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Brian Bell & Matt Whittaker

THE PAY DEFICIT

Measuring the effect of pension deficit payments on workers' wages

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Summary

This paper is the sixth report for the Intergenerational Commission, which was launched in the summer of 2016 to explore questions of intergenerational fairness that are currently rising up the agenda. Previous work has shown that younger cohorts have been particularly badly affected by recent trends in pay growth. Far from enjoying the generation-on-generation gains in pay that characterised much of the 20th century, the oldest millennials (born 1981-85) are earning £40 a week less around the age of 30 than those born 10 years earlier earned at the same age. And the next group of millennials (born 1986-90) have had the same levels of weekly pay in their early- and mid-20s as those born 15 years before them did.

These outcomes owe much to the long post-financial crisis wage squeeze. Even after two years of wage recovery – driven by ultra-low inflation – ***average earnings remain around £16 a week below peak****. With a fresh pay squeeze now hitting and likely to grow over the course of 2017 as inflation picks up, pre-crisis pay levels are unlikely to be restored until 2022.*

Yet, while this disappointing pay performance can be attributed in part to the unusual circumstances of a financial crisis in the first instance and a sterling depreciation sparked by the vote for Brexit in the second, the fact that pay growth had already slowed markedly in the pre-crisis period provides cause for longer-term concern. ***Average weekly earnings grew by just 0.6 per cent a year between 2004 and 2008, compared with an annual average of 2.5 per cent between 1996 and 2004****. Identifying what contributed to this slowdown – and whether it represents a new benchmark for 'normal' wage growth or simply a blip – is key to understanding the pay prospects facing younger workers.*

Several factors appear relevant to this pre-crisis wage disappointment – not least a slowdown in productivity growth and reductions in working hours – but ***this paper focuses specifically on what appears to have been an important shift in the nature of employee compensation from the turn of the century****. Between 2000 and 2016, non-wage employer social contributions comprised a growing share of total employee compensation – generating an increased 'wedge' between overall remuneration and workers' pay packets.*

Before 2000, non-wage elements accounted for 13 per cent of compensation on average; but this share increased sharply thereafter, reaching more than 18 per cent in 2012. While it has fallen a little since, it remained just under 17 per cent in 2016. Relative to the pre-2000 average, ***this elevated share of compensation accounted for by non-wage employer contributions was equivalent to around £37 billion****. Non-wage compensation includes employer National Insurance contributions as well as maternity and sickness pay. But* ***by far the biggest driver of the increase in non-wage payments over the post-2000 period – accounting for £26 billion of the overall £37 billion increase in 2016 – was employer pension contributions****.*

This increase is somewhat surprising given the shift in workplace pensions that has taken place in recent years. Overall employee coverage in occupational pension schemes fell over the course of the 2000s, as increasing numbers of defined benefit (DB) schemes closed to new members. It then picked up strongly from 2012 as the policy of auto-enrolment increased access to defined contribution (DC) pension schemes. Given the much lower employer contribution rates typically associated with DC pensions however, the shift away from DB might have been expected to lower overall employer contributions.

That employer pension contributions instead rose as a share of overall compensation after 2000 flows from the fact that improvements in longevity, weak asset returns and a reduced discount rate significantly increased the cost of funding a given DB pension. This raised the employer (and employee in some cases) contributions required to meet both pre-existing and new DB commitments. On the employer side this manifested itself in steep increases in both 'normal' DB payments (covering new pension entitlements accrued) and 'special' (or deficit-funding) payments. Having accounted for an average 0.5 per cent of total employee compensation before 2000, the latter made up 3.3 per cent of the total by 2012 – remaining at 2.5 per cent in 2016. Increased ***deficit-funding contributions therefore accounted for around £19 billion of the overall £37 billion elevation in non-wage employer contributions in 2016****.*

Faced with a cost pressure associated with meeting a schedule of pension deficit payments that applies to some but not all firms, businesses might be expected to respond in a range of ways. In perfectly competitive labour and product markets – where employers are price takers – this would primarily take the form of lower profits, while some business groups have argued that investment spending has been reduced. Another hypothesis is that, due to either imperfect competition or the fact that some employees benefit from the plugging of DB deficits, there might also be a wage effect. With the time-periods in question neatly aligned, the suggestion has been that this wage effect might go some way to explaining the pre-crisis slowdown in pay growth and therefore represent an important consideration for future living standards prospects.

To date there has been little research to distinguish between these different possibilities, each of which has potentially important distributional – including intergenerational – implications. ***With 85 per cent of DB schemes closed to new members and 35 per cent also closed to future accrual, the population with most to gain from closing scheme deficits is likely to have limited overlap with the population affected by any reduction in dividend payments, investment or pay****. Of the 10.9 million members of DB schemes, 40 per cent are already in retirement and just 1.6 per cent are under-30 and actively contributing.*

To help inform debate in this area, this note presents the first empirical testing of the impact of deficit payments on pay levels*, based on more than 180,000 observations across around 400 firms between 2002 and 2015. The approach takes advantage of the exogenous nature of the deficit payments to present regression analysis that compares the pay of similar-looking workers in similar-looking firms where only the level of deficit payment made by the firms varies. In doing so it provides an opportunity to consider whether the micro deficit payments issue links back to the macro wage slowdown phenomenon.*

