proportional fall in wages (if perhaps little else), we were all in this together. Nor is it the case that firms – perhaps emboldened by the relative reduction in the power of organised labour – were able to cut nominal pay to a greater extent than in the past, with workers choosing to accept these cuts rather than lose their jobs.

Although firms were no more likely (compared to previous recessions) to impose nominal pay cuts on their employees, the pain of adjustment clearly did come through wages. This was because a significant rise in inflation allowed wages to fall in real terms. Because the UK economy suffered a relatively deeper downturn than many other advanced economies, there was a significant depreciation of the pound. This in turn caused inflation to spike, which meant that to a certain degree firms were able to adjust to the drop in demand by 'cutting' real wages rather than cutting employment. A relatively simple statistical model suggests that above-average inflation allowed the UK to avoid job losses, but at the expense of a deeper pay squeeze than other advanced economies.

The UK's pay squeeze was not a distributional issue – it was felt across occupations, industries, and the higher and lower paid

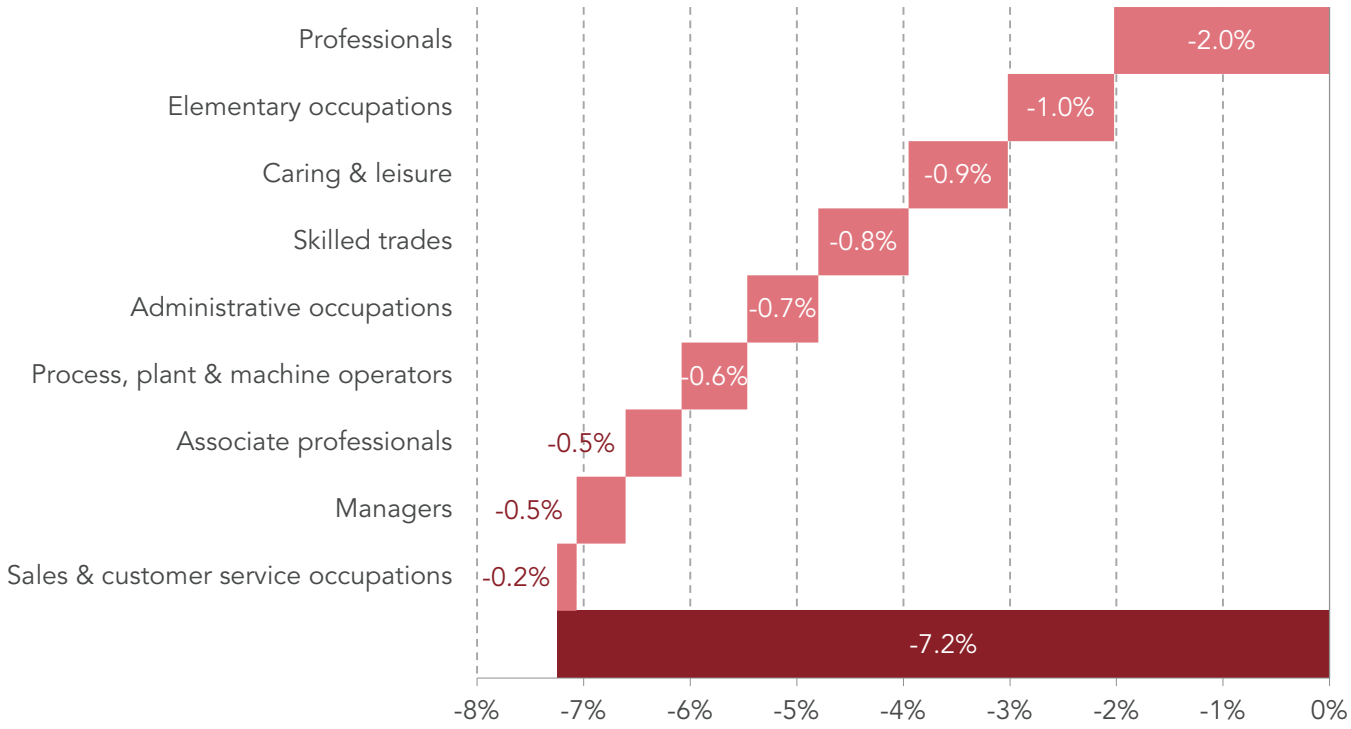
The first avenue we explore in order to understand why the UK suffered such a deep pay squeeze is whether certain occupations, industries and employees felt its effects disproportionately. This allows us to understand whether the squeeze was the result of an uneven process by which some workers shouldered the burden of the adjustment while others did not. Although this is in some senses true (clearly some workers fared well throughout the period), there is no evidence of significant systematic differences between workers in different industries, occupations or parts of the distribution.

Between 2009 and 2014 real median hourly pay, excluding bonuses, declined by 7.2 per cent.[7] Figure 3 shows the occupations that were responsible for this decline. Professionals accounted for almost a third of the pay squeeze over this period. However, some other sets of higher-paid workers contributed relatively little to the decline. In particular, managers and associate professionals combined accounted for just 10 per cent of the total decline, while those in elementary occupations, skilled trades and caring and leisure roles accounted for approximately 40 per cent.

[7] This is similar but differs from the figure in the previous section (6.7 per cent) because it relates to median hourly pay rather than average weekly pay.

Figure 3:
Both higher- and lower-paid occupations accounted for the squeeze

Occupational contributions to change in real (CPIH-adjusted) median gross hourly pay (ex. bonuses): 2009-14; UK



Notes: The pay changes by occupation have been weighted as a share of total employees based on their relative weights in 2009. This ensures that each occupation's contribution to the total pay fall is the result of its individual pay squeeze not any change in its relative weight. This approach is justified by the fact that over this short period there was little meaningful change in the share of employees accounted for by each occupation.

Source: RF analysis of ONS, Annual Survey of Hours and Earnings

Figure 3 tells which occupations were responsible for the pay squeeze, taking into account their relative size. By contrast, Figure 4 shows which occupations suffered the largest falls in real pay. It highlights the fact that the pay squeeze was pretty evenly felt across both higher- and lower-paying occupations. The squeeze was most pronounced for professionals, but there was also significant decline in real hourly pay for many mid- and lower-paying occupations, such as process, plant and machine operators, skilled trades and caring and leisure roles.

Figure 4:
Professionals, skilled trades and those in caring and leisure occupations suffered the biggest squeeze

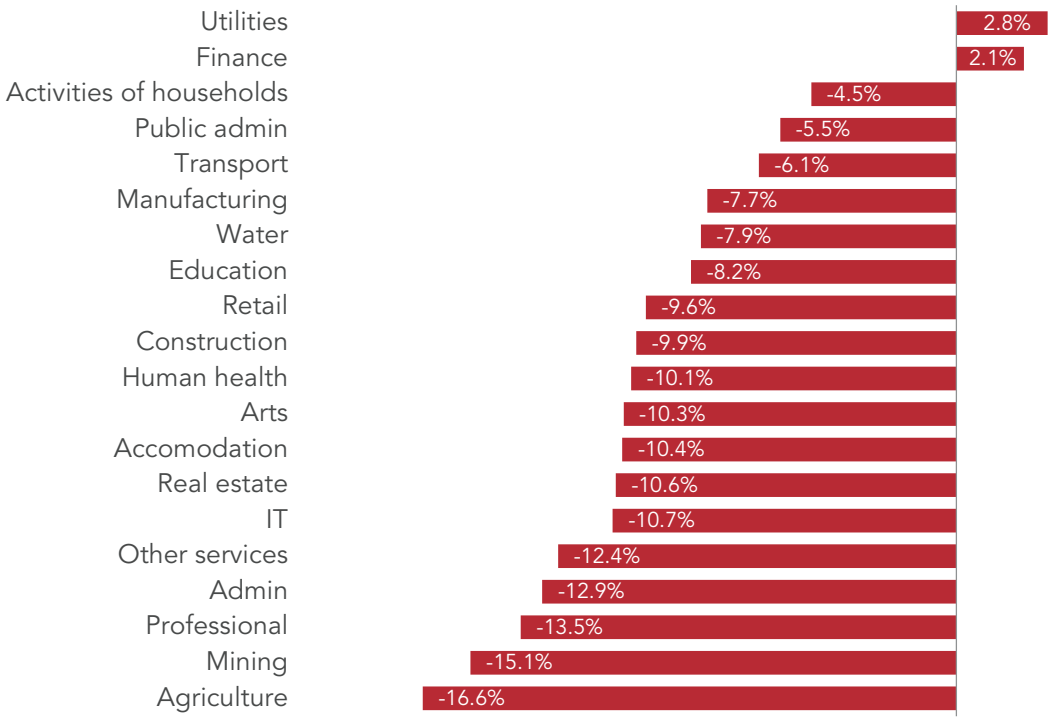
Change in real (CPIH-adjusted) median gross hourly pay (ex. bonuses), by industry: 2009-14; UK

Source: RF analysis of ONS, Annual Survey of Hours and Earnings

A similar pattern emerges in Figure 5, which shows the change in real hourly pay across different industries. Some higher paid sectors – most notably finance – fared relatively well between 2009 and 2014, whereas others – professional, scientific activities and IT, for example – experienced above-average falls in real earnings. Across lower-paying sectors the size of the squeeze was similar, and so overall the impression is that the pain was relatively evenly shared.Figure 6 shows that this pattern of the effects of the pay squeeze being fairly evenly felt is also true across most of the pay distribution. Between 2009 and 2014, hourly pay declined by between 3 per cent and 10 per cent across the earnings distribution. Those right at the bottom (the 1st and 2nd percentiles) fared particularly poorly, while the rest of the bottom 10 per cent of employees arguably fared best. The hourly pay data suggests that the minimum wage helped partially mitigate the impact for most of the bottom 10 per cent of the distribution – between 2009 and 2014 the minimum wage for those aged 21-and-over retained its value in real terms.

Figure 5:
Although finance escaped, both higher and lower-paid sectors felt the squeeze

Changes in real average gross hourly pay (ex. bonuses): 2009-2014

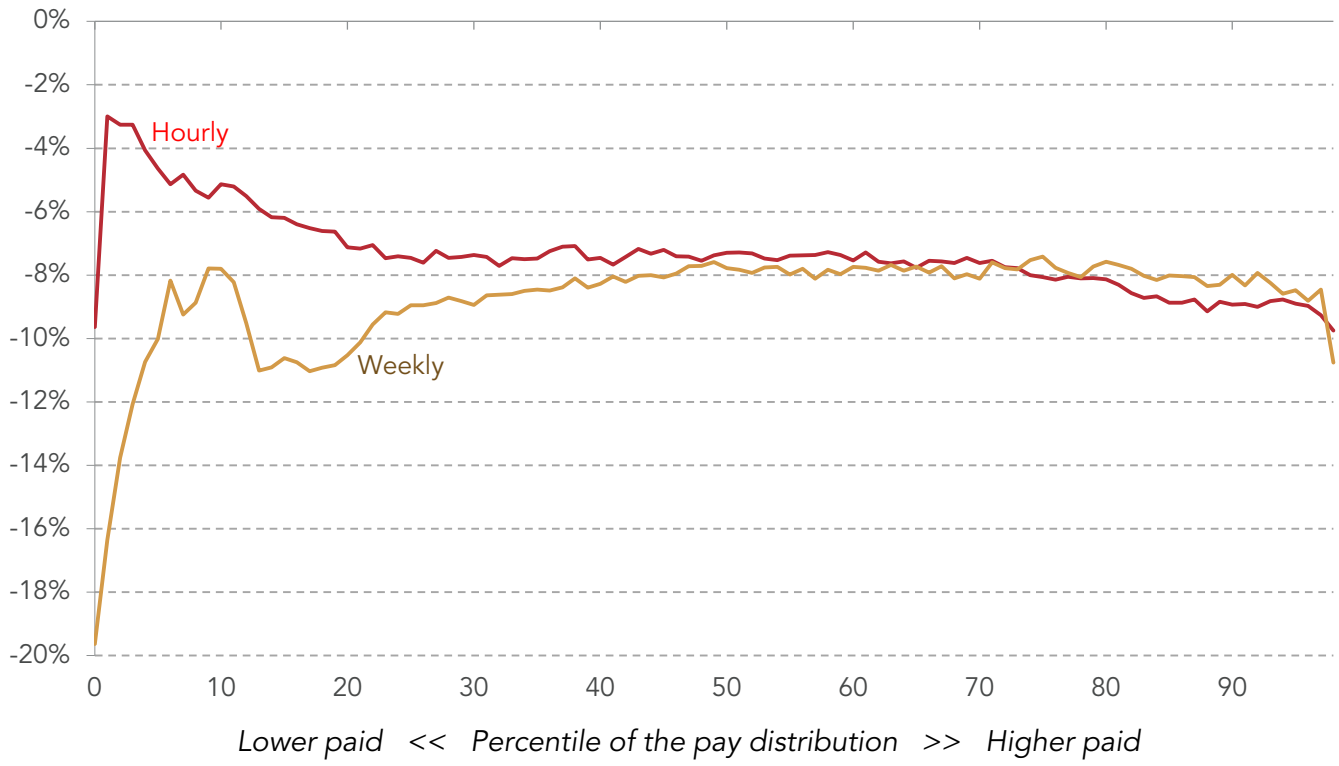


Source: RF analysis of ONS, Annual Survey of Hours and Earnings

However, as Figure 6 shows, this does not mean that those at the bottom escape entirely. Above them and between the 10th and 80th percentiles the pain was relatively evenly shared with pay falls of between 6 per cent and 8 per cent. Those right at the top experienced a marginally larger squeeze of around 9 per cent. An examination of year-to-year changes shows that early in the period, in 2010 and 2011, the pay squeeze was pretty evenly spread, but then shifted and became worse at the top between 2012 and 2014.

Figure 6:
In terms of weekly pay, the squeeze was evenly felt across the distribution

Change in real (CPIH-adjusted) gross pay: 2009-14; UK



Source: RF analysis of ONS, Annual Survey of Hours and Earnings

A slightly different picture emerges when examining weekly pay. Aside from the bottom few percentiles, the squeeze on weekly pay was more evenly spread across the earnings distribution than on hourly pay. There is little difference in the change in pay (both hourly and weekly) for the top half of the distribution, yet for those in the bottom third a 'wedge' between hourly and weekly pay changes is clear. The fact that the squeeze for those in the bottom third was worse in terms of weekly pay suggests that reductions in hours was one way in which employers and employees dealt with the fall in demand that followed the crisis.

Box 1: Younger workers were more affected by the squeeze

Although the pay squeeze affected all parts of the wage distribution to a similar extent, the same is not true when comparing workers of different ages. The squeeze was most pronounced for workers aged 22 to 29, with real pay falling by 11 per cent for this group. As Figure 7 shows, the pay squeeze declines linearly up the age range, with the smallest reduction for employees aged above 60. Younger workers faring particularly badly is perhaps not surprising: we know from previous recessions that younger workers are more likely to be made redundant during a downturn and in this recession it was pay rather than employment that took the hit. The fact that pay growth has continued to be sluggish for younger workers in the period since 2014 is a cause for serious concern, and something we have examined in detail as part of the Intergenerational Commission.

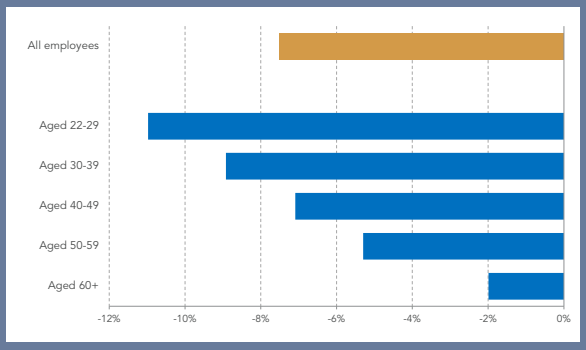


Figure 7: The squeeze was worse for younger employees

Change in real (CPIH-adjusted) median gross hourly pay (ex. bonuses), by age: 2009-14; UK

Source: RF analysis of ONS, Annual Survey of Hours and Earnings

The pay squeeze was not caused by an increase in nominal pay cuts

Having ruled out distributional explanations for the squeeze, we now turn to the notion that workers were forced to, or agreed to, take nominal wage cuts. It has been commonly assumed that a significantly more flexible labour market on the eve of the crisis led to workers negotiating nominal pay cuts – or firms imposing them – in order to minimise job losses.