The analysis ***identifies a strongly significant negative effect on hourly pay at the level of the individual firm****. For every increase in deficit payment equivalent to 1 per cent of the firm's total wage bill, the hourly pay of its workers is lowered by roughly 0.1 per cent.* ***With the £19 billion relative increase in DB deficit payments that we have identified in 2016 being roughly equivalent to 2.5 per cent of the UK's total wage bill, the implication is that such employer contributions are lowering average employee pay by between 0.2 per cent and 0.3 per cent.*** *Converting that hourly pay effect into an aggregate annual figure suggests that DB deficit payments are directly lowering employee pay by between £1.4 billion and £2.2 billion a year.*

This means that ***in the region of 10 per cent of the £19 billion elevation in special payments can be directly associated with lower hourly pay****. The remaining 90 per cent is likely to be spread across a combination of wider wage spillover effects that include*

non-pension deficit firms, reductions in profits, or lower investment. Understanding how this remaining burden has been distributed across groups should form an important next step in unpicking the impact of elevated DB deficit payments.

A direct wage drag of the magnitude identified in this research can only explain a small part of the aggregate pre-crisis pay slowdown. However, it must be remembered that the £1.4 billion to £2.2 billion figure relates entirely to employees in DB-deficit firms rather than the entire working population. ***With roughly half of private sector employees working in firms with DB schemes, the average annual pay effect within this group rises to somewhere in the range*** £1***45-£225****. And this average is likely to mask still more sizeable effects for some: looking across the firms in the sample used in the research, the average deficit payment relative to wage bill is 6 per cent, with a standard deviation of 9 per cent.*

The regression also shows that the wage effect is stronger on those employees who remain active members of the DB scheme*. For such workers, an increase in deficit payments equivalent to 1 per cent of a firm's wage bill is associated with a pay reduction of between 0.12 per cent and 0.18 per cent. The magnitude of impact is lower for deferred DB pension members (those in schemes which are closed to future accrual) and across all firms is not statistically significant for employees who have never been members of the pension scheme.*

However, ***there is a significant negative effect (with a coefficient of 0.22 per cent) for those who have never been members when we concentrate on employees in the bottom quarter of the pay distribution.*** *This group is younger than any other considered in the research, with an average age of 34.7 years. This compares with an average age across the sample of 39.5 years. The implication is that the UK's youngest and lowest earners are suffering an additional pay penalty as a result of DB deficit payments that have no benefit to them. The fact that higher earners who have never been members of their firm's DB schemes (where the average age is 40.4 years) do not appear to have been affected implies that relative labour strength may form part of the story too.*

This analysis tells us about what the specific relationship between deficit payments and pay has been in the past, describing which groups have felt wage effects and which haven't. It doesn't tell us anything either about what firms should have done when faced with these increased costs, or about wider employer and employee attitudes to pay and reward that might affect the impact of future deficit payments on pay. Nor can we confidently predict how the scale of DB deficits will alter in the coming years. Forward-looking scheme valuations are inevitably subject to significant uncertainty and will depend in part on the future path of interest rates.

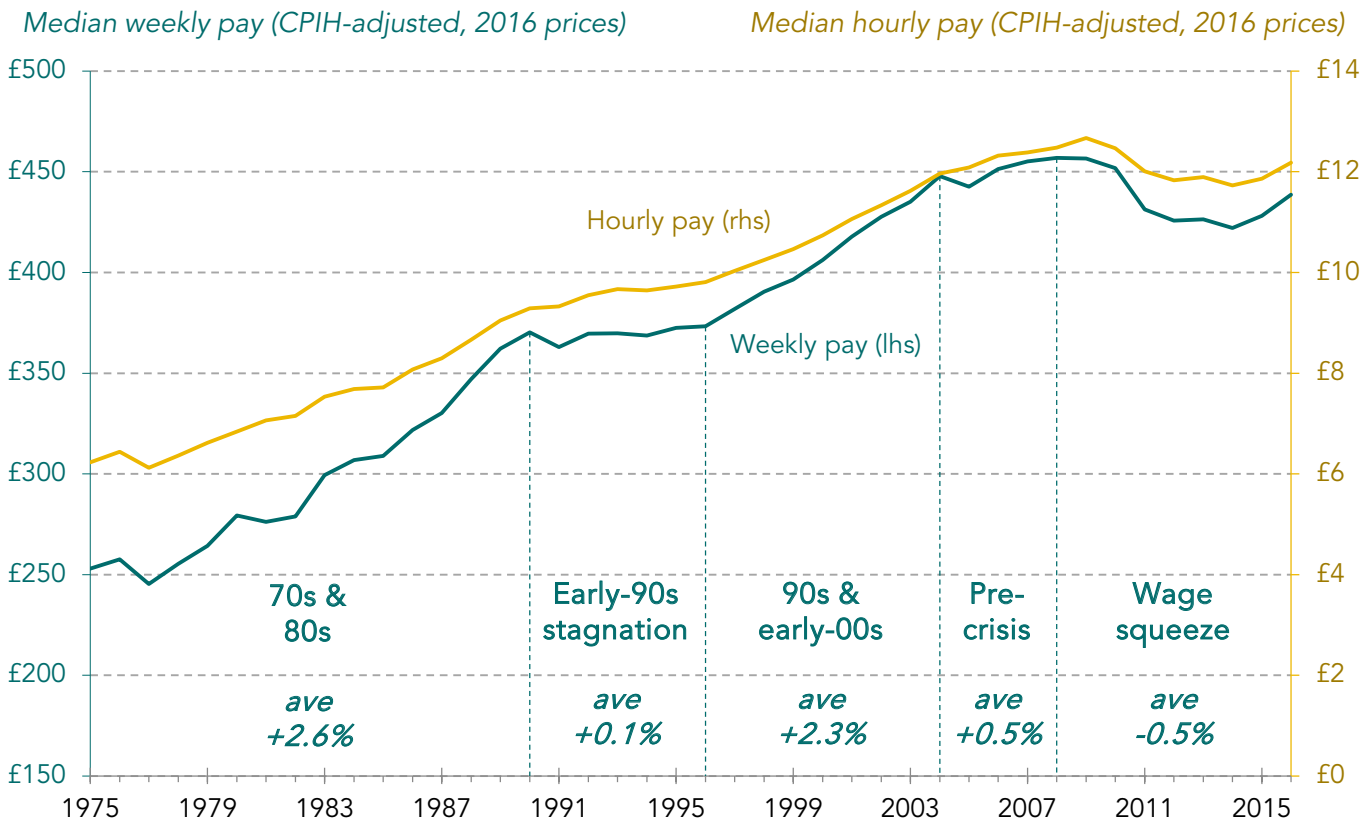
Nevertheless, the current scale of deficits and the tendency of longevity to surprise on the upside implies that we might expect contributions to drag on pay for the foreseeable future. With this in mind, ***the new evidence reported in this paper highlights the need to look beyond questions relating to the sustainability of deficit schedules. Policy makers should also seek to better understand how the DB deficit burden is being distributed across different groups and different cohorts****, with our findings providing added urgency to the need to tackle the UK's ongoing pay and productivity problems.*