There are a few ways in which employers can react to a downturn and as we shall discuss below, how they do so has important ramifications for how a downturn ultimately affects people's living standards. One way firms can react is to either cut nominal pay, or freeze pay in nominal terms. Economic theory implies that the former rarely occurs because of downward nominal rigidity. This refers to wages being 'sticky' and not rapidly adjusting to macroeconomic shocks because they are not continually negotiated and, more importantly, workers are reluctant to accept cuts

in nominal wages.[8] UK research has examined the extent to which nominal wages are downwardly rigid in the UK, with the common conclusion being that, although a significant proportion of

people who remain in the same job experience nominal wages cuts from year to year, there is a bunching of wage changes at 0 per cent, implying that firms find it hard to impose those nominal pay cuts.[9]

As Figure 8 shows a relatively large proportion – around a fifth – of employees who remain in the same job experience a nominal pay cut each year. This is a high number, but one that tallies with the findings of other authors, and could be partly a product of the fact that a significant proportion of people experience relatively sharp changes in earnings on a month to month basis. For example, forthcoming Resolution Foundation research shows that 40 per cent of employees

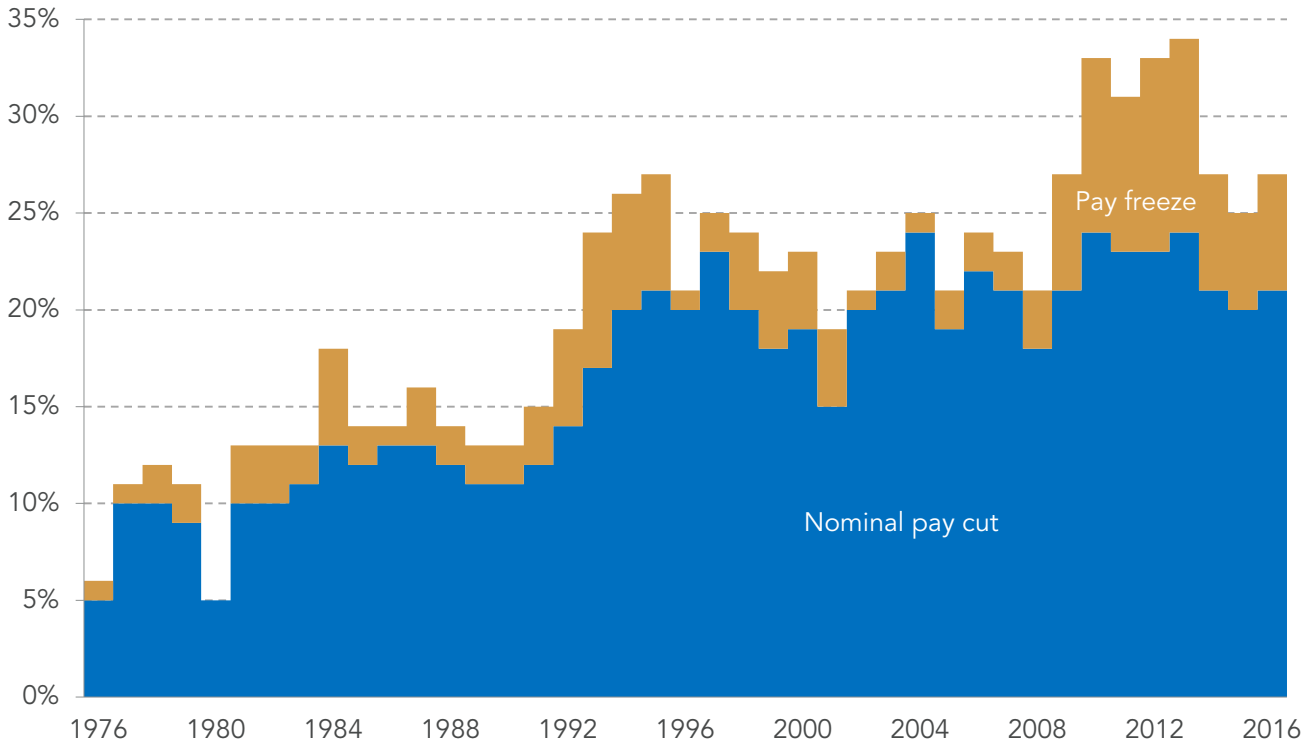
[8] J M Keynes, *The General Theory of Employment, Interest and Money*, 1936

[9] S Nickell & G Quintini, *Nominal Wage Rigidity and the Rate of Inflation*, Centre for Economic Performance, 2001; R Blundell, C Crawford, & W Jin, 'What can wages and employment tell us about the UK's productivity puzzle?, *The Economic Journal*, 124(576), May 2014

experience monthly pay variations of more than 5 per cent each month.[10] We would expect a smaller proportion to experience variations in their hourly pay, but frequent volatility helps explain why when people are surveyed just once a year, a significant number of employees report hourly pay rates below those of a year ago. Nominal pay cuts may be more common than economic theory suggests, but the question for our purposes is whether more employees took nominal wage cuts during the recent downturn than in previous recessions. The evidence in Figure 8 suggests they didn't – the proportion of people experiencing nominal pay cuts has remained relatively constant since the mid-1990s. Rather than pay cuts, an increase in pay freezes was apparent; in 2012 and 2013 one-in-ten employees remaining in the same job experienced a nominal pay freeze, compared to a high of 7 per cent in the early-1990s recession.

Figure 8:
The share of employees experiencing a cut in their nominal pay was no higher in the aftermath of the recent recession

Proportion of employees in the same job that experience a cut or pay freeze in nominal hourly pay (ex. bonuses and overtime)



Source: RF analysis of ONS, Annual Survey of Hours and Earnings; ONS, New Earnings Survey Panel Dataset

This puts paid to the theory that one reason why the recent squeeze was so severe was because nominal rigidity was less prevalent and that a greater share of employees accepted nominal pay cuts rather than lose their jobs. Contrary to this, Figure 8 shows that nominal pay cuts were not much more prevalent during the pay squeeze years than they were in the early-2000s.

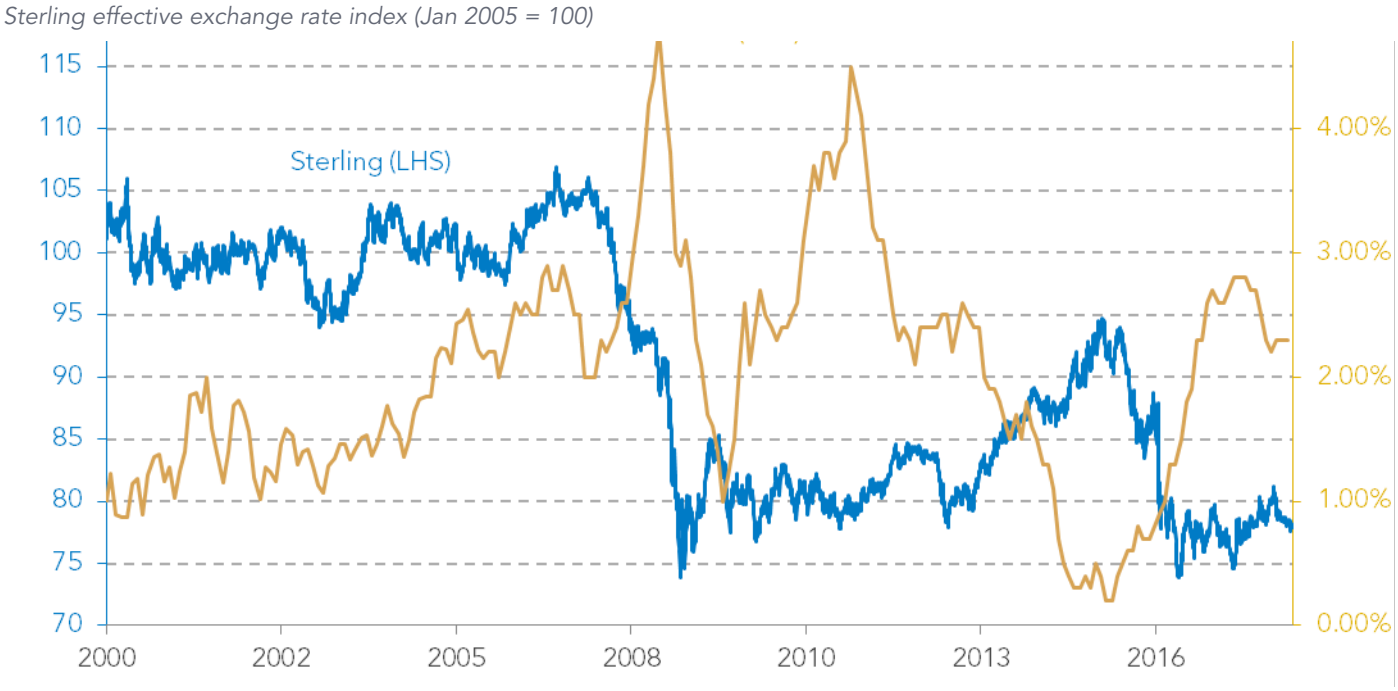
[10] D Tomlinson & P Jefferson, Resolution Foundation (forthcoming)

The UK experienced a deep pay squeeze because it adjusted to the financial crisis through a rise in inflation rather than unemployment

It is clear from the above discussion that the UK economy did not adjust to the downturn through an increase in the share of employees accepting nominal pay cuts. We also know that, relative to the size of the downturn, the UK experienced a comparatively small increase in unemployment. In the early 1990s output fell by just 2.3 per cent, yet unemployment increased by 3.3 percentage points. By contrast in the recent downturn output fell by 6.2 per cent, yet unemployment only rose by 2.8 percentage points. One of the reasons for such a muted rise in unemployment was because employers were able to cut workers *real* pay; nominal wage cuts were not more common, but real pay falls certainly were. In the recession of the early 1990s around 50 per cent of employees remaining in the same job over a year experienced a reduction in their real wages. This figure jumped to around 70 per cent in the wake of the recent crisis.

This opportunity was open to firms because of high inflation. As shown in Figure 9, inflation rose particularly sharply in the UK because of a large depreciation (of around 27 per cent), and because oil and commodity prices did not fall as much as would have been predicted given the size of the downturn, so the cost of imports rose significantly. A sharp increase in inflation ate into real wages as the financial crisis hit our national income and the country adjusted to being poorer.

Figure 9:
The depreciation of sterling was followed by a significant rise in inflation



Source: Bank of England and ONS

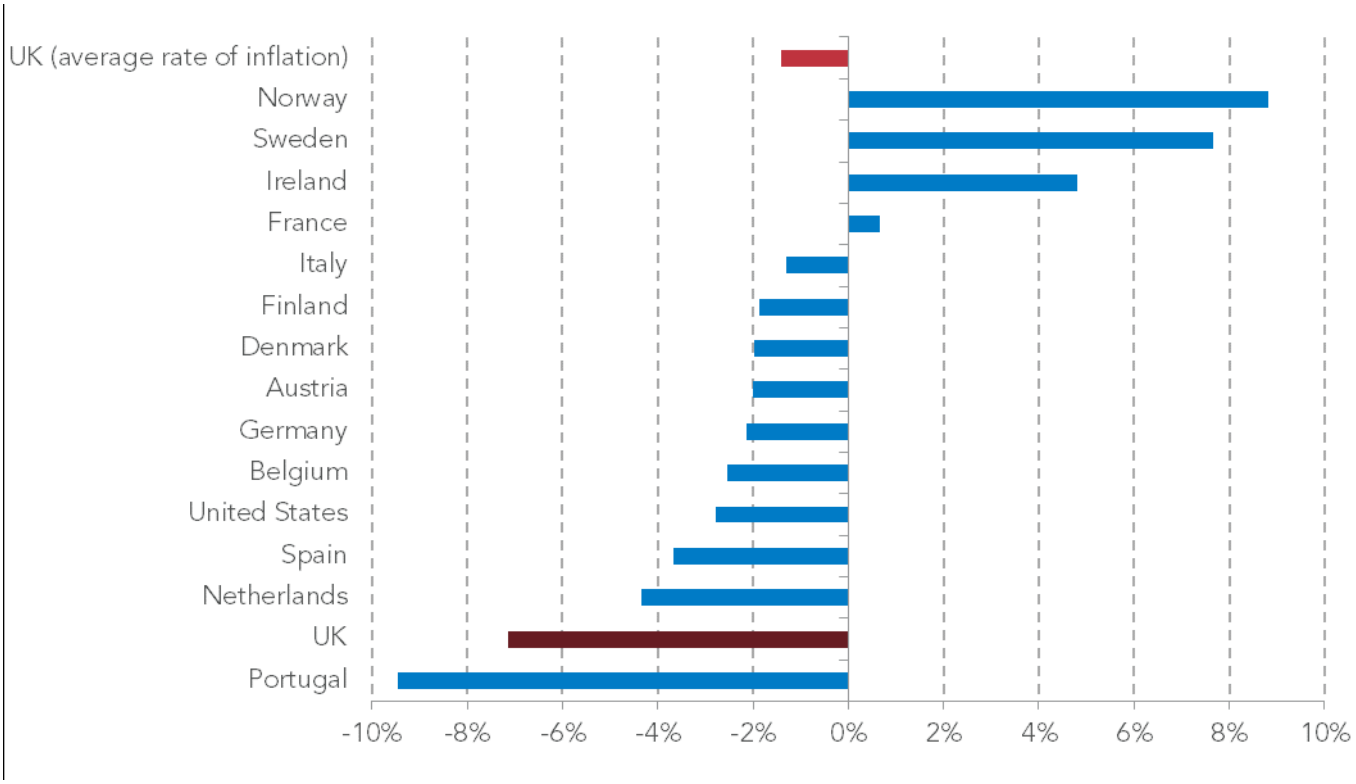
The part-depreciation-driven rise in inflation meant that firms could adjust to the fall in demand by allowing pay packets to fall (in real not nominal terms) rather than cutting jobs. The result was a squeeze on real pay which surpassed that in other countries. Based on comparable data between 2010 and 2014, real hourly pay declined by 7.1 per cent in the UK, not as high as Greece (-15.1 per cent), but much more severe than the US (-2.8 per cent), Germany (-2.1 per cent) or France (where may did not fall in this period, but rather grew by 0.7 per cent).

These are the key components of the UK's unusually severe wage squeeze: a relatively more severe downturn, devaluation and more pronounced rise in inflation, and a smaller increase in unemployment. We can use cross-country data to test the narrative we have established. A very simple model that explains the change in real pay between 2010 and 2014 using the size of the downturn and the rate of inflation does a good job of calculating the squeeze for 14 major European economies and the United States.

The model suggests that the UK's pay squeeze can be well-explained by the fact that the country experienced a sharper recession and larger increases in consumer price inflation than most other countries. Our model can also be used to test what could have happened if UK inflation had not risen by as much. Substituting the average rate of inflation across these advanced economies for the UK's rate and rerunning the model suggests that in the absence of the severe inflation spike real wages would only have fallen by 1.4 per cent in the UK, not 7.1 per cent. A squeeze of 1.4 per cent would have been less than that of Germany (-2.1 per cent) and the United States (-2.8 per cent). These results are shown in Figure 10.

Figure 10: The UK's pay squeeze versus the squeeze under a 'lower inflation' scenario

Changes in real hourly pay (2010-2014)



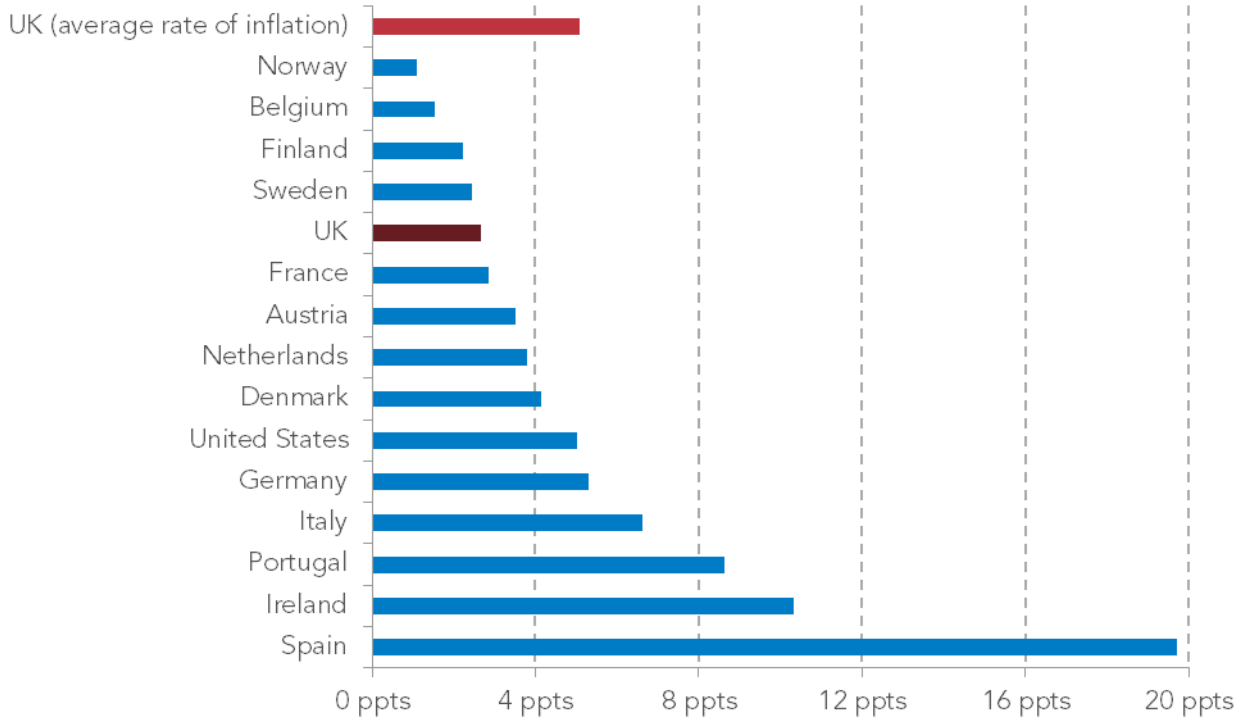
Notes: Independent variables are change in consumer price inflation and change in GDP-per-capita (peak to trough). See the Annex for full details of the modelling approach. US data is annual pay.

Source: Eurostat, Mean hourly earnings, All-items HICP, Euro per capita chain linked volumes (2010); Current Population Survey, Mean annual earnings; OECD, Gross domestic product (expenditure approach), constant prices

Now of course this thought experiment is simplistic: we cannot just tweak one element and expect the rest of the factors in the model to be unaffected. However it remains illustrative for confirming our conclusions about what went on during the pay squeeze. Indeed, we can use another model to test our other key assumption – that high inflation provided a route for the UK economy to adjust through real wage cuts rather than job losses. Rather than modelling changes in real pay contingent upon inflation and GDP-per-capita, we can explain changes in unemployment across the 15 countries contingent upon these factors. Compared to other countries, the UK experienced a relatively limited increased in unemployment (through to peak). However, if we substitute in the average rate of inflation across these advanced economies for the UK's rate and rerun the model, Figure 11 shows that in the absence of the severe inflation spike unemployment would have increased by 5.1 percentage points rather than 2.7 percentage points. Again this would have made the UK experience similar to that of other developed countries: Germany's unemployment rate increased by 5.3 percentage points and the United States by 5 percentage points.

Figure 11: The UK's increase in unemployment versus the increase under a 'lower inflation' scenario

Changes in unemployment (trough to peak)



Notes: Independent variables are change in consumer price inflation and change in GDP-per-capita (peak to trough). See the Annex for full details of the modelling approach. US data is annual pay.

Source: Eurostat, All-items HICP, Euro per capita chain linked volumes (2010); OECD, Unemployment

Inflation meant that the UK experienced a sharper pay squeeze, but this was offset by a smaller increase in unemployment. Rough calculations from the two models suggest that the UK experienced a 2.5 percentage point reduction in unemployment at the expense of a 5 percentage point squeeze in pay. Rough estimates suggest that had unemployment risen by 5.1 percentage points than an additional 800,000 people would have been out of work.

That the UK economy adjusted to the recession through depreciation and then higher inflation rather than job losses is the primary reason why our pay squeeze was worse than the experience in other countries or during past recessions. One could imagine another situation in which – perhaps due to a downturn being caused by a shock that affects the UK less than other countries – sterling appreciates and job losses are higher. It is debateable which 'type' of recession one would prefer – though minimising job losses and adjusting through wage cuts is likely more progressive. In addition, while the 2009-14 pay squeeze was bad for living standards, a squeeze of some sort may have been a necessary adjustment in the context of a global financial crisis prompting reductions in economic output around the world. By contrast, there are no offsetting gains for the current period of historically low wage growth – we can be somewhat sanguine about the first period, but the second is unambiguously bad. It is to this unmitigated disaster for living standards that we now turn.

Section 3: The meagre recovery

In 2014 the UK economy appeared ready to turn a corner. By the end of that year output had grown for seven consecutive quarters, pay growth had turned positive again, and unemployment was returning to a rate similar to (if still around a percentage point above) where it was on the eve of the crisis. Economists expected that more robust wage growth would soon follow. Unfortunately, a significant uptick in nominal wage growth never materialised, with real wage growth temporarily driven more by low inflation.

Why wage growth failed to return to pre-crisis levels has been a key question that has dogged economic and political debates in recent years. In this section we evaluate various answers that have been proposed. We weigh up the idea that wage growth over the past four years hasn't been slow, just unevenly felt across the distribution; that growth has been strong for those who have remained continuously employed; that the failure of wages to pick up is down to the fact that wages no longer respond to labour market slack; that there is more slack than we think; and that sluggish productivity is to blame. We find some support for each theory, but the strongest evidence points to productivity as the most important driver.

Recent sluggish pay growth is not explained by distributional differences, but has occurred despite wage rises at the bottom

A number of explanations have been offered for the recent period of almost unprecedentedly slow pay growth. On the surface, the puzzle has been that this occurred despite unemployment falling since 2014 and standing at a record low for over a year now. Some have argued that for those in continuous employment, pay growth hasn't in fact been slow, and as such compositional changes in the workforce (the result of the large increase in employment) explain why average growth has been so poor.[11] Others have argued that the traditional relationship between labour market slack and wage growth has broken down,[12] or instead that on a broader measure of slack our labour market isn't as tight as the unemployment figure suggests.[13] Some have argued that given the currently sluggish rate of productivity growth – which is the main long-term determinant of real pay – there is no puzzle to explain, or at least the puzzle is why productivity growth has been so slow. Others have questioned this assumption by suggesting that the relationship between productivity and pay has broken down.

In this section we tackle each of these theories in turn. First, however, it is worth emphasising that the recent period hasn't been one of poor wage growth for all. In particular, for those right at the bottom of the pay distribution growth has been relatively robust over the past two years.

Figure 12 shows that unlike the period in which real pay was falling (when the effect was relatively evenly spread across the distribution) growth since 2014 has been far stronger for lower-paid employees. Growth has been pretty robust for lower-paying occupations, most notably sales, customer service roles and elementary occupations, while pay has fallen in many higher-paying occupations.

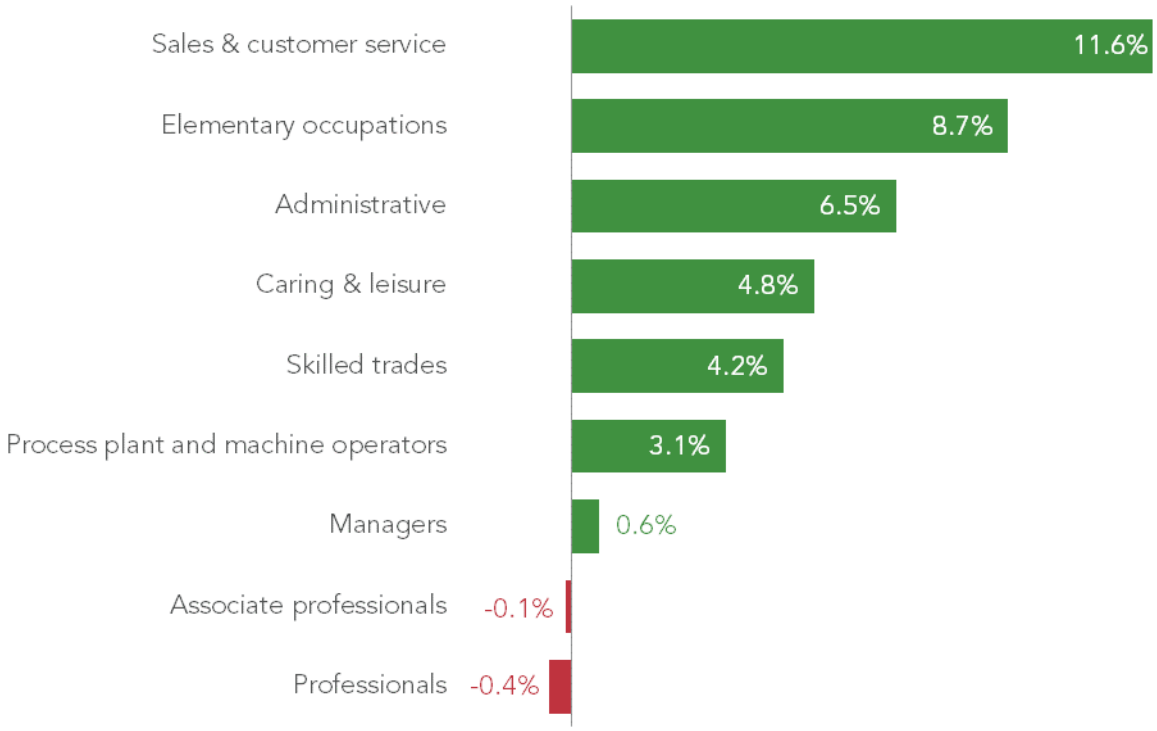
[11] A Lilico, 'What's really happened to average wages', *Reaction*, 26 October 2017

[12] M Dotsey, S Fujita & T Stark, 'Do Phillips Curves Conditionally Help to Forecast Inflation?', *Working Paper 17-26,* Federal Reserve Bank of Philadelphia, 2017

[13] D Bell & D. Blanchflower, 'Underemployment and the Lack of Wage Pressure in the UK', *National Institute Economic Review*, 243(1), February 2018

Figure 12: Pay growth has been stronger in lower-paid occupations

Change in real (CPIH-adjusted) average gross hourly pay (ex. bonuses), by occupation: 2014-17; UK

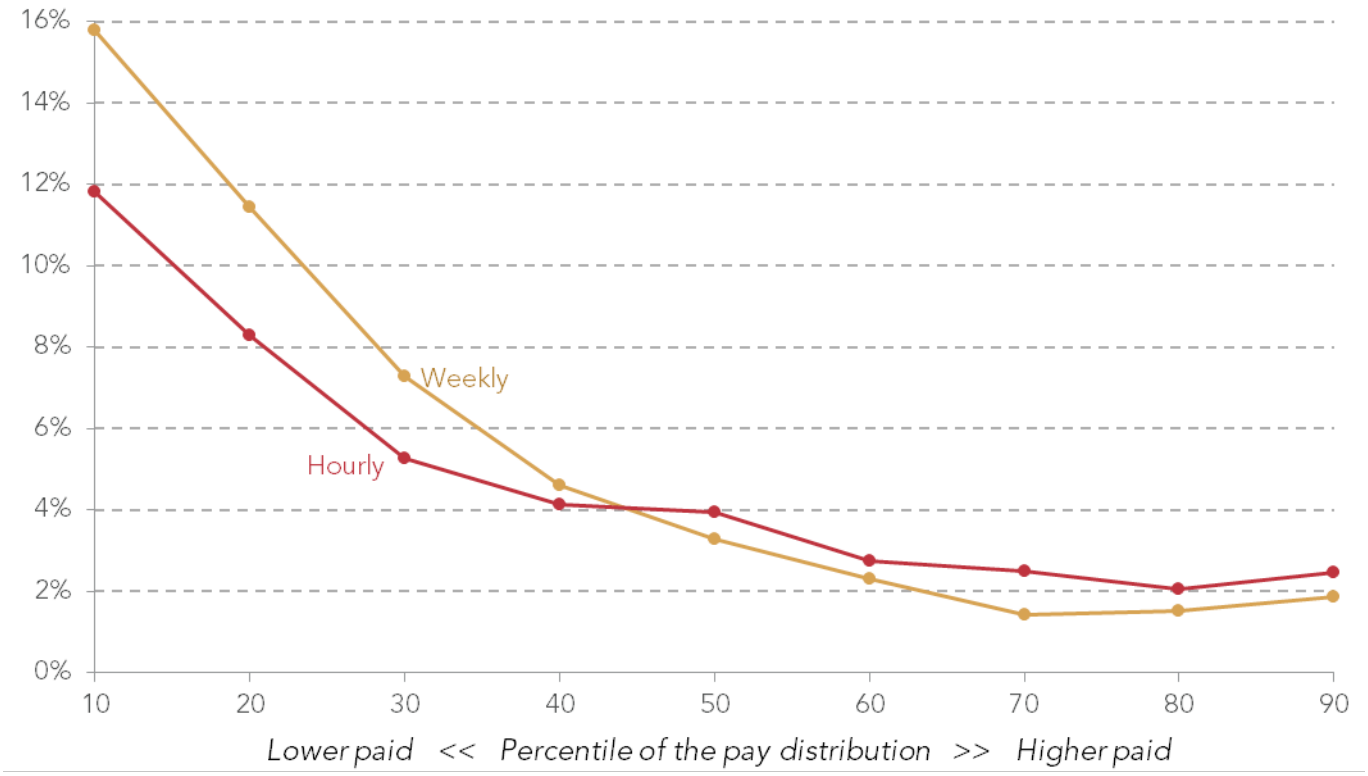


Source: RF analysis of ONS, Annual Survey of Hours and Earnings; ONS, Labour Force Survey

A similar picture emerges if we analyse pay growth across the distribution. Wages grew by between 2 and 4 per cent between 2014 and 2018 for employees in the top half of the distribution, whereas in the bottom half growth was between 4 and 16 per cent. As with Figure 6 in the previous section, we see a difference between weekly and hourly pay growth in the bottom half of the distribution. A comparison of the two emphasises that the big hours adjustment in the aftermath of the recession appears to have unwound more recently. While weekly pay growth was weaker than hourly during the period of falling pay, since 2014 weekly growth has been stronger than hourly. This reflects the fact that towards the end of this period there was a large upswing in the number full-time jobs and hours worked.

Figure 13: Pay growth has been much stronger at the bottom of the distribution

Change in real (CPIH-adjusted) gross pay: 2014 - 2018



Source: RF analysis of ONS, Annual Survey of Hours and Earnings; ONS, Labour Force Survey

Looking at Figure 13, it may be tempting to conclude that what needs to be explained for the period since 2014 is just weak wage growth at the top. However this would ignore the role that minimum wages have played. Although we cannot be certain that wage growth would have been as sluggish at the bottom as at the top in the absence of minimum wages, we can be certain that the wages of lower earners were boosted by the minimum wage, particularly since 2016 when the National Living Wage (NLW) was introduced. Between 2016 and 2018 the minimum wage for those aged 25-and-over increased by 3.7 per cent in real terms, and the rate for those aged 21-24 increased by 5 per cent in real terms. This is not to say that other factors – a tightening labour market and rising productivity in some sectors, for example – may not have played a part, but it is unlikely that these factors were solely having an impact at the very bottom of the labour market.

i Box 2: For the first time the lowest paid are not those most at risk of nominal pay cuts

Figure 14 shows the share of employees remaining in the same job who experienced a nominal wage cut or freeze in 1984, 1993, 2011 and 2016. The first of three of these are the years in which the share of people experiencing nominal wage freezes or cuts peaked in the wake of a recession. 2016 is the year in which the NLW was introduced. For the three post-recession years, we find that it tends to be lower-paid employees who are more likely to face nominal wage cuts or freezes.

This is perhaps unsurprising; hourly wages may vary more for such employees, and these employees are also those who are likely to have the least bargaining power. Even outside of recessions those at the bottom are more likely to experience nominal pay cuts or freezes. Something shifts in 2016 though. The introduction of the NLW meaning that for the first time it was workers in the middle of the distribution (rather than those at the bottom) who were more likely to experience a nominal pay cut or fall.

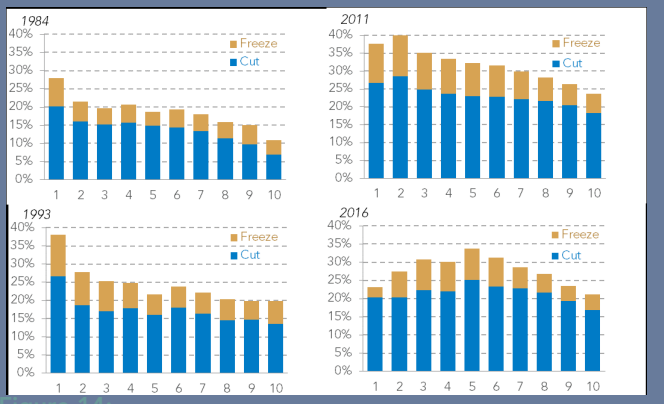


Figure 14:

The introduction of the NLW means that nominl pay cuts and freezes were less prevalent at the bottom in 2016

Proportion of employees in the same job who experience a nominal pay freeze or cut, by hourly earnings decile and year; GB

Source: RF analysis of ONS, Annual Survey of Hours and Earnings; ONS, New Earnings Survey Panel Dataset

One factor that has been discussed a lot in relation to lower-paid workers in the US is that a rise in monopsony and a reduction in workers bargaining power has reduced wage growth. However, what evidence we do have for the UK suggests that workers are spread across more firms than they were in the mid-2000s, suggesting that the danger of monopsony has, if anything, fallen. Given this it is difficult to conclude that this factor can do much to explain why wage growth is slower now than it was a decade ago.

Finally it is worth considering the argument that pay growth has been so poor overall *because* pay at the bottom has been relatively robust. An argument along these lines would suggest that firms – due to enforced wage rises at the bottom – increased pay packets for low earners at the expense of those higher earners. Yet, even if this were occurring in some parts of the economy, it cannot explain the magnitude of the slowdown in wage growth. Figure 13 shows that the apparent impact of a rising wage floor is mostly limited to the bottom 20 per cent of the earnings distribution, where the magnitude of cash changes required to deliver these proportional increases is of course far smaller than it would be further up the distribution. It is therefore hard to conclude that it is just the *distribution* of pay growth that has changed and not the *rate*.

Compositional factors explain only part of why pay growth has recently been so sluggish

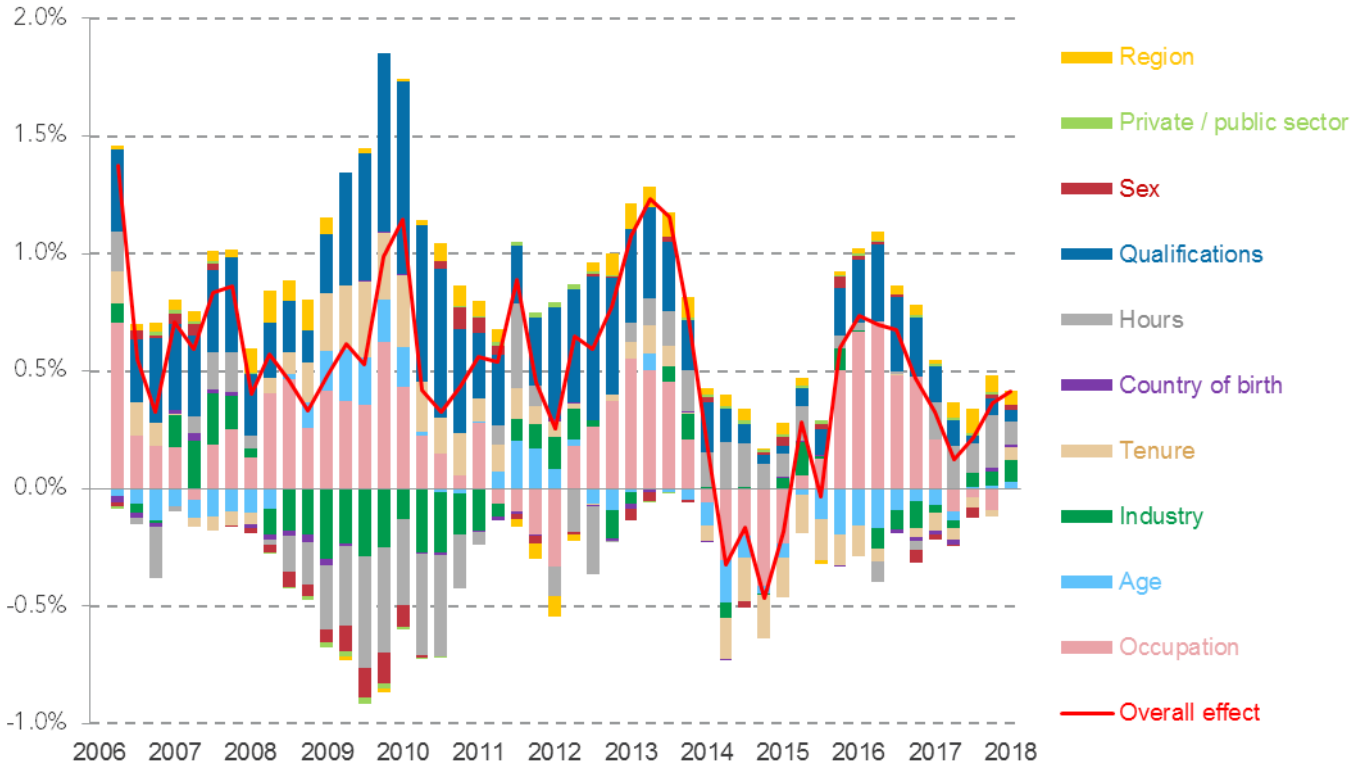
One reason that has been volunteered for why wage growth has been so sluggish since the crisis is that either the changing composition of the workforce has weighed on pay growth, or that compositional changes have not been boosting wage growth as much as they used to. In this section we review this argument and find that, although compositional factors have had an effect, they can explain only a relatively small part of the slowdown.