Employee pay growth slowed some years before the financial crisis

The UK's post-crisis labour market story is well-rehearsed. Employment fell in the immediate aftermath of the 2008 crash, but recovered much more strongly than anyone expected after 2011 and now stands at a record high. In contrast, poor performance on pay has proved stubbornly resistant to recovery – related in no small part to an ongoing stagnation in productivity growth.

Less well-recognised is the fact that, as Figure 1 shows, pay growth had already slowed markedly in the years immediately prior to the crisis. Real-terms growth in median weekly pay averaged just 0.5 per cent a year between 2004 and 2008, less than one-quarter the pace averaged between 1996 and 2004. The pre-crisis slowdown in *hourly* wage growth was a little less pronounced – implying that the weekly pattern owed something to changes in average working hours too – but it is observable nonetheless (average annual growth of 1.1 per cent between 2004 and 2008 compared with growth of 2.5 per cent in the period from 1996 to 2004).

Figure 1: **Typical weekly pay growth slowed before the financial crisis of 2008**



Notes: Pay data relates to April each year.

Source: ONS, *NESPD & ASHE*

Similar wage growth slowdowns appeared across a number of advance economies in this pre-crisis period, though the UK deceleration was particularly marked. This raises important questions about just what sort of future we can expect as the economy continues its post-crisis recovery. The outlook has of course been complicated by the UK's impending withdrawal from the EU. In the near-term, inflation is now expected to rise more rapidly than previously thought, raising the prospect of a fresh pay squeeze in 2017; in the medium-term, productivity forecasts have been revised down to reflect the impact of Brexit uncertainty on business investment decisions.[1] As a result, pre-crisis levels of pay aren't expected to be restored until 2022 – an outcome that would mean 15 years of lost growth.[2]

Notwithstanding these complications, it is worth exploring the pre-crisis period in more detail in order to ascertain what our 'normal' baseline for pay growth might look like. Was this period merely a blip or something more structural? The answer has important macroeconomic implications, but it is also crucial to our understanding of the potential lifetime earnings profiles of different generations. As we've shown before, younger cohorts who have entered the labour market since the financial crisis have so far displayed earnings paths that have fallen short of their predecessors'.[3] Unpicking the pre-crisis story might offer important clues as to the extent to which earnings among these groups can be expected to pick-up in the coming years.

Economic growth is only one part of the pay slowdown story

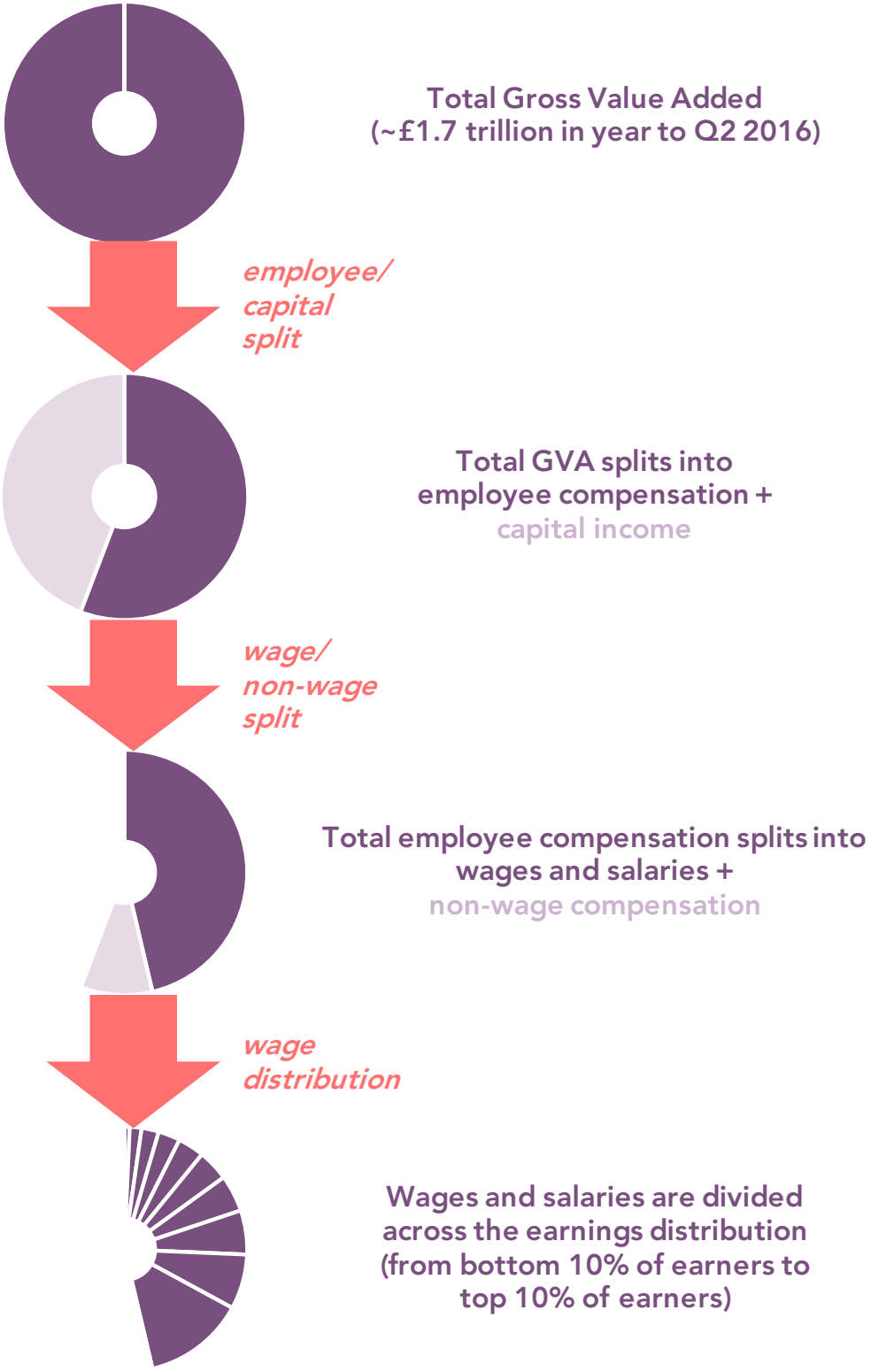
Economic growth is of course central to pay growth, but the relationship is far from uniform. There are several points at which the two can diverge – reflecting both underlying economic structures and political and economic policy decisions – with the result that wage patterns can differ across countries and across time, even when overall levels of economic growth have varied little. Figure 2 provides an overview of how the income associated with UK national output – measured by gross value added at basic prices (GVA) – works its way through to different groups.

1 See for example, OBR, *Economic and Fiscal Outlook*, March 2017

2 S Clarke et al, *Are we nearly there yet? Spring Budget 2017 and the 15 year squeeze on family and public finances*, Resolution Foundation, March 2017

3 L Gardiner & P Gregg, *Study, work, progress, repeat? How and why pay and progression outcomes have differed across cohorts*, Resolution Foundation, February 2017

Figure 2: The relationship between economic output and pay



Source: ONS, *National Accounts*

The first distinction we can draw is between that part of income which pertains to employees and that part which flows to capital (including the self-employed), with a roughly 56/44 split in the year to Q2 2016.[4] Of the total accounted for by employees, we can make a second distinction between that element which appears in workers' pay packets (which amounted to 46 per cent of total GVA in the year to Q2 2016) and that part relating to employer social contributions (which amounted to 9 per cent of GVA and includes employer pension contributions and employer National Insurance (NI) payments). The final step relates to the way in which employee pay is distributed.

A forthcoming Resolution Foundation paper will explore how this pattern has changed in the UK over recent decades, quantifying the impact of factors such as shifts in the labour share and changes in pay inequality on the share of GVA received as pay by different groups of workers in the economy.

In this briefing note we focus in some detail on one particular aspect of this process: namely the way in which total employee compensation has been split between wage and non-wage elements. The latter has grown in importance since the turn of the century, with an increase in employer pension contributions proving especially influential. Holding all else (the aggregate labour share for example) equal, this raises questions over the extent to which different groups of employees have been affected.