To understand how compositional changes effect pay growth, consider that the difference in mean or median pay between two periods will be affected by how the make-up of the workforce differs in those two periods. For instance, during a particularly pronounced rise in employment, the marginal worker being enticed into the labour market is likely to earn less than the stock of workers already employed, all else equal lowering the average wage. Figure 15 shows that this is what happened in 2014, when the employment rate started to rise sharply.

This does not mean that aggregate pay growth figures are not informative (we want to account for compositional shifts in our overall view of wage pressures), but indicates that segmenting out compositional effects can help us understand the drivers of wage changes. Before doing so however, we estimate how important these compositional factors have been over time, with the results shown in Figure 15. It is noticeable that since 2006 the compositional impact has mostly been positive, but it is also apparent that the compositional boost is currently lower than it was before the crisis (around 0.4 per cent rather than 0.7 per cent).

Figure 15: The compositional boost to pay growth has fallen

Compositional effect on annual changes in average weekly pay (nominal)



Source: RF analysis of ONS, Labour Force Survey

To illustrate the implications of this, we can estimate the impact on wage growth if the compositional boost had remained at its pre-2014 level. We find that growth in average weekly earnings would have been 0.3 percentage points higher since 2014, pushing nominal wage growth up, but not taking it back to the levels typically enjoyed in the early 2000s. Put differently, compositional shifts explain around a fifth of the difference between wage growth in recent years and its level before the crisis.

Beyond the headline effect, some of the changes evident in Figure 15 are worth drawing out. Over time rising qualification levels have tended to push up pay growth, as better-educated workers – who tend to earn more – become a larger share of the workforce. Similarly, the UK economy has benefitted from the fact that over time higher-paying occupations have risen as a share of the total. The light pink bars in Figure 15 show that this shift has pushed up pay growth as well. Over the last year, however, occupational upgrading appears to have stalled.

It is too soon to say if these shifts will unwind, but there are reasons to think that the first may endure over the medium term at least. We have previously documented the slowdown in human capital accumulation as enrolment in higher education has slowed and non-university routes have remained limited and of relatively poor quality.[14] Looking forward, it is difficult to see how the growth in the supply of human capital that the country experienced in the 1990s and early 2000s can be repeated without significant reforms to technical and non-university routes, reforms which will take time to have an effect.

In terms occupational upgrading – the second key factor underpinning the currently subdued compositional boost – the current slowdown could be cyclical. Figure 15 shows that the occupational component tends to rise and fall over time, hitting similar lows in early 2007, 2011 and 2014. It could be that we are due an upswing soon. Less positively however, there is evidence that the rate of occupational upgrading has slowed post crisis,[15] and other advanced economies have experienced a slowdown in occupational upgrading.[16] It remains to be seen if this will happen in the UK.

An alternative perspective on this same question is provided by looking at the typical pay rise for those in continuous employment. Here, again, the effects of changes in the employee population over time on average pay growth figures are effectively stripped out by focusing only on the pay rise experience of those who remain in work from one year to the next.

Figure 16 shows the typical (median) pay rise for those in continuous employment and also the change in average weekly earnings, the headline measure of pay growth. Just as there was also a sharp drop in nominal wage growth, those in continuous employment experienced a decline in typical pay rises in the aftermath of the crisis. Furthermore, the fact that the median change in pay for those in continuous employment and growth in average weekly earnings were approximately the same over the period provides further support for the conclusion that compositional changes are not the main reason for the UK's particularly poor pay growth.

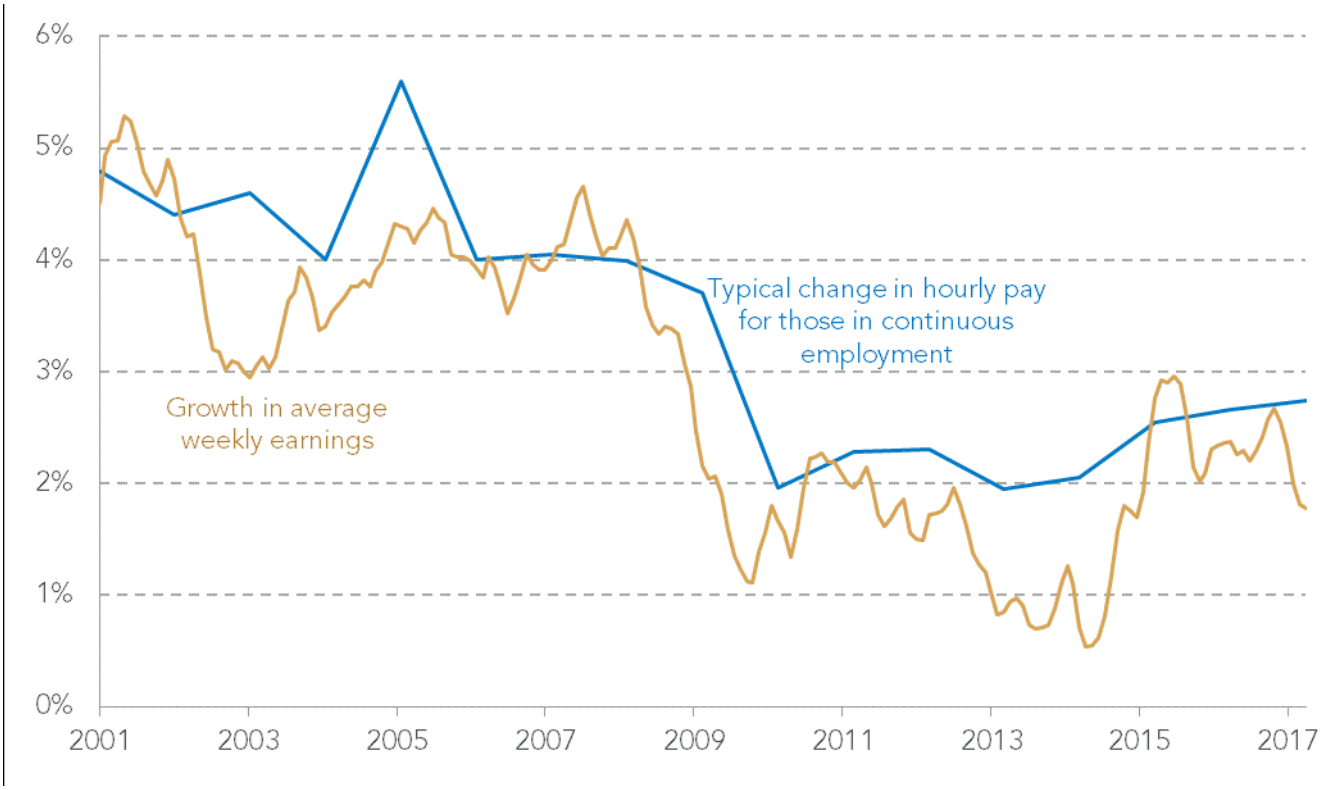
[14] L Gardiner & P Gregg, *Study, Work, Progress, Repeat? How and why pay and progression outcomes have differed across cohorts*, Resolution Foundation, February 2017

[15] S Clarke & P Gregg, 'The Prospects for the UK Labour Market in the post Brexit era', *Political Quarterly* (forthcoming)

[16] P Beaudry, D Green & B Sand, 'The Declining Fortunes of the Young since 2000', *American Economic Review*, 104(5), May 2014

Figure 16: Typical pay rises for those in continuous employment tracks growth in average weekly earnings

Change in nominal pay



Source: RF analysis of ONS, Annual Survey of Hours and Earnings; ONS, Average Weekly Earnings

The relationship between unemployment and pay has weakened over time

The argument that has perhaps attracted the most debate, is that there has been a change to the relationship between labour market slack (measured using the unemployment rate) and wages. Some have argued that the relationship has broken down, while others argue that the relationship holds, but only if one uses a broader measure of slack than just the unemployed. It is therefore important to draw a distinction between labour market slack and unemployment. Traditionally the latter has been viewed as the best proxy for the former, but as we shall see unemployment may no longer be the best measure.

The idea that wages and inflation are related to slack or unemployment was first outlined by William Phillips, who in 1958 described the inverse relationship between rates of unemployment and corresponding rates of inflation and wage rises.[17] Over time, economists have refined Phillips's original model, first in response to the stagflation of the 1970s,[18] which suggested that high unemployment and high inflation can coexist, and then again in the 1980s as economists moved away from models that assumed the existence of a perfectly competitive labour market.[19]

[17] A Phillips, 'The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom 1861–1957', *Economica*, 25(100), November 1958

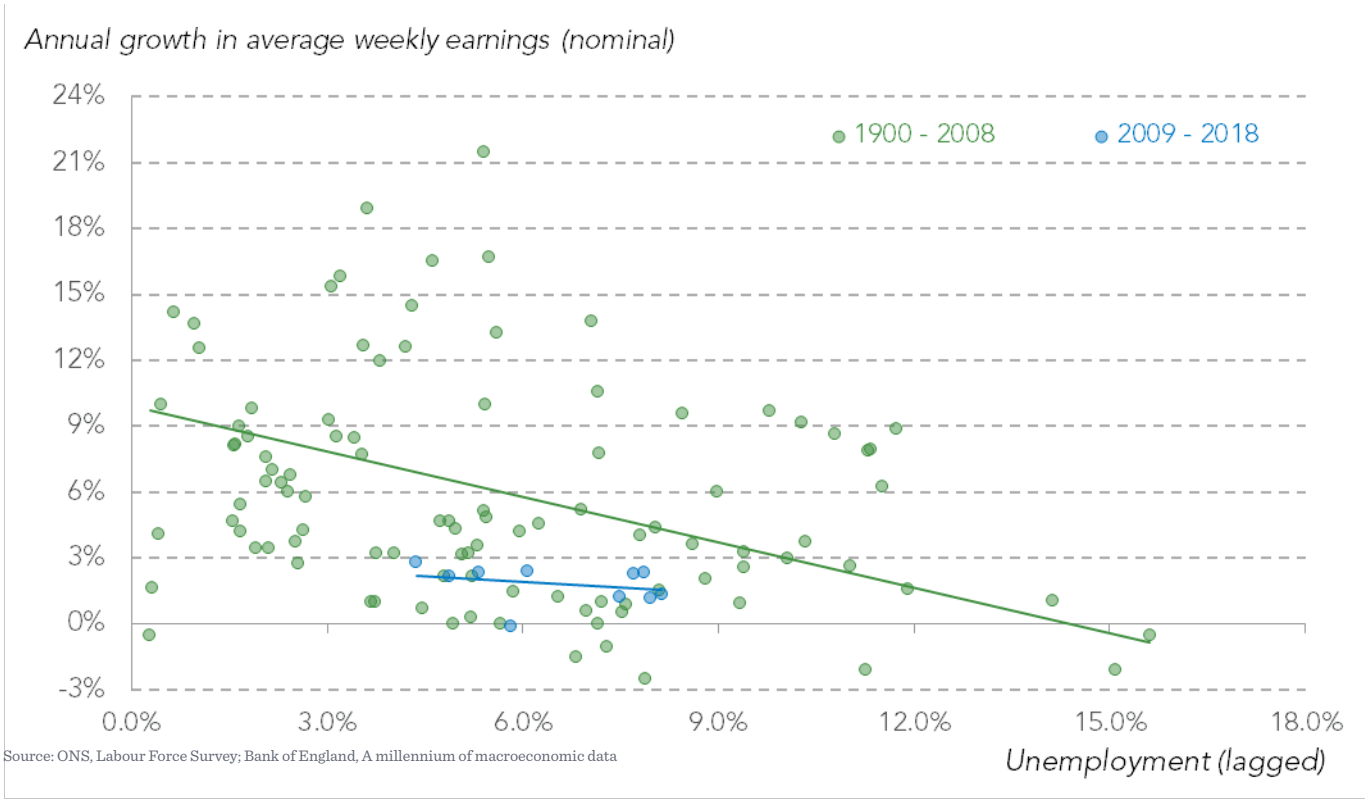
[18] M Friedman, The Role of Monetary Policy', *The American Economic Review*, 58(1), March 1968

[19] R Layard & S Nickell, 'Unemployment in Britain', *Economica*, 53(210) Supplement: Unemployment, 1986

Although they refined Phillip's original model, these changes did not alter his underlying insight, and the idea that slack or unemployment is negatively related to wage growth and inflation remains an important tenet of economic thinking. It is therefore a puzzle that currently low levels of unemployment – not just in the UK, but across many other developed economies – have not coincided with faster wage growth. A number of theories have been volunteered to explain this, but a dominant line of argument has been that unemployment is becoming less useful for forecasting inflation, particularly during economies expansions.[20]

At least on the surface, there does appear to be a weakening of the relationship between unemployment and wage inflation recently. Figure 17 shows the relationship between unemployment and nominal wage growth in each year since 1900, with unemployment lagged by one year. Between 1900 and 2008 there is a clear negative relationship between unemployment and nominal wage growth. However, in the final decade the relationship significantly weakens and the Phillips curve is both flatter (for a given fall in unemployment there is a smaller rise in pay growth) and lower (pay growth is lower for a given level of unemployment). The same analysis for the US finds a similar shift.[21]

Figure 17: The Phillips curve appears both lower and flatter



Source: ONS, Labour Force Survey; Bank of England, A millennium of macroeconomic data

A number of drivers of this apparent shift in the Phillips curve have been suggested. Some have argued that central bankers and monetary policy makers have done a good job of reducing output whenever inflation is set to rise, meaning that identifying a Phillips curve is increasingly

[20] M Dotsey, S Fujita & T Stark, 'Do Phillips Curves Conditionally Help to Forecast Inflation?', *Working Paper 17-26,* Federal Reserve Bank of Philadelphia, 2017

[21] S Leduc & D Wilson, 'Has the wage Phillips Curve Gone Dormant?', *FRBSF Economic Letter, 2017-30,* October 2017

difficult.[22] The same authors, however, admit that sub-national data may still tell us something about the relationship between unemployment and wages: because central banks are tasked to respond to aggregate national measures of inflation and slack, regional variations can still be revealing. Using sub-national data, other authors argue that unemployment is a very imperfect proxy for the amount of slack in an economy. For example, David Bell and David Blanchflower argue that when you take into account the fact that there are both unemployed people looking for work and other people who would like to work more hours, an 'augmented' Phillips curve can be found between a broader measure of slack and wage growth.[23] Finally, there are those who argue that the Phillips curve may not have shifted, but that other factors – in particular weak productivity growth – are holding back wage growth (something we will analyse below).[24]

To tackle each of these arguments and explore the relationship between unemployment and wages we collect data on the two for 11 regions and nations of Great Britain between 1986 and 2017.[25] We then run a series of regression models in which either the annual growth of typical (median) weekly wages or the level of typical weekly wages is related to unemployment. In all these models we control for both year and region effects so as to strip out any aggregate trends (such as rising productivity or a recession) which may be affecting both series and any timein-variant differences between regions.[26]

i Box 3: Growth versus the level of wage

We test the relationship between the level of wages as well as wage growth because there is some debate as to whether a fall in unemployment continues to push up wages indefinitely or whether it fades out. The traditional Phillips curve model, which associates unemployment with wage growth, assumes that unemployment falls accumulate in their effect. For example, if unemployment falls from 5 to 4 per cent and this increases wage growth by 1 per cent then this will keep pushing up wage levels as long as unemployment stays at that level (the 1 per cent increase compounds until the unemployment rate changes).

By contrast, associating unemployment with the level of wages while also controlling for the level of wages in the past (see Blanchflower and Oswald's 'Wage Curve' model) suggests that unemployment does affect the growth rate, but also the level of wages. The level of wages in the current period is clearly strongly related to the previous year's level, yet the evidence suggests that it is not perfectly related. This means that a fall in unemployment raises pay, but the impact on pay growth fades over time, and eventually growth returns to the underlying trend. Our analysis suggests that the effect of a fall in unemployment reduces to almost nothing in between 5 and 9 years. This suggests that, in the short run, the two models are relatively indistinguishable because unemployment often shifts up or down over time, meaning that its effect will be constantly changing. The difference is of interest though when unemployment falls and then remains steady for some time.

[22] M McLeay & S Tenreyo, 'Optimal inflation and the identification of the Phillips curve', *Vox*, 3 July 2018

[23] D Bell & D Blanchflower, 'Underemployment and the Lack of Wage Pressure in the UK', *National Institute Economic Review*, 243(1), February 2018

[24] M Lopresto & A Kara, 'Weakness in wage growth: what is driving it?', *National Institute of Economic and Social Research*, 4 May 2018; A Keane, 'Another way to look at US wage growth', *Financial Times*, 25 August 2017

[25] We do not collect data for Northern Ireland because it is not available before the mid-1990s.

[26] For example, the North East tending to have lower wages than other parts of the country.

Table 1 shows the relationship between unemployment and wages over four periods. The first column shows that unemployment has a negative relationship with both the growth and the level of typical weekly regional wages. A 1 percentage point fall in unemployment (for instance from 5 to 4 per cent) is associated with a rise of 0.5 percentage points in the growth of weekly wages or a rise of 0.7 per cent in the level of wages. Similar to Figure 17, this shows that in the long run there does appear to a relationship between unemployment and wages.