To the extent that this represents little more than a shift in the *timing* of employee remuneration rather than its *level* – from today's pay into tomorrow's pension – we might take a more sanguine view of the pre-crisis pay slowdown. Yet the critical role played in this trend by employer 'deficit recovery' payments associated with defined benefit (DB) pension schemes – many of which are no longer open to new entrants – has prompted some to question the extent to which those benefiting from increased employer pension contributions represent a different population to those affected by lower pay growth. That is the question we seek to answer below.

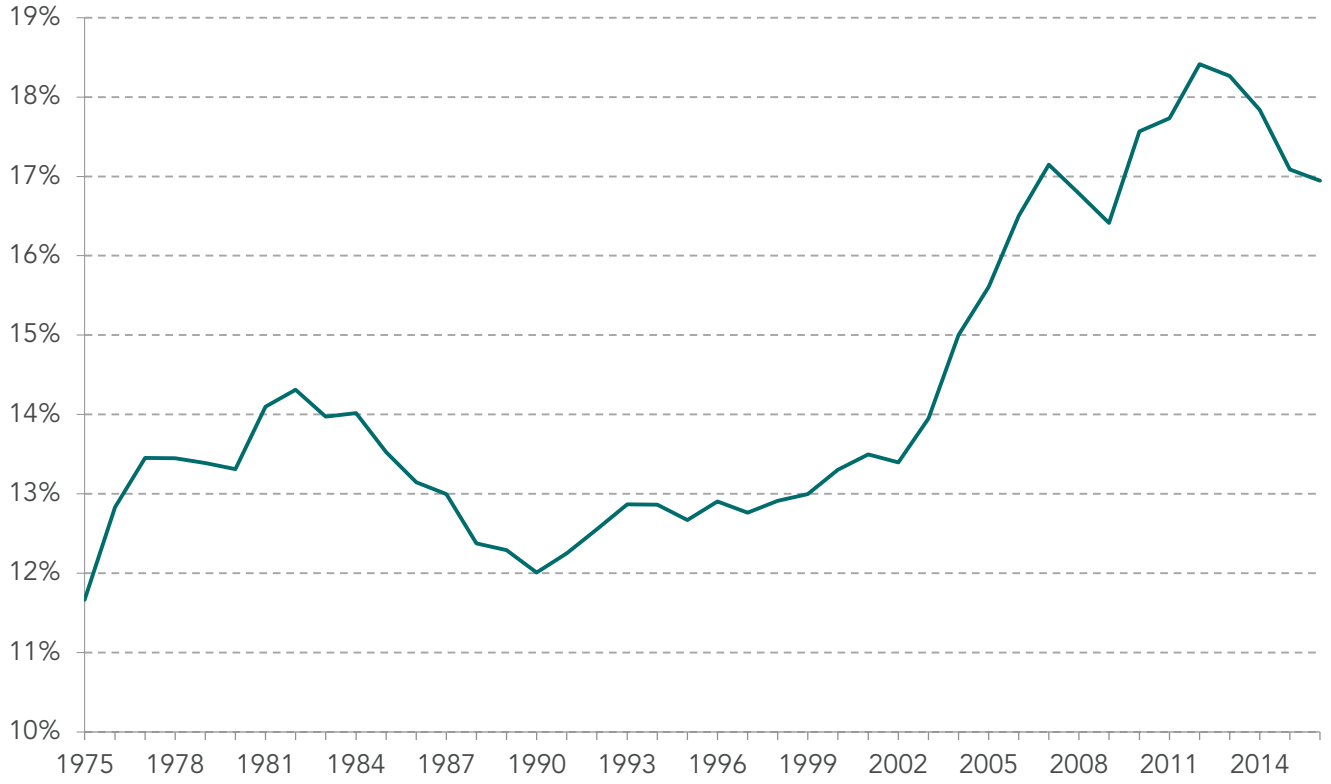
Non-wage compensation has grown in importance since 2000, rising by the equivalent of £1,000 per employee

As noted above, employee compensation accounted for 56 per cent of GVA in the year to Q2 2016. Wages and salaries represent by far the largest part of this, comprising 83 per cent of all compensation. But the non-wage element of total compensation has grown over recent years, as shown in Figure 3. Having fluctuated around 13 per cent between 1975 and 1999, the proportion of overall compensation accounted for by employer social contributions subsequently picked-up sharply. It reached 17.2 per cent in 2007, just before the financial crisis hit, and peaked at 18.4 per cent in 2012. Although the share has fallen a little since then it remains – at 16.9 per cent in the year to Q2 2016 – substantially above its 20th century levels.

4 Throughout much of this paper we present National Accounts data in the year to Q2, in order to better match the April pay data captured in the NESPD and ASHE surveys (as shown in Figure 1).

Figure 3: **Employee compensation has become increasingly non-wage related this century**

Employer social contributions as a share of total employee compensation



Notes: Data relates to year ending Q2.

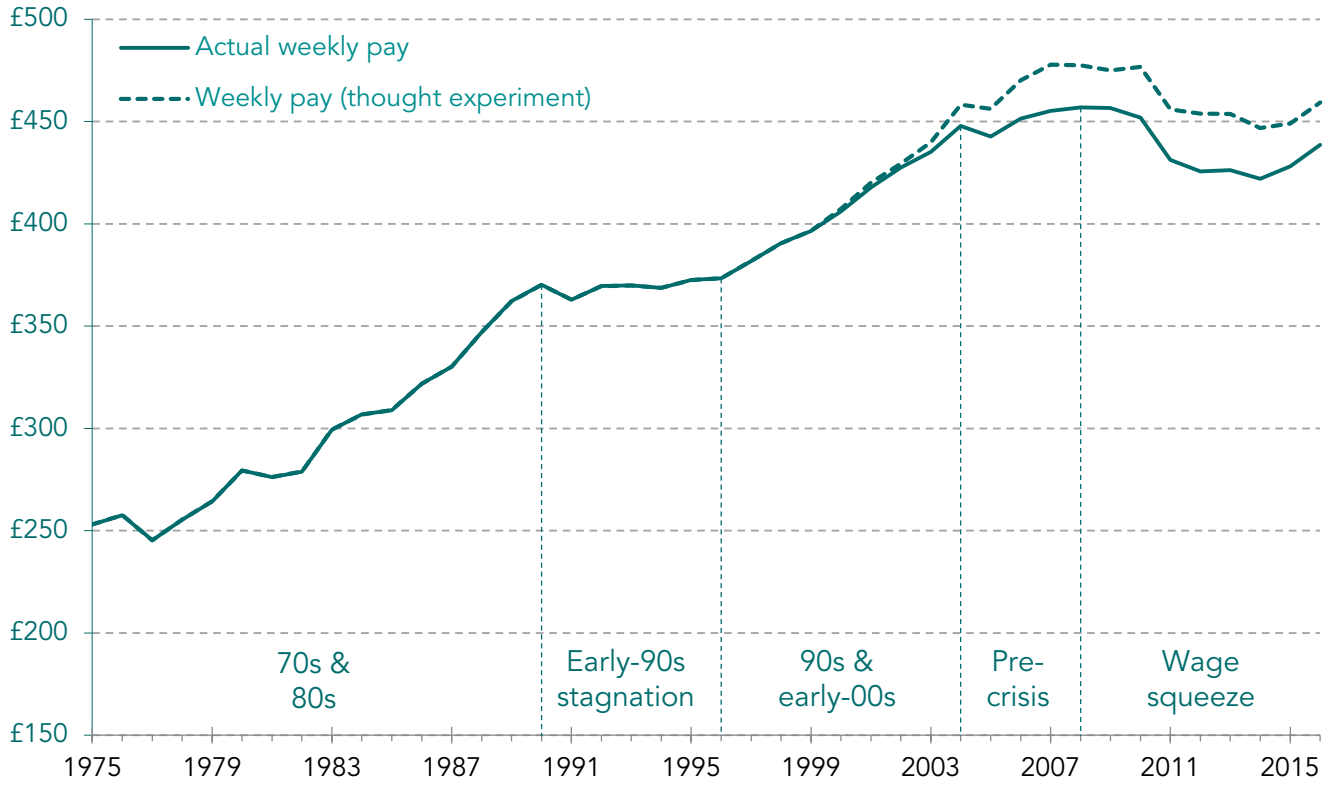
Source: ONS, *National Accounts*

By way of understanding the potential importance of the increase in the share of compensation accounted for by non-wage elements in the period since 2000 we establish a very simple thought experiment below.

By holding the non-wage share of compensation constant at its pre-2000 average over the remainder of the period, we can establish a figure for the extra total compensation that might otherwise have found its way into employees' pay packets (or higher profits). By 2016, this figure would stand at £37 billion. Assuming nothing else changed – employee numbers, hours worked and the distribution of the overall pay pot – the extra funds going into employee wages would boost median weekly pay as set out in Figure 4.

Figure 4: **In the absence of rising non-wage compensation, the pre-crisis slowdown in median pay might have been less marked**

Median weekly pay (CPIH-adjusted, 2016 prices)



Notes: Pay data relates to April each year.

Source: ONS, *NESPD* & *ASHE*

This new – illustrative – pay trajectory would represent average annual wage growth in the pre-crisis period of 1.0 per cent. That would still mark a slowdown relative to the 1990s and early-2000s, when growth stood at an average of 2.6 per cent a year. This means that there is more going on in the slowdown than just the trend in non-wage compensation (with a slowdown in productivity growth playing a significant role). Nevertheless, such a rate of growth would still be double the pace actually recorded in this period. This would amount to an extra £1,080 a year in 2008, with a similar gap remaining in place in 2016. On a cumulative basis, the stronger median wage growth depicted in our thought experiment would have generated additional earnings of just under £15,000 over the course of 2000-2016.

Interesting though this thought experiment is, it is of course an oversimplification. There are many reasons why the assumption of a zero-sum game between wage and non-wage elements of compensation – whereby any reduction in non-wage payments might instead have been paid out as wages – might not hold. It is just as possible that lower non-wage payments would have been associated with lower overall compensation, and correspondingly higher profits instead. To better understand the extent to which the post-2000 rise in non-wage compensation might have directly lowered pay growth, we need to dig deeper into what has driven the overall shift.