Table 1: The relationship between unemployment and pay in four periods

Fall in unemployment of 1 percentage point			
1986 - 2017	1986 - 2002	2003 - 2012	2003 - 2017
Is associated with an increase in the *growth rate* of weekly wages of...			
0.5 ppts ***	**0.46 ppts *****	**0.4 ppts ***	0.1 ppts
Is associated with an increase in the *level* of weekly wages of...			
0.68 % ***	0.2%	**1.4 % *****	0.6%

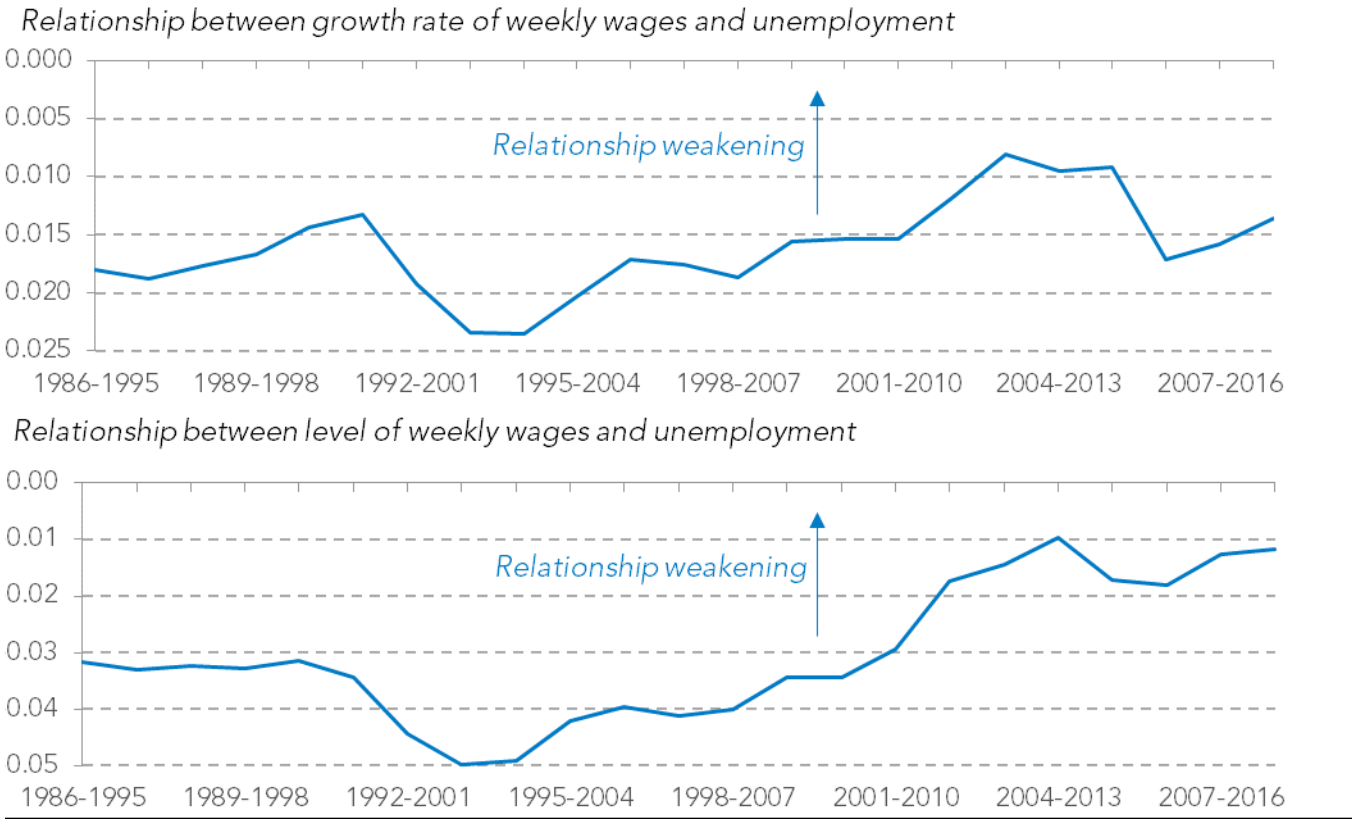
Notes: Significant coefficients are in bold, with asterisks denoting significance level (*** 1%, ** 5%, * 10%). Both models include year and region fixed effects. The level of weekly wages model is estimated using two-stage least squares, where unemployment is instrumented with its first and second lags and wages instrumented with their second and third lags. Full results available in the Annex.

Source: : RF analysis of ONS, Labour Force Survey; ONS, Annual Survey of Hours and Earnings; ONS, New Earnings Survey

Over time, though, this relationship weakens. The coefficient in the growth equation is 0.46 percentage points between 1986 and 2002, it then falls (albeit marginally) to 0.4 percent in 2003 to 2012, and there is then a pronounced fall to 0.1 per cent (and the relationship between the two is no longer statistically significant) between 2003 and 2017. A slightly different pattern emerges in the level of wages equation, yet there is still a big fall in the unemployment coefficient when the relationship is analysed between 2003 and 2012 and then between 2003 and 2017.

Table 1 suggests that the relationship between unemployment and wages really starts to weaken after 2012. We can test this by running a series of regression models in which we include a dummy variable to measure whether or not the relationship changes over a specific time period (in our case a decade). Figure 18 plots the relationship between unemployment and pay (both growth and level of wages) from 1986 to 1995, and rolls forwards over decades to 2008 and 2017. The relationship between unemployment and pay weakens over time (shown by the fact that the coefficient moves closer to zero), with the weakening more apparent when we examine the relationship between unemployment and the level of wages. As in Figure 17, there is strong evidence to suggest that the Phillips curve has flattened over time.

Figure 18: The relationship between unemployment and pay over time



Notes: See Annex for full details of model.

Source: RF analysis of ONS, Labour Force Survey and ONS, Annual Survey of Hours and Earnings & ONS, New Earnings Survey

This analysis could lead one to conclude that the reason why wage growth has been so sluggish since 2014 is because the relationship between unemployment and pay has shifted, such that for a given level of unemployment there is now a lower level of pay growth. On the surface there is evidence to support this conclusion, yet fundamentally the Phillips curve is about the relationship between labour market slack and wage growth. The unemployment rate is usually taken as the best proxy for the amount of slack in the labour market. But a reasonable conclusion from the above could be that although the relationship between unemployment and pay appears to have weakened, the underlying relationship between labour market slack and wages may not have changed. We explore this theory below.

The relationship between wider labour market slack and pay growth remains

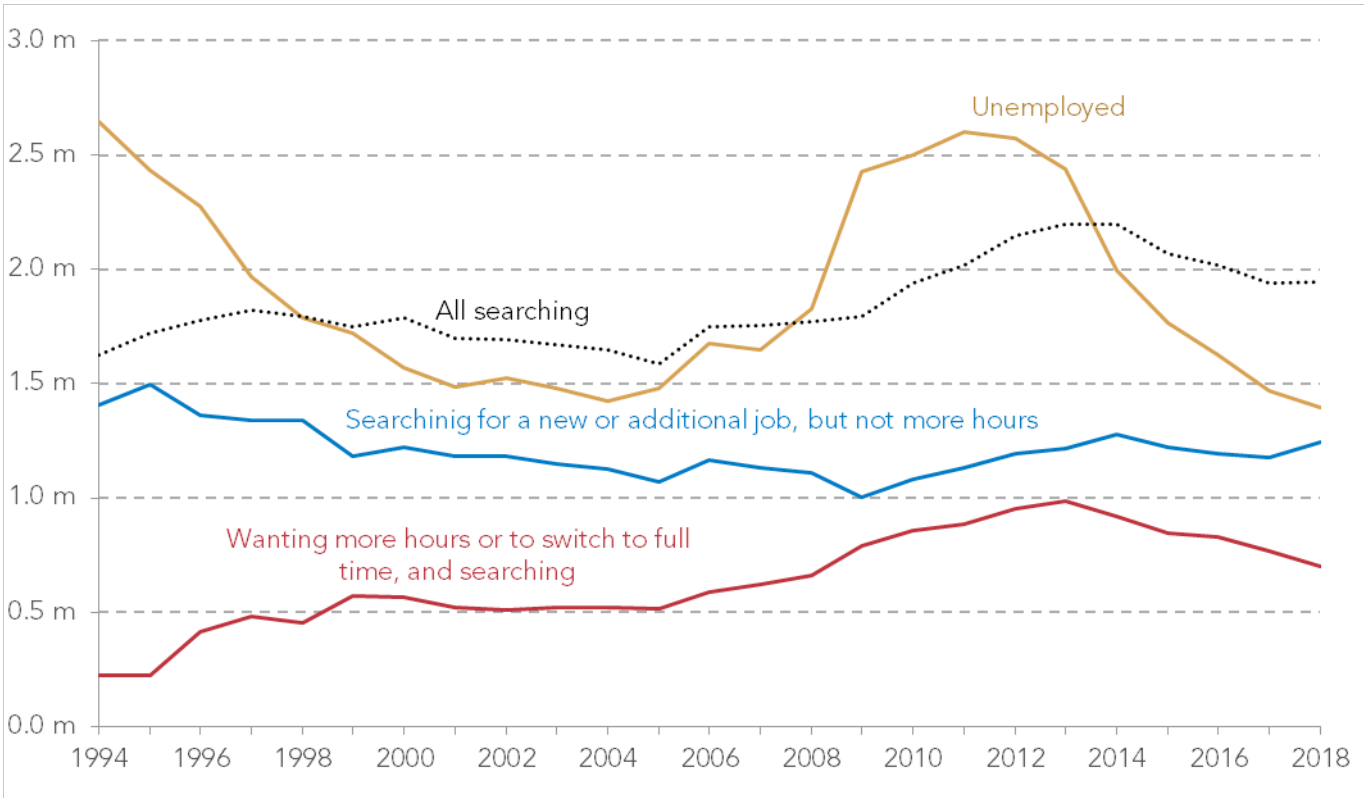
There are good theoretical reasons to believe that unemployment, while always imperfect, has become an increasingly poor proxy for the amount of slack in the labour market. Unemployment is only a proxy for labour market slack because potential labour supply is made up of those out of work (who are currently not supplying their labour), but also people in work who would like to

supply more labour.[27] The latter group is currently larger than it has traditionally been. Using similar data to ours, Bell and Blanchflower included the latter in their augmented Phillips curve model and found a negative (and significant) relationship between the net number of additional hours wanted by those in work and the level of pay between 2002 and 2017.[28]

However, the definition of someone who is unemployed is both that they wish to work, but also that they are searching for work. Therefore it may be best to conceptualise potential labour supply (or the amount of slack in the labour market) as composed of the unemployed but also those who both say they wish to work more hours and also state that they are actively looking for work that provides these. Figure 19 shows the number of people actively looking for work, including both the unemployed and those in work. The blue line shows people who are currently employed who state that they are actively searching for a new or an additional job, but who do not state that

Figure 19: The underemployed searching for work are an important component of labour market slack

Numbers of those in-work but looking for new/additional job and the number of unemployed (million)



Source: RF analysis of ONS, Labour Force Survey

[27] Other than this there are also those in work who do not necessarily wish to supply more labour, but to supply labour for a different firm. Such individuals have an ambiguous relationship with overall slack because if they choose to switch firms they increase supply for the firm that hires them, but also reduce supply for the firm they depart, leaving the overall level of potential supply unchanged. Such individuals may exert upward pressure on pay – job-to-job moves are a good indicator of pay pressure – but this is something outside of the Phillips curve model.

[28] D Bell & D Blanchflower, 'Underemployment and the Lack of Wage Pressure in the UK', *National Institute Economic Review,* 243(1), February 2018

they want to work more hours or to move from part-time to full-time.[29] Unlike unemployment, this latter category does not vary with the economic cycle. It has actually been rising recently as the labour market has tightened, perhaps because it is related to job-to-job moves, a pro-cyclical measure.

The red line in Figure 19 shows those people who state they are actively searching for a new job or additional work but who also say that they would like to work more hours or move into full-time work. This is the group we are most interested in; they are both saying that they would like to supply more labour and actively trying to do so, similar to the unemployed. They are also a sizeable group – around 700,000 people compared to approximately 1.4 million unemployed – and this measure remains elevated above pre-crisis levels (by about 36 per cent). There is one other important source of slack, potential labour from abroad, that is also important for labour market dynamics, but which (see Box 4) is hard to measure.

i Box 4: Potential migrants as another source of labour supply

covers all sources of additional labour supply in the UK (as measured by the Labour Force Survey of UK residents) but it does not cover people who wish to supply UK firms with more labour who live outside the UK. Since the expansion of the EU in 2004 there has been a large increase in migration into the UK of people looking for, or coming to take up, work. On average, net migration for work averaged 50,000 per quarter since 2009, suggesting that potential and actual labour supply was being significantly boosted by foreign workers over this period.

It is impossible to properly estimate the extent to which workers in other countries contribute to potential labour supply in the UK, but we can get some sense of their importance relative to domestic sources by looking at the number of unemployed people and the number of recently arrived migrants moving into work. Figure 20 shows that over the past two decades, between 400,000 and 600,000 previously unemployed people have moved into work each quarter. This compares to 15,000 to 50,000 newly arrived migrants.

These two groups are not directly comparable (for example because those previous unemployment may be more likely to cycle in and out of work whereas those who have moved to the UK for work may have greater longevity), but the picture presented in Figure 20 is nonetheless illustrative. To the extent that foreign workers are captured in the Labour Force Survey once they've arrived in the country, they will be captured in our estimations of the relationship between slack and wages. When they are not captured in the Labour Force Survey (either because they move directly from another country into UK jobs or because they are out of the survey sampling frame) then they represent an additional source of slack not captured in our models.

In terms of the impact that such migrants have had on pay growth, a recent report by the Migration Advisory Committee concluded that migration is not a major determinant of the wages of UK-born workers, but there is some evidence that migrants may have supressed wages for lower-skilled workers and pushed up wages for the higher skilled. Given what we know about the distribution of pay growth since 2014, it seems unlikely that migrants were having a large impact on pay growth over a period during which it has been relatively robust at the bottom.

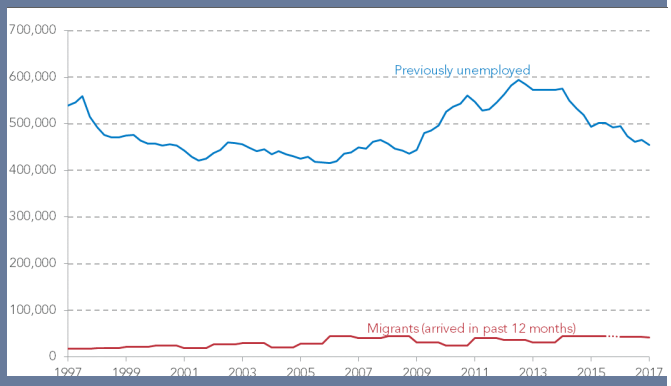


Figure 20: Unemployed and recently-arrived migrants moving into employment

Number of people moving into employment each quarter

Notes: Data for migrants who have arrived in past 12 months only available in spring quarters; no data available for 2016.

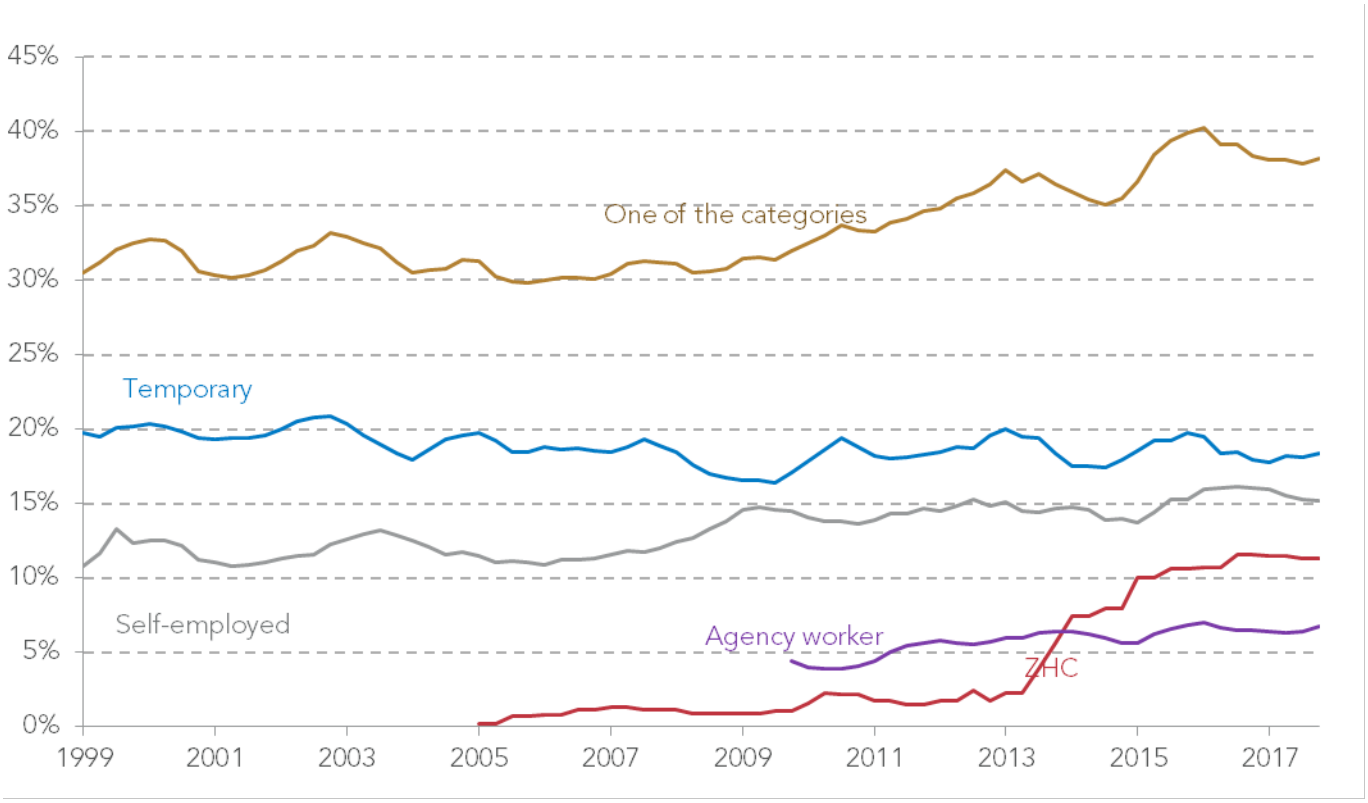
Source: RF analysis of ONS, Two-quarter Longitudinal Labour Force Survey

[29] The question is asked of all those in employment, including the self-employed.

To get a sense of who those wanting more hours or to move to full-time work are it is illustrative to examine the types of jobs they are doing. The vast majority (currently 74 per cent) are people who are working part time, with the remainder working full time. Figure 21 breaks the group down further and shows that 19 per cent are on temporary contracts, 15 per cent are self-employed, 11 per cent are on zero-hours contracts (ZHCs) and 8 per cent work through an agency. Some workers fall into more than one of these categories, but looking across all categories we find that between 35 and 40 per cent of those who want to supply more labour, and are actively doing so, are in atypical work.