The increase in non-wage compensation has been driven primarily by trends in employer pension contributions

As discussed above, non-wage compensation comprises different forms of employer social contributions – that is, payments made by employers to social security schemes and employment-related social insurance schemes that secure social benefits for their employees. We can split the National Accounts data into three broad categories:

- *Employer National Insurance contributions* cover the actual payments made by employers in the form of employer NI;
- *Private pension contributions* capture those payments made by employers on behalf of employees to pension funds including funded pension schemes and notionally funded[5] pension schemes;
- *Other social contributions* represent an imputed measure of payments by employers on behalf of employees to unfunded social benefits schemes. These include government unfunded pensions schemes and local government unfunded pension schemes.[6] In addition, wages and salaries paid directly by employers to their employees on a temporary basis – for example to cover sickness, maternity, industrial injury or disability – are recorded here, reflecting the fact that they are treated as a form of social insurance for accounting purposes.

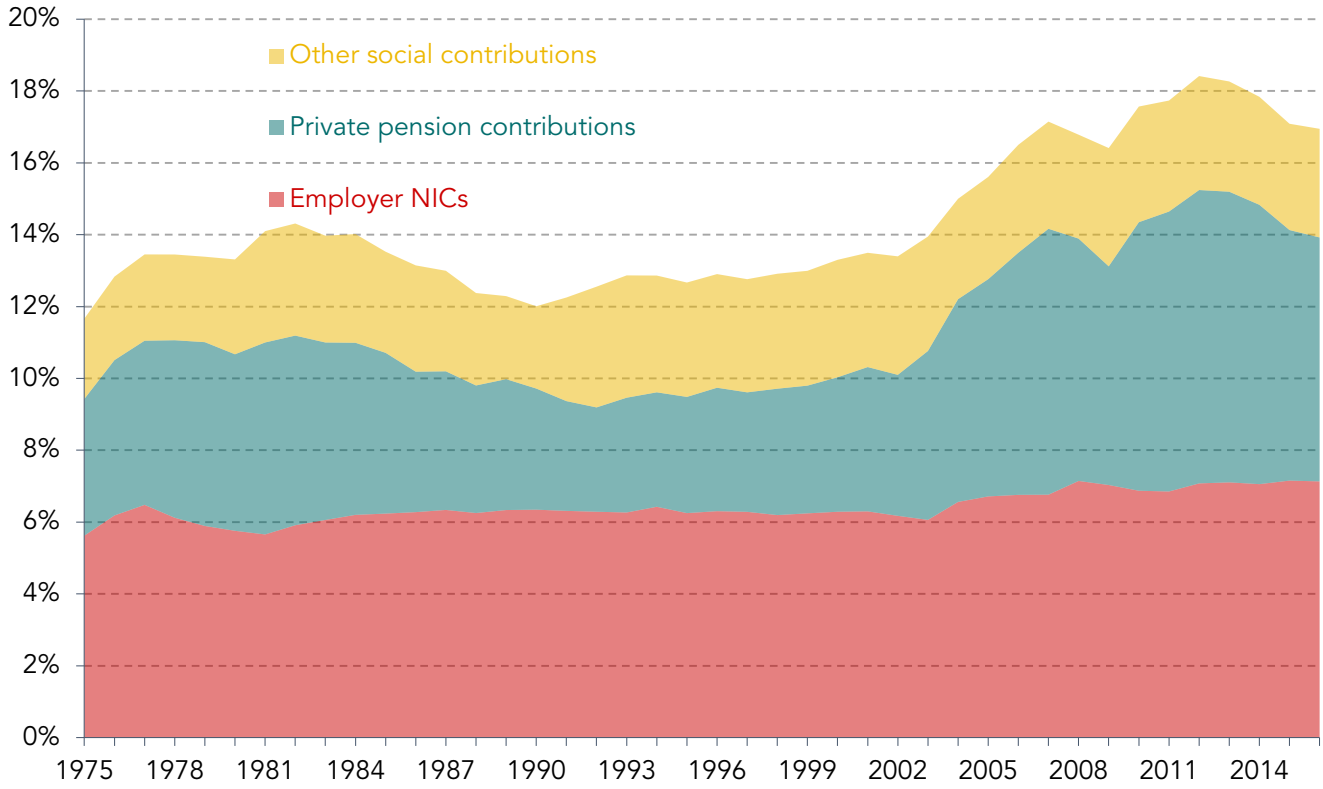
Figure 5 re-presents the overall trend in non-wage compensation set out in Figure 3, but this time adds in the detail on each of the three components outlined above.

5 These schemes are subject to periodic valuations as though there was a fund, with contributions then being set on the basis of these valuations.

6 This covers just those parts of the unfunded liabilities met by employers. A much larger proportion is derived from general taxation, meaning the unfunded elements of these public sector pensions are primarily being covered by current and future taxpayers.

Figure 5: **Employer pension contributions have accounted for an increasing share of employee compensation in the period since 2000**

Share of total employee compensation accounted for by non-wage elements



Notes: Data relates to year ending Q2.

Source: ONS, *National Accounts*

What's clear is that employer pension contributions have tended to be the most likely of the social contribution elements to move over time. For instance, the fall in the share of overall employee compensation accounted for by non-wage payments between 1982 and 1990 was driven primarily by a fall in the compensation share of employer pension contributions from 5.2 per cent to 3.4 per cent.