Figure 21: Those in atypical forms of work make are an important part of the those wishing to supply more labour

Those in atypical forms of work make are an important part of the those wishing to supply more labour

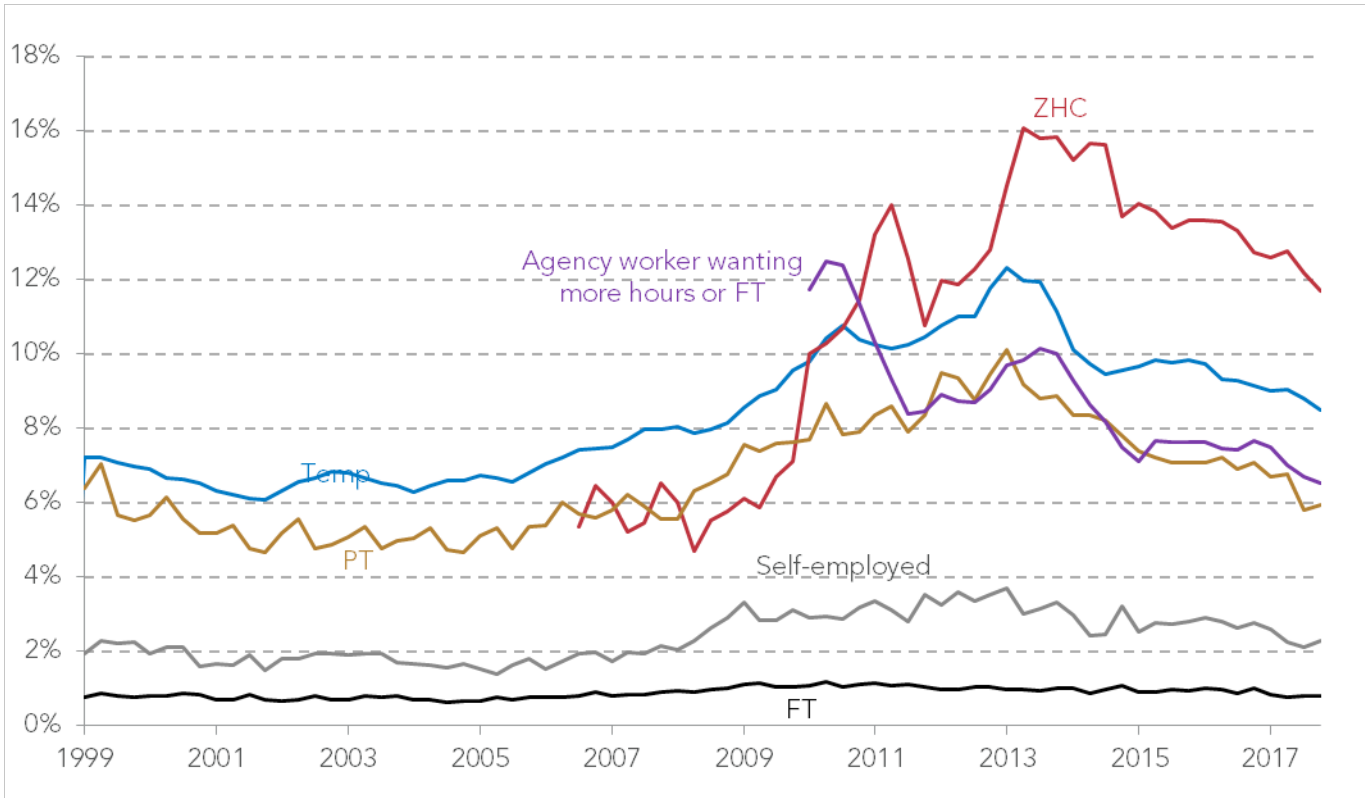


Notes: Categories sum to more than 100 per cent because workers may fall into more than one category.

Source: RF analysis of ONS, Labour Force Survey

The fact that these forms of work grew in prevalence in the immediate aftermath of the financial crisis provides a good reason to believe that many workers in them should be included in our measure of slack. Those in atypical forms of work are obviously not unemployed, but like the unemployed, many wish to supply more labour. To underscore this point, figure 22 provides the corollary of Figure 21, showing how prevalent job-search is among different kinds of workers. People working full time have the lowest rate of job search, then the self-employed, followed by part-time employees. People working on a temporary contract or on a ZHC tend to have the highest rates. Furthermore the propensity of these workers to search for work rose in the aftermath of the crisis and, although it has fallen back, is higher than pre-crisis levels.

Figure 22: Those in atypical forms of work are more likely to want to supply more labour than before the crisis



Source: RF analysis of ONS, Labour Force Survey

In sum, then, the strengthening correlation between atypical employment forms and those wanting to supply more labour and actively searching for opportunities to do so suggests that atypical employment is a relevant consideration in discussions of labour market slack, although whether these workers exert pressure at different part of the earnings distribution than unemployed workers is not clear (Box 5).

i Box 5: Where in the pay distribution are such workers?

Having identified groups of workers who wish to supply more labour, and are actually seeking to do so, we can see where in the pay distribution they enter work. It is plausible that, although the unemployed and those that wish to increase their hours or move to full-time work are similar in that they are adding to labour supply, they are entering work at different points in the earnings distribution.

In the long run this may not matter. Even if the unemployed tend to move into lower-paid jobs, a low level of unemployment will reflect the fact that across the economy there is strong demand for labour, with vacancies becoming available across the distribution as people move into higher-paying jobs, in effect freeing up roles for those moving from unemployment into work. However, in the short run it could be that the unemployed and job-movers exert pay pressure in different parts of the distribution.

To illustrate this, Figure 23 shows nearly half the unemployed who entered work between 2014 and 2017 did so at the bottom of the earnings distribution, compared to around 40 per cent of those moving from part-time work (our closest approximation to those previously underemployed and searching for work in the longitudinal data used here). Furthermore those moving into full-time work tended to move into jobs higher up the distribution than people previously unemployed. However, the differences are not dramatic, which may suggest that qualitatively speaking the unemployment and underemployed job-seekers are not too dissimilar.

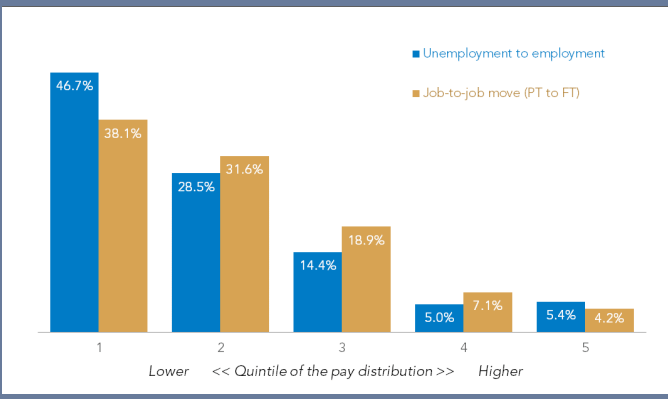


Figure 23: Previously part-time workers are more likely to enter jobs higher up the earnings distribution than those who were unemployed

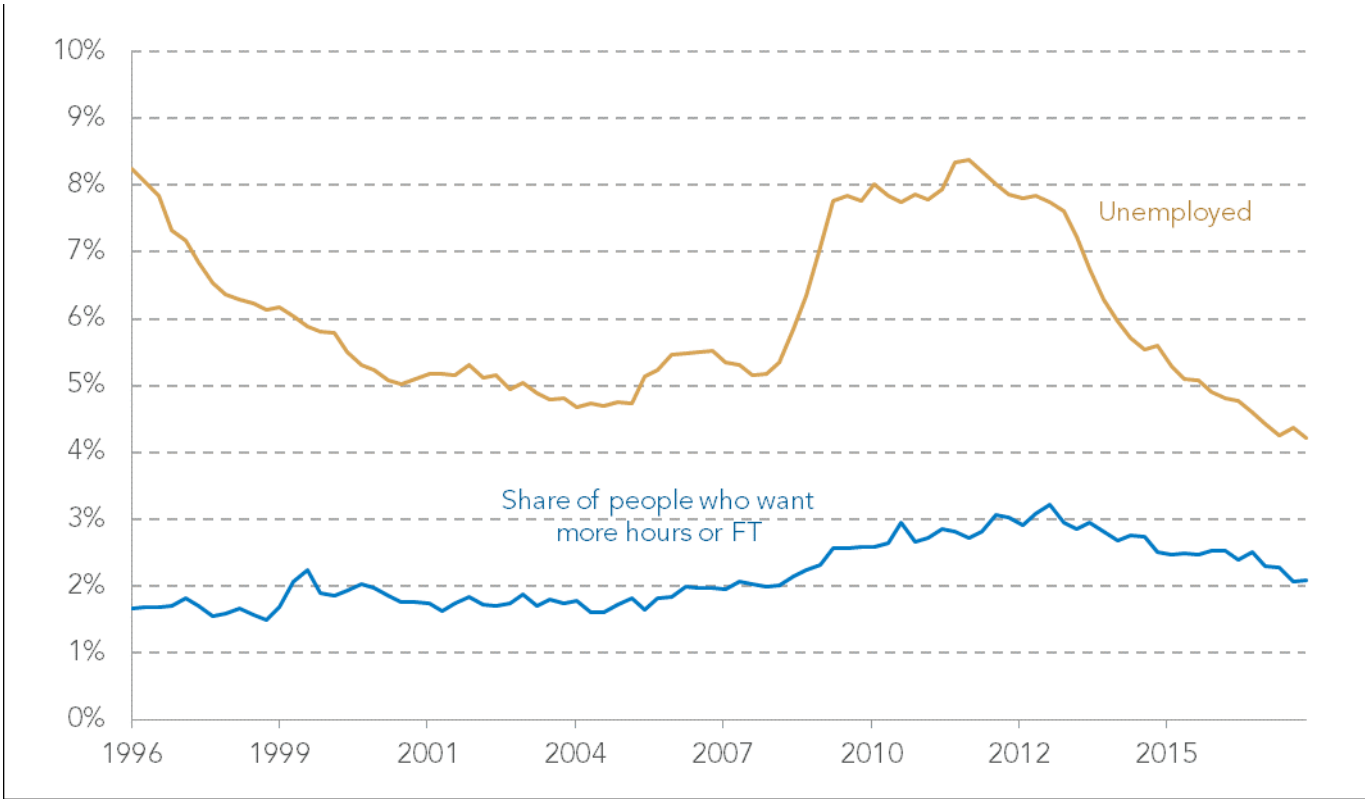
Proportion of employees who have moved into work, or started a new job over the past year: 2014-17

Notes: Data for migrants who have arrived in past 12 months only available in spring quarters; no data available for 2016.

Source: RF analysis of ONS, Five Quarter Labour Force Survey

We have identified those who want more hours or a full-time job and are actively searching as a group representing labour market slack alongside the unemployed. It is therefore worth taking a look at their prevalence in proportional terms (as opposed to the numbers presented in Figure 19) to see if there is evidence that slack remains elevated above pre-crisis levels. Figure 24 charts how our two measures of slack has evolved over time. It shows that the unemployment rate has now dipped well below pre-crisis levels, yet the share of people aged over 16 that are employed but who say they would like to work more, and are actively trying to do, is still around 30 per cent above pre-crisis levels. On this basis, we the question becomes whether the inclusion of this group alters our understanding of the Phillips curve relationship.

Figure 24: Those looking to work more hours remains elevated above pre-crisis levels



Source: RF analysis of ONS, Labour Force Survey

Our broader measure of slack can explain some, if not all, of the wage growth puzzle

The equations that follow update our understanding of the Phillips curve include both the unemployed and those underemployed and actively searching for more hours or a full-time job. In these, we disaggregate those looking for more work to see which types of workers (part-time wanting full-time, people wanting more hours, on temporary contracts, etc.) have the strongest association with pay.

The results of our models are given in for the period 2003-17. The third row of the table gives the results when just the unemployed are used as our measure of labour market slack. The coefficients (-0.12 percentage points and 0.6 per cent) are identical to those in Table 1.

The rows below this show the relationship between wage growth (columns two to four) or wage levels (columns five to seven) and various measures of slack across regions and nations of Great Britain. The columns titled 'unemployed' give the coefficient on the unemployment term in each model. The column titled 'extra slack' gives the coefficients on our new measures of labour market slack, while the last column ('combined') gives the coefficient where the unemployed and 'on-the-job searchers' are grouped together.

Table 2: Relationship between slack and typical wages: 2003-17

	Growth in median weekly wages			Level of median weekly wages		
	Unemployed	Extra slack	Combined	Unemployed	Extra slack	Combined
Unemployed	0.12 ppts			0.6%		
PTwFT	-0.02 ppts	0.26 ppts		0.3%	0.4%	
PTwFT & unemployed			0.24 ppts			0.7%
More hours	0.02 ppts	0.2 ppts		0.3%	**1 % ***	
More hours & unemployed			0.26 ppts			0.7%
PTwFT, more hours	0.008 ppts	0.38 ppts		0.2%	**1.2 % ****	
PTwFT, more hours, unemployed			**0.38 ppts ****			**1.2 % ****
PTwFT, more hours, ZHCs	0.006 ppts	0.36 ppts		0.2%	**1.2 % ****	
PTwFT, more hours, ZHCs, unemployed			0.28 ppts			0.8%
Temporary contract	0.02 ppts	0.2 ppts		0.5%	0.2%	
Self-employed	0.1 ppts	-0.004 ppts		0.5%	0.2%	
Lower-qualified self-employed	0.18 ppts	-0.08 ppts		0.7%	0.0%	
All searchers	0.08 ppts	**0.64 ppts ***		0.5%	0.8%	
All searchers, unemployed			0.54 ppts			1.0%

Notes: Significant coefficients are in bold, with asterisks denoting significance level (*** 1%, ** 5%, * 10%). "PTwFT" stands for part time but wanting full time, "more hours" includes people who want more hours. The 'lower-qualified' self-employed are all those with less than higher education. Both models include year and region fixed effects. The level of weekly wages model is estimated using two-stage least squares, where unemployment is instrumented with its first and second lags and wages instrumented with their second and third lags. The growth in wages model uses lagged values of explanatory variables and includes change in independent variables to control for short-run fluctuations (coefficients not shown). The level of wages model includes the lag of weekly wages (coefficients not shown). Full results available in the Annex.

Source: RF analysis of ONS, Labour Force Survey; ONS, Annual Survey of Hours and Earnings; ONS, New Earnings Survey

The inclusion of people in work who would like to work either full time or more hours, and who also say they are searching for work, adds to the size of the coefficients and therefore the strength of the relationship between our measure of slack and wages. Taking the second column in Table 2, a fall in our measure of slack by 1 percentage point increases the growth of weekly wages by 0.12 percentage points when just the unemployed are included. Including those people working part time who would like to work full time (and who are searching for work) increases the coefficient to 0.26 percentage points.

The second strongest relationship is between the unemployed, along with those who want to work full time or more hours, and pay growth. A reduction of one percentage point in the share of such people is associated with a 0.38 percentage points rise in pay growth. The strongest relationship is between wage growth and a measure of all people in work who are searching for a new or additional job. A reduction of 1 percentage point in the share of such people increases pay growth by 0.64 percentage points. The last result is interesting given that people in work who are searching for a new job have an ambiguous relationship with labour supply because they may not be seeking to provide any additional labour (just labour for a different firm). It could be related to 'spillover' effects from job-to-job moves, for example firms raising pay after resignations of (non-underemployed) former staff in order to prevent further departures.

Finally it is worth noting that the strength of the relationship between slack and wage growth weakens when the self-employed are included, perhaps suggesting that it is difficult to measure the impact that the increase in the share of self-employed people are having on the wages of employees over this period. The coefficients in columns two and three suggest that there is more slack in the jobs market than the unemployment rate alone picks up. That said, the vast majority of coefficients are insignificant, suggesting that the relationships are imprecisely estimated.

Turning to column five, where we investigate the relationship between the same measures of slack and the *level* of weekly wages, a similar picture emerges. The unemployment rate has a negative relationship with the level of wages across regions and nations of Great Britain. A fall in the unemployment rate of 1 percentage point increases the level of wages by 0.6 per cent. However, once we include other people who also wish to supply more labour (and are actively looking for work) the relationship strengthens. The strongest effects are found when we include people who want to work full-time, those wanting more hours, in addition to the unemployed. An increase of one percentage point in the proportion of such people is associated with an increase in the level of regional wages of 1.2 per cent. Including those on ZHCs doesn't seem to strengthen the relationship at all.

Overall, the results given suggest that there is more slack than the unemployment figures alone suggest. In the same way as we did for compositional effects, we can summarise the impact that the elevated level of slack has had on real pay growth in recent years when compared to pre-crisis growth rates. Based on the coefficients in Table 2, a 1 percentage point fall in the amount of slack would push up wage growth by 0.38 percentage points. Our measure of slack that combines the unemployed with on-the-job seekers who want more hours is around 1 percentage point higher than it was between 2001 and 2006, suggesting that real wage growth may be around 0.4 percentage points lower as a result.

Although heightened levels of slack do a good job of explaining some of the slowdown in wage growth that occurred between 2014 and 2017, it does a less good job of explaining why pay growth remains so sluggish. Our measure of additional slack has fallen over the past year and so it is unlikely to offer a robust explanation for why growth remains so slow now.

Weak productivity growth has been the most important head-wind to sluggish wage growth

No examination of why wage growth has been so sluggish over the past few years would be complete without discussing productivity. The productivity puzzle (why the UK has failed to recover to pre-crisis rates of productivity growth) has been the subject of countless pieces of analysis. Recently, somewhat of a consensus has emerged about where (sectors, firms, part of the country) the crisis lies.[30] Here we will not go into detail on why productivity growth has been so slow, but rather attempt to quantify its impact on pay growth.

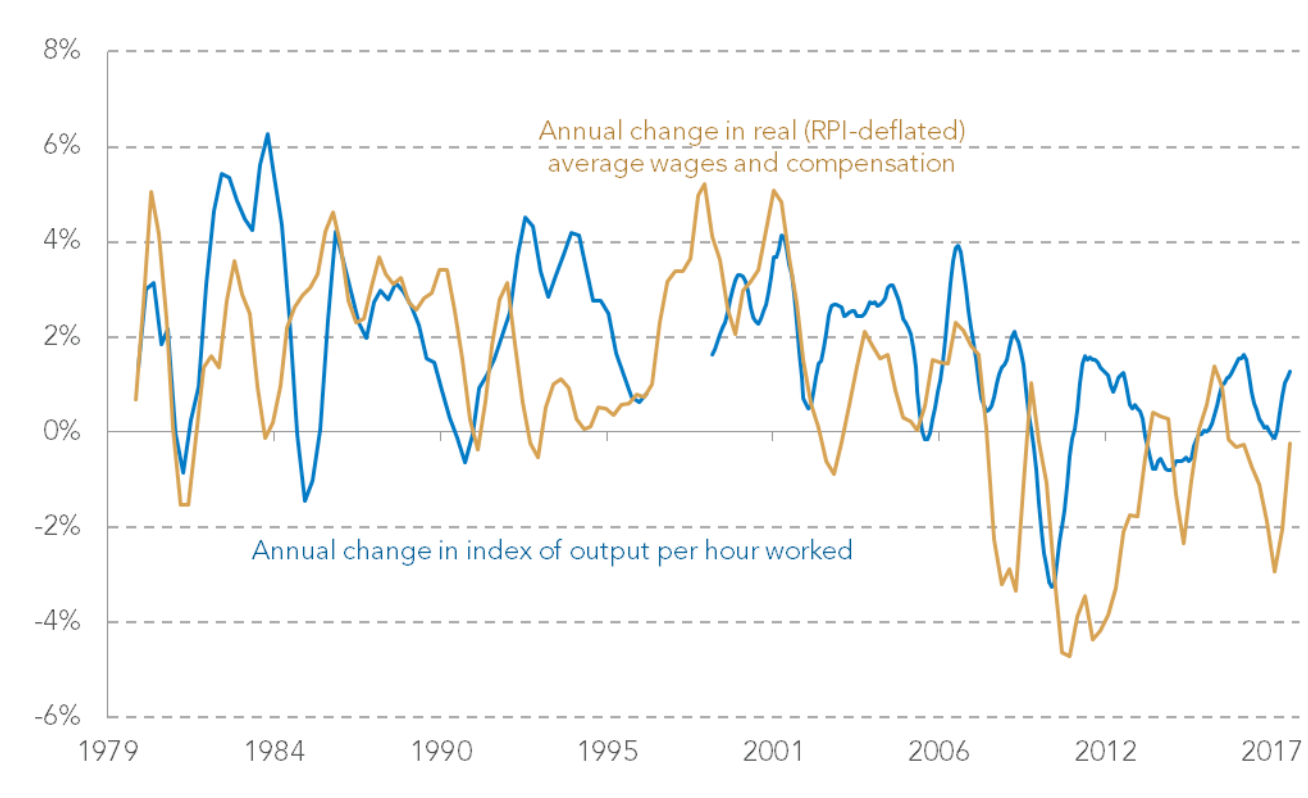
Although some have argued that the link between productivity and pay growth has broken down there is scant evidence that this is the case. Since 1993 output per hour worked has increased by 33 per cent and mean pay per employee hour has increased by 36 per cent.[31] The close link between productivity and pay remains and so the slowdown in productivity improvements offers a pretty convincing explanation for why pay growth has been so slow. Figure 25 shows that productivity and real wages tend to move closely together and that periods of rising productivity are usually associated with stronger wage growth.

[30] C Giles, 'Britain's productivity crisis in eight charts', *Financial Times*, 13 August 2018

[31] This close link between pay and productivity is clear when the two are deflated using the same price index (the GDP/GVA deflator). Where a disconnect between the two appears is when the consumer price deflator is used to deflate wages. Yet as we point out above this is because over the past few years the consumer price deflator has risen by more than the producer price deflator because of depreciations and imported inflation, there is nothing yet to suggest the two price series have decoupled in any meaningful way.

Figure 25: Productivity and wage growth are closely related

Average change in real labour productivity and real average wage



Notes: The UK figure on this chart is not as up-to-date as those reported elsewhere in this report in order to be consistent with international data.

Source: Resolution Foundation analysis of stats.OECD.

In the long-run there is strong empirical evidence that increases in wages tend to move very closely with productivity. Between 1979 and 2008 productivity grew at an annual average rate of 2.3 per cent, pay by 1.9 per cent. Theory would suggest that productivity determines the rate of (real) pay growth, and any deviation from this likely means that either a greater share of output is flowing to capital rather than labour, a greater share of output is flowing to non-wage compensation, or that the two series are different because the two are deflated using different price indices. While there is little evidence of the former occurring, the latter has been important over the past few decades, and this, along with differences in the way the two series are deflated, explains why wages have grown slightly slower than productivity since the 1980s.

Since 2014, productivity growth has averaged 0.8 per cent and real wage growth (based on average weekly earnings rather than the National Accounts-based measures used in Figure 25) has averaged 0.6 per cent. This is not to say that productivity just affects pay and not vice versa (see Box 6), indeed one of the likely effects of falling pay and the subsequent slow growth in real wages is that the lack of wage pressure has dulled the incentive for firms to invest and improve efficiency. In the long run, though, productivity growth (determined by a range of factors including technology, human capital, and the way in which the two are combined) sets an 'upper bound' to the rate at which pay can rise.

i Box 6: The interaction between productivity, the labour market and pay

Although productivity growth sets a limit on the rate of real pay growth in the long run, over a shorter time horizon, the state of the labour market can affect productivity. For instance, a tight labour market, where the potential supply of labour is relatively constrained and labour is relatively expensive, may encourage firms to adopt new technologies because the relative cost of capital has fallen. An improved jobs market can also encourage job-switching, which reduces mismatches between firms and workers and can boost productivity by getting workers to high-growth and innovative firms quickly. It is therefore an important sign of the state of the UK labour market that voluntary job-to-job moves are still (around 10 per cent) below their pre-crisis level, as Figure 26 shows.

It is particularly noticeable that moves are around 13 per cent below their pre-crisis level for people aged under 29. This group tends to move more than others because early on in people's careers such moves are a vital way to gain experience and benefit from above-average pay rises. The fact that moves are down for this group could have serious ramifications for their career prospects going forward, but will also weigh on aggregate pay growth (because of fewer above-average pay rises) and weigh on productivity growth. Muted job-to-job moves are sign of a labour market that is less dynamic. Regaining some of this dynamism is both reliant on, but also will contribute to, faster productivity growth.

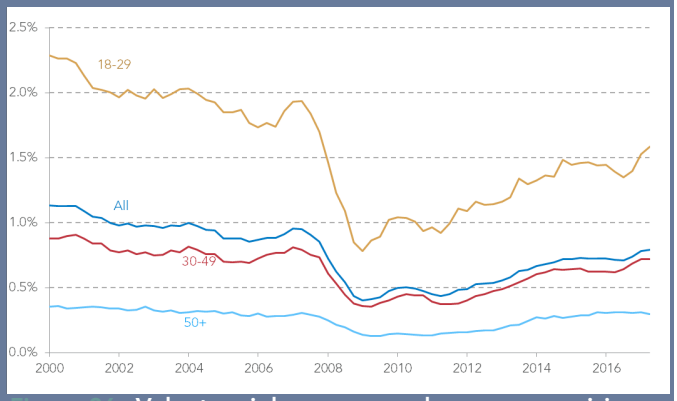


Figure 26: Voluntary job moves are down on pre-crisis levels

Share of people moving jobs voluntarily each quarter

Source: RF analysis of ONS, Labour Force Survey

We can examine the relationship between pay and productivity more formally by constructing a regression model (similar to those above) in which we test the relationship between real wage growth, trend productivity, and our measure of labour market slack. The results are shown in Table 3. The magnitude of the two coefficients are of similar size. What's more, the coefficient on the share of people wanting to work full time, more hours and the unemployed is the same as that in Table 2, suggesting that a lot of what was being picked up in the year and region dummies in our previous model is now being picked up in the trend productivity term. The coefficient on the productivity variable suggests that the post-crisis downturn in productivity growth has weighed on real wage growth. Over the past three years productivity growth has been around 1.2 percentage points lower, on average, than it was between 2001 and 2006, suggesting that this has repressed wage growth by at least half a percentage point.

Table 3: Relationship between pay growth, productivity and labour market slack: 2001-16

	Change in independent variable of 1 percentage point
	Growth in real median weekly wages
Trend productivity	**0.47 ppts *****
PTwFT, more hours, unemployed	**0.38 ppts ***

Notes: Significant coefficients are in bold, with asterisks denoting significance level (*** 1%, ** 5%, * 10%). Data on regional productivity is only available 1997 to 2016. Trend productivity is an average of the last three years of productivity growth. The model is run without year or region terms to allow for differences in productivity growth rates between regions, as well as aggregate improvements in productivity, to explain wage growth. This model uses lagged values of our measure of slack and includes change in slack to control for short-run fluctuations (coefficient not shown). Full results are available in the Annex.
Source: RF analysis of ONS, Labour Force Survey; ONS, Annual Survey of Hours and Earnings; ONS, New Earnings Survey; ONS, Regional Productivity

Nominal wages no longer respond to inflation shocks

Before we quantify the impact of compositional factors, heightened slack and weak productivity growth combined on the difference between real pay growth in recent years and that in the pre-crisis period, it is worth returning to the question of inflation. Inflation played a big part in our explanation of why the UK suffered a more pronounced wage squeeze in Section 2. When we take the post-2014 sluggish pay recovery period as a whole, however, it is not helpful for explaining why wage growth has been weaker than is was pre-crisis. This is because on average inflation was actually slightly *lower* over 2014-17 than it was during 2001-06. However, the very recent (2017-18) inflation spike that followed the EU referendum pushed real wages negative for most of 2017, and is therefore part of the reason why wage growth has been poor over the past year.

In some respects there is something simple and mechanical about this – inflation rises and so real wage growth slows – yet this points to a fundamental way in which the labour market has changed over time. Although wages and inflation are closely related – a large part of inflation being driven by rising labour costs – it used to be the case that nominal wages were far more responsive to externally generated inflation shocks than they are now. Indeed the ratcheting up of nominal pay in response to inflation shocks was arguably the key labour market concern in the 1970s and 1980s.

No longer. Following the two recent devaluations of sterling, import prices rose, thereby boosting inflation and eroding real wages. The post-referendum devaluation of 12 per cent pushed up prices by 4 per cent over 2017 and 2018, with no response from nominal earnings. Although the unresponsiveness of nominal pay growth to imported inflation became particularly evident in the aftermath of the crisis and referendum, it is clear that the link between inflation and pay has been weakening for some time. Figure 27 shows the relationship between wage growth (measured as the growth in average wages and salaries) and inflation for each quarter since 1972. Between 1972 and 1998 the relationship between the two was pretty strong: periods of high inflation were also associated with higher (nominal) wage growth. Figure 27 also tells us something about the relationship between *real* wage growth and inflation. The two would be independent if the slope of the line was constant, and *nominal* wages increased one-to-one with inflation (for instance if real wage growth was always 2 per cent above inflation). However between 1972 and 1998 the slope of the line declines as inflation increases, indicating that periods of higher inflation were also periods of lower *real* wage growth.

Figure 27: The relationship between inflation and nominal wage growth has changed since the late 1990s

Source: RF analysis of ONS, Quarterly National Accounts; ONS, Consumer Prices

While there is a strong association between inflation and wage growth between 1972 and 1998, there has been no association between the two in the two decades since. Between 1999 and 2018, both inflation and wage growth have been a lot lower, but more importantly there is little evidence that wages have responded to inflation shocks.

In the short run, this clearly matters for living standards. If the risks associated with inflation shocks fall onto workers rather than firms, then people should be paying close attention to exchange rate movements not just because they affect the price of a Spanish holiday, but because they increasingly determine real living standards (in the short run).

Whether or not this matters in the long run depends on why inflation has risen.[32] If, as followed the financial crisis, the rise in inflation reflects a real fall to national income, then this obviously has long-run ramifications for living standards. However if the rise in inflation reflects a short-lived rise in imported goods (such as an oil price shock) or investors taking a dimmer view of the country's future growth potential (following the EU referendum), then this may not have a lasting impact on living standards once the effect dissipates and as long as the economic fundamentals remain unchanged.

Although it is incredibly difficult to disentangle real versus nominal and long-versus short-run effects, doing so will become more important if wages are unresponsive to shocks. It cannot be denied that over the past year real wage growth has been slower than it would otherwise have been without the depreciation of sterling and rise in inflation. Whether this effect will persist is not yet clear.

[32] K Forbes, I Hjortsoe & T Nenova, 'The shocks matter: improving our estimates of exchange rate pass-through', *External MPC Unit Discussion Paper 43*, November 2015

Although the depreciation of sterling has undoubtedly been a big (if not the biggest) contributor to slower real wage growth over the past year, to understand the whole period since 2014 in the next section we attempt to quantify the effect of each factor.

One factor that has been discussed a lot in relation to lower-paid workers in the US is that a rise in monopsony and a reduction in workers bargaining power has reduced wage growth. However, what evidence we do have for the UK suggests that workers are spread across more firms than they were in the mid-2000s, suggesting that the danger of monopsony has, if anything, fallen. Given this it is difficult to conclude that this factor can do much to explain why wage growth is slower now than it was a decade ago.

Section 4: Why pay growth has been so sluggish

Having marshalled the evidence for the various theories seeking to explain why wage growth has been so poor in recent years, we can now quantify the importance of each one. The results suggest that the most important driver has been meagre productivity growth. However, this does not mean that we should ignore the role of other factors, particularly greater slack than our headline measure of unemployment is able to capture and – more recently – inflation shocks.

Turning to the future, the prospects for stronger wage growth hinge on restarting improvements in productivity. Although heightened slack plays an important part in explaining the weakness of wage growth over the past four years it cannot explain why – given that most remaining slack has unwound – growth remains so poor.

Slower productivity growth and heightened slack explain almost two-thirds of the slowdown in real wage growth

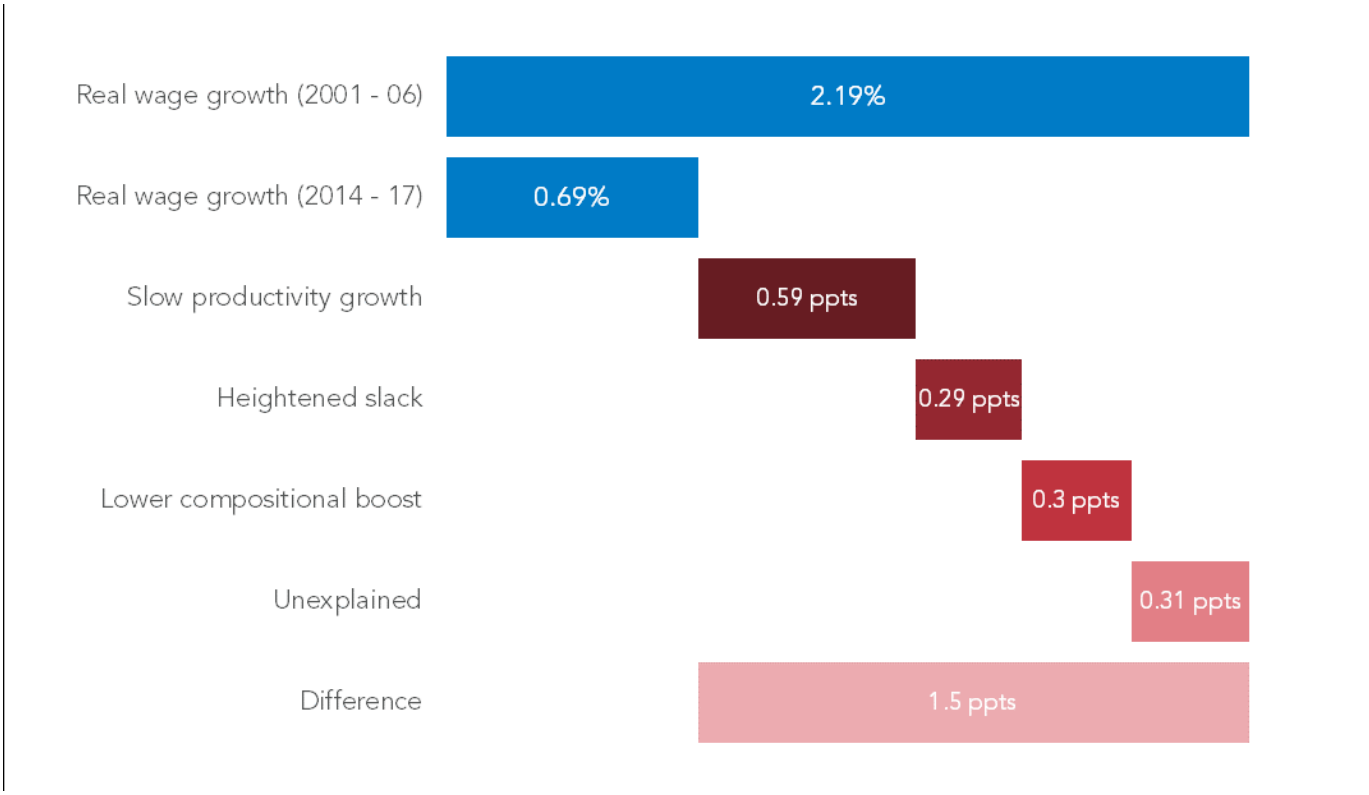
The regression models, for which the results are provided in Table 1, 2 and 3 in the previous section, describe the relationship between slack, productivity and real wage growth. We can also obtain from Figure 15 in the previous section an estimate of the impact of the slowdown in the compositional boost to wage growth.

Using this information we can get some sense of how important each factor is in explaining the slowdown in real wage growth between 2014 and 2017, compared to the rate in the pre-crisis period of 2001-06. The results are presented below, but first a quick warning is warranted. For some of these factors (productivity and slack) we have tested their relationship with pay in a model with the two combined (Table 3 presents the results). However, our estimate of the impact of a lower compositional boost does not take into account the effect that a change in productivity or slack would have on the composition of the workforce. For example if the compositional boost had been higher between 2014 and 2017 then it is likely that productivity would also have been higher (perhaps because there would have been a larger increase in the share of people with higher qualifications, who are likely to be more productive), and vice versa. Therefore our estimate of the effect of a lower compositional boost, although presented as independent from slack and productivity, is not.

With this important caveat in mind, Figure 28 quantifies the various factors that have contributed to slower wage growth. Growth averaged 2.2 per cent per year between 2001 and 2006, but between 2014 and the end of 2017 it has only averaged 0.7 per cent. Of this 1.5 percentage point slowdown between the two periods, around 40 per cent is the result of slower productivity growth, 20 per cent is the result of heightened levels of slack, 20 per cent a lower compositional boost (though the true figure is likely lower for reasons outlined above) and another 20 per cent remains unexplained.

Figure 28: Productivity is the most important factor in explaining poor wage growth since 2014 in comparison to post-crisis growth rates

Contributions to the slowdown in real wage growth: 2014-17 compared to 2001-06



Notes: Magnitudes are calculated by estimating the difference (in percentage points) between levels of productivity growth and levels of slack in 2001-06 and 2014-17. We then apply elasticities derived from regression models (0.37 for productivity and 0.38 for our measure of slack) to these to produce estimates. Unexplained is the residual that cannot be explained by our models or the lower compositional boost.

What might the 'unexplained' factors be? A larger amount of employee compensation being paid in non-wage forms (e.g. pension contributions) and firms paying lower wages in order to meet legacy pension commitments will likely be playing a role. Our previous research has suggested that such legacy payments could be lowering pay by between 0.2 to 0.3 per cent (these are not percentage point changes to pay growth, so not comparable to the figures above) per year.[33] There could also be factors not picked up in our regional productivity modelling such as the low propensity for UK workers to move regions for work, though it is less clear whether this has worsened over time to an extent sufficient to explain the pay slowdown.[34] In addition, and as discussed at the end of the previous section, one reason for poor pay growth many have pointed to is the sterling depreciation and consequent rise in inflation that followed the EU referendum. This is certainly responsible for lower real wage growth in 2017 than otherwise would have been the case, but actually over the whole period (2014-17) inflation was slightly *lower* than in the pre-crisis (2001-06) period.

[33] M Whittaker & B Bell, *The pay deficit: measuring the effect of pension deficit payments on workers' wages*, Resolution Foundation, May 2017

[34] A Turrell, at al., 'Using job vacancies to understand the effects of labour market mismatch on UK output and productivity', *Bank of England Staff Working Paper 737*, July 2018

Right now productivity is the biggest factor holding back pay growth

Figure 28 shows how much each factor has contributed to slower real wage growth between 2014 and 2017, but what about the last six months? This is a pertinent question as it gets closest to what policy makers are keen to understand – the factors likely to be most important for pay growth in future.

We can get some sense of the answer to this question by analysing how slack, productivity and compositional factors have evolved since the start of 2018. Productivity growth has risen from an average of 0.7 per cent per year to 1.2 per cent over the past six months; the proportion of workers who are underemployed and searching for work has fallen from 2.5 per cent to 2.1 per cent; and the compositional effect has remained constant at 0.3 percentage points. Updating Figure 28 to take into account these changes suggests that the contribution of slack to the slowdown in real wage growth has fallen to 0.1 percentage points, while productivity is now responsible for 0.4 percentage points. That the 'unexplained' component rises is unsurprising, given that the post-referendum devaluation is undoubtedly having a large impact. Over the past year, inflation has averaged 2.5 per cent, 0.8 percentage points higher than it did between 2001 and 2006. With inflation trending towards its pre-crisis average in the latest data, we might expect this component to play less of a role in the years ahead.

What these most recent results make clear is that although heightened slack has been an important contributor to slower wage growth in recent years, further tightening has reduced its effect and now productivity appears to be the main driver.

Section 5: Conclusion

Nearly a decade on from the start of the worst pay squeeze in over a hundred years, we now have relatively good understanding of what drove it and, hopefully, something of an agreement (if not yet a consensus) is forming about why pay growth has been so sluggish over the past few years. Much of what we have learnt also has important lessons for the future. Three insights are worth highlighting.

First, when the next recession hits we need to be aware of the different ways in which the economy can adjust. We may not get the same mix of unemployment, depreciation, inflation and real wage growth that we did after the financial crisis. It is just as easy to imagine a world in which the pound fares relatively well and firms, unable to cut nominal wages and in a world of relatively subdued inflation, cuts hours and headcount rather than allowing real pay packets to fall. In such a world, automatic stabilisers (the way taxes and welfare benefits act to lessen the impact of fluctuations in output on family living standards) become more important. However, the relative paucity of out-of-work benefits compared to the previous crisis – with £14 billion of welfare cuts currently underway – may mean that our stabilisers are less effective than they could be.

Second, even if job losses are lower than the levels we were used to before the financial crisis during the next downturn, a better understanding of labour market slack will be important in future. Unemployment perhaps serves as a good proxy in a world in which the vast majority of people work full time, but underemployment and atypical work are a larger part of our labour market now. They are likely to continue to be so in future, and a broader measure of slack is important, not least because the recent experience suggests that after a downturn it may take longer for slack to unwind than previously thought.

Third and finally, in downturns and expansions it would appear that one important structural change that has occurred over the past two decades or so is the relationship between nominal wages and imported inflation shocks. As we have shown, nominal wages no longer appear to respond to shocks and so, at least in the short run, such shocks will become increasingly important for living standards. Finding ways in which the risks associated with exchange rate movements can be more equally borne by firms, the state and employees should be a priority.

Beyond these insights, we are left with productivity as the most important part of the recent pay story. It is perhaps somewhat dispiriting that in explaining the current period of sluggish pay growth we have simply changed the question. It is no longer ‘why is wage growth so sluggish?’, but rather ‘why is productivity growth so poor?’ There is something of a consensus emerging about where the current slowdown in productivity has occurred, but what is lacking is a similar consensus about why it has occurred. Moving towards such a consensus is perhaps the next task.

Annex

Datasets

The report uses a range of statistics and datasets produced by the Office for National Statistics. We make uses of the following microdata from the ONS:

Office for National Statistics. Social Survey Division. (2016). *Quarterly Labour Force Survey*. UK Data Service. SN: 8039, http://doi.org/10.5255/UKDA-SN-8039-1

Office for National Statistics (2018). *Annual Survey of Hours and Earnings, 1997-2017: Secure Access.* 19/07/2018]. *11th Edition.* UK Data Service. SN: 6699, http://doi.org/10.5255/UKDA-SN-6899-10

Modelling

The report uses a number of econometric models to estimate relationships between variables of interest. Below we present each model used and provide a full set of regression outputs.

Exploring changes in pay and unemployment across countries (Figure 10 and Figure 11)

We build two simple regression models:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon_1$$

Where: Y is change in real hourly pay (2010-14) (CPIH-adjusted). $\beta_1 X_1$ *is change in constant GDP per capita (peak to trough).* $\beta_2 X_2$ *is cumulative inflation (2010 – 2014).*

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon_1$$

Where: Y is change in unemployment (trough to peak). $\beta_1 X_1$ *is change in constant GDP per capita (peak to trough).* $\beta_2 X_2$ *is cumulative inflation (2010-14).*

We estimate this model using an ordinary least squares estimator for 15 developed countries, the results of which are given below. The model does a good job of explaining changes in hourly pay. It also does a good job of predicting the UK's pay squeeze (6.7 per cent versus an actual value of 7.1 per cent). However, the second model does a relatively poor job of explaining changes in unemployment. Nevertheless, our predicted estimate of the change in unemployment for the UK is close to the actual value (3 per cent rather than 2.7 per cent), suggesting that we can be more confident of our estimate for the UK.

	Δ Hourly pay	Δ Unemployment
GDP	-0.461	-0.304
	(0.433)	(0.580)
Inflation	-1.301**	-0.436
	(0.445)	(0.595)
Constant	0.0581	0.0656
	(0.0466)	(0.0624)
Observations	15	15
R-squared	0.493	0.080
Robust SE	YES	YES

Analysing the relationship between unemployment and pay (Table 1)

We build two regression models. The first of the form:

$$Y_{it} = \beta_0 + \beta_k X_{k,it} + \gamma_n E_n + \delta_t T_t + u_{it}$$

Where: Y is change in hourly pay for region i at time t. X represents two independent variables: the lag of the unemployment rate for region i at time t and the change in the unemployment rate for region i at time t. The model includes region fixed effects (E_n) and year fixed effects (T_t). The results are given below.

Depedent variable: Growth of median weekly wages				
	1986 - 2017	1986 - 2002	2003 - 2012	2003 - 2017
Unemployment rate $_{t-1}$	-0.0250***	-0.0236***	-0.0207*	-0.00664
	(0.00404)	(0.00482)	(0.00980)	(0.0159)
Δ Unemployment rate	-0.0279**	-0.0357***	-0.0149	-0.00901
	(0.0108)	(0.00800)	(0.0170)	(0.0204)
Constant	-0.0351***	-0.0320**	-0.0410	0.000974
	(0.0100)	(0.0101)	(0.0302)	(0.0500)
Observations	352	187	110	165
R-squared	0.731	0.643	0.799	0.718
Number of region	11	11	11	11
Region FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Robust SE	YES	YES	YES	YES
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

The second model is estimated using a two-stage least squares estimator of the form:

1. $$X_{it} = \beta_0 + \beta_{kZk,it} + \gamma_n E_n + \delta_t T_t + u_{it}$$

$$Y_{it} = \beta_0 + \beta_{k\bar{x}k,it} + \gamma_n E_n + \delta_t T_t + v_{it}$$

When $X_{k,it}$ are our endogenous variables, in this case the first lag of median weekly wages and unemployment; and our instruments Z are the second and third lag of real median weekly pay in region i at time t and the first and second lag of the unemployment rate in region i at time t.

After obtaining the fitted values of Xit we plug them into the second equation, where Y is the level of median weekly wages in in region i at time t, and vit is a composite error term that is uncorrelated (in theory) with Xit. The model includes region fixed effects (En) and year fixed effects (Tt).

Depedent variable: Level of log median weekly wages				
	1986 - 2017	1986 - 2002	2003 - 2012	2003 - 2017
Unemployment rate	-0.0344***	-0.0125	-0.0707***	-0.0314
	(0.00889)	(0.0105)	(0.0206)	(0.0196)
Log median weekly wages $_{t-1}$	0.854***	0.733***	0.751***	0.771***
	(0.0385)	(0.0618)	(0.106)	(0.0773)
Constant	0.653***	1.477***	1.200*	1.172**
	(0.247)	(0.395)	(0.646)	(0.488)
Observations	352	187	110	165
R-squared	0.995	0.994	0.995	0.993
Region FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Robust SE	YES	YES	YES	YES
Instrument	YES	YES	YES	YES
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

The weakening of the relationship between unemployment and pay (Figure 18)

In order to estimate how the relationship between unemployment and pay has changed over time we construct two 'rolling' regression models:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it*} \beta_2 D_{1,t} + \gamma_n E_n + \delta_t T_t + u_{it}$$

$$Y_{it} = \beta_0 + \beta_1 X_{1,it*} \beta_2 D_{1,t} + \beta_2 \hat{y}_{it-1} + \gamma_n E_n + \delta_t T_t + v_{it}$$

These are identical to models 3 and 4[35] above except that they include a decadal dummy (D1,t) which takes the value of 1 for a ten year window between 1986 and 2008. For example we first run the model and (D1,1986 - 1995) takes the value of 1 for the years between 1986 and 1995 and the value of 0 for all other years. We then run the model again for (D1,1987 - 1996) and so on until (D1,1999 - 2008). We choose this approach rather than simply running the model over the same decadal window, as we want the coefficients on the other variables in our model (time and year fixed effects and the constant) to be based on the full sample of observations, and only want the coefficient on the variable of interest (unemployment) to vary over time. To compute the coefficient

[35] $\hat{y}$it-1 are the predicted values of the lag of the dependent variable that has been instrumented by its second and third lags.

that is graphed in Figure 18 we sum two coefficients: the coefficient on the unemployment term and the coefficient on the interaction term of unemployment with our decadal dummy.

The relationship between broader measures of slack and pay (Table 2)

We estimate the same models as those above (3 and 4) but rather than including unemployment as our independent variable of interest we include various broader measures of slack. The model in which the log of median weekly wages is the dependent variable includes the first and second lags of the measure of slack and the second and third lags of the dependent variable as instruments. The results are given below.

	Dependent variable: growth in median weekly wages: 2003 - 2017													
Unemployment	-0.00664	0.00179		-0.00161		-0.000470		-0.000342		-0.00194	-0.00580	-0.00917	-0.00479	
	(0.0159)	(0.0205)		(0.0169)		(0.0166)		(0.0165)		(0.0157)	(0.0165)	(0.0161)	(0.0142)	
Δ unemployment	-0.00901	0.00473		-0.00178		9.23e-05		-0.000222		-0.00763	-0.00637	-0.00677	-0.00427	
	(0.0204)	(0.0160)		(0.0183)		(0.0176)		(0.0177)		(0.0205)	(0.0205)	(0.0213)	(0.0206)	
PTwFT		-0.0131												
		(0.0111)												
Δ PTwFT		-0.0190												
		(0.0132)												
PTwFT & unemployed			-0.0128											
			(0.0154)											
Δ PTwFT & unemployed			-0.0277											
			(0.0254)											
More hours				-0.0158										
				(0.0105)										
Δ more hours				-0.0390**										
				(0.0127)										
More hours & unemployed					-0.0132									
					(0.0164)									
Δ More hours & unemployed					-0.0374									
					(0.0220)									
PTwFT, more hours						-0.0193								
						(0.0109)								
Δ PTwFT, more hours						-0.0432**								
						(0.0142)								
PTwFT, more hours, unemployed							-0.0194**							
							(0.00858)							
Δ PTwFT, more hours, unemployed							-0.0433***							
							(0.0131)							
PTwFT, more hours, ZHCs								-0.0184						
								(0.0106)						
Δ PTwFT, more hours, ZHCs								-0.0419**						
								(0.0141)						
PTwFT, more hours, ZHCs, unemployed									-0.0141					
									(0.0166)					
Δ PTwFT, more hours, ZHCs, unemployed									-0.0379					
									(0.0232)					
Temp										-0.0108				
										(0.00611)				
Δ temp										-0.0155**				
										(0.00599)				
Self-employment											0.000224			
											(0.00576)			
Δ self-employment											-0.00423			
											(0.00490)			
Low qual self-emp												0.00495		
												(0.00348)		
Δ low qual self-emp												0.00324		
												(0.00286)		
All searchers													-0.0324*	
													(0.0173)	
Δ all searchers													-0.0591***	
													(0.0162)	
All searchers, unemployment														-0.0275
														(0.0196)
Δ all searchers, unemployment														-0.0522***
														(0.0146)
Constant	0.000974	-0.0425	-0.0167	-0.0481	-0.0157	-0.0583	-0.0574	-0.0544	-0.0178	-0.0368	0.00518	0.0271	-0.0867*	-0.0412
	(0.0500)	(0.0501)	(0.0471)	(0.0373)	(0.0465)	(0.0385)	(0.0321)	(0.0389)	(0.0468)	(0.0343)	(0.0450)	(0.0548)	(0.0458)	(0.0449)
Observations	165	165	165	165	165	165	165	165	165	165	165	165	165	165
R-squared	0.718	0.735	0.723	0.739	0.725	0.741	0.741	0.740	0.725	0.725	0.720	0.721	0.737	0.727
Number of region	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Instrument	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Robust standard errors in parentheses														
*** p<0.01, ** p<0.05, * p<0.1														

	Dependent variable: log median weekly wages: 2003 - 2017													
Unemployment	-0.0314	-0.0141		-0.0133		-0.0107		-0.0105		-0.0252	-0.0268	-0.0340	-0.0256	
	(0.0196)	(0.0259)		(0.0183)		(0.0181)		(0.0182)		(0.0243)	(0.0209)	(0.0210)	(0.0180)	
Lag. Weekly wages	0.771***	0.787***	0.782***	0.740***	0.771***	0.751***	0.747***	0.751***	0.773***	0.773***	0.757***	0.773***	0.740***	0.756***
	(0.0773)	(0.0949)	(0.0767)	(0.0720)	(0.0754)	(0.0713)	(0.0711)	(0.0706)	(0.0747)	(0.0723)	(0.0870)	(0.0780)	(0.0704)	(0.0720)
PTwFT		-0.0214												
		(0.0321)												
PTwFT & unemployed			-0.0373*											
			(0.0220)											
More hours				-0.0563**										
				(0.0274)										
More hours & unemployed					-0.0345									
					(0.0242)									
PTwFT, more hours						-0.0661**								
						(0.0271)								
PTwFT, more hours, unemployed							-0.0623**							
							(0.0281)							
PTwFT, more hours, ZHCs								-0.0646**						
								(0.0270)						
PTwFT, more hours, ZHCs, unemployed									-0.0382					
									(0.0242)					
Temp										-0.00990				
										(0.0188)				
Self-employment											-0.00845			
											(0.0184)			
Low qual self-emp												0.000911		
												(0.00897)		
All searchers													-0.0393	
													(0.0323)	
All searchers, unemployment														-0.0522
														(0.0317)
Constant	1.172**	1.021	1.093**	1.193**	1.169**	1.101**	1.170**	1.111**	1.150**	1.130**	1.224**	1.155**	1.266***	1.238***
	(0.488)	(0.662)	(0.486)	(0.482)	(0.476)	(0.477)	(0.473)	(0.473)	(0.472)	(0.456)	(0.510)	(0.486)	(0.439)	(0.452)
Observations	165	165	165	165	165	165	165	165	165	165	165	165	165	165
R-squared	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Instrument	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust standard errors in parentheses														
*** p<0.01, ** p<0.05, * p<0.1														

The relationship between broader measures of slack, productivity and wage growth (Table 3)

In order to estimate the relationship between slack, productivity and wage growth in the same equation we construct a model:

2. $$Y_{it} = \beta_0 + \beta_1 X_{1,it-1} + \beta_1 X_{1,it\Delta t-1} + \beta_3 X_{3,it} + u_{it}$$

Where Y is the change in real (CPIH-adjusted) median weekly wages; X_1 is our preferred measure of slack which includes the unemployment, those who would like to work full-time and those who would like more hours, and who are searching for work (logged); X_3 is our measure of trend productivity, which is a rolling three-year lagged average of productivity in region i at time t. Note that neither time or region dummies are included in this model. Results are provided below.

Depdendent variable: Growth in median weekly wages	
Trend productivity (GDP deflated)	0.478***
	(0.137)
PTwFT, more hours and unemployed	-0.0198**
	(0.00786)
Δ PTwFT, more hours and unemployed	-0.0391***
	(0.0127)
Constant	-0.0760***
	(0.0289)
Observations	187
R-squared	0.274
Region FE	NO
Year FE	NO
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

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