Likewise, the sharp post-2000 increase in social contributions as a share of employee compensation was mainly a product of increased pension contributions. The share of compensation accounted for by employer NI contributions also rose a little following the introduction and development of the National Minimum Wage and the raising of the main NI contribution rates from April 2013. But the real action came on pension contributions. Their share of compensation jumped from 3.7 per cent in 2000 to a peak of 8.2 per cent in 2012. It has since fallen back to 6.8 per cent, but remains well above the 20th century average.

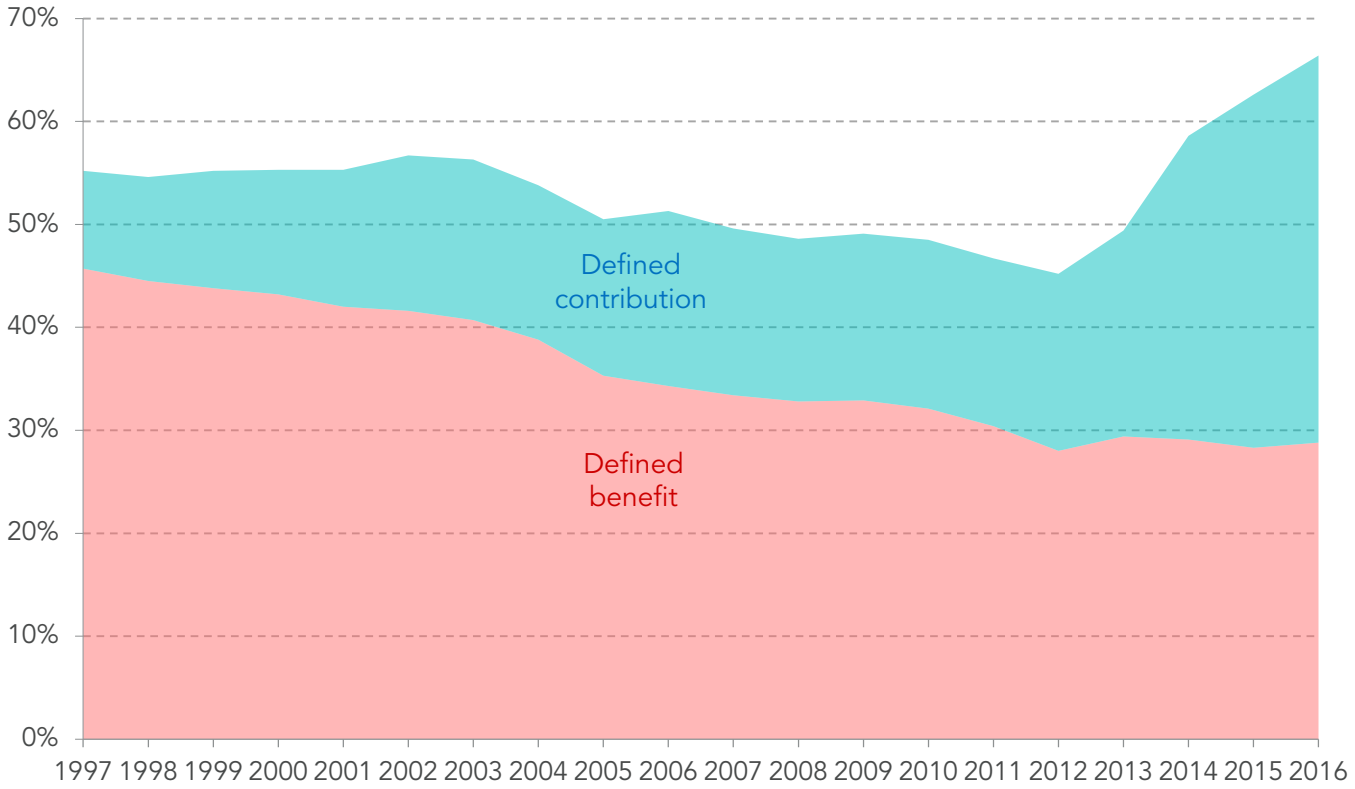
Indeed, of the £37 billion higher level of non-wage payments in 2016 that we identified above (relative to pre-2000 average shares of overall compensation), higher employer pension contributions account for just over £26 billion.

These trends have in turn been affected by rising deficits in defined benefit pension schemes

This rise is all the more remarkable when we consider the shift that has occurred in workplace pension coverage over the same period. Figure 6 details the proportion of employees actively contributing[7] to different types of pensions (see Box 1 for a description of how these schemes differ) in the period since 1997.

Figure 6: **Workplace pension coverage has picked up sharply in recent years, but the composition has shifted significantly since the 1990s**

Proportion of employees with active workplace pensions with their current employer



Notes: Results for 2005 onwards are based on a new questionnaire and may not be comparable to earlier results. ASHE collects information on only the current employer's pension scheme. Employees may hold preserved rights in former employers' pension schemes or be in receipt of a pension from a former employer. This information is not captured by the survey. In ASHE, employees are defined as making contributions to a workplace pension if they have made a contribution, or had a contribution made on their behalf, in the survey pay period. Data relates to April each year.

Source: ONS, *ASHE*

Two things stand out. First the steady and marked decline in the proportion of employees actively contributing to DB schemes – from 46 per cent in 1997 to 28 per cent in 2012 – which drove an overall reduction in workplace pension coverage over the course of the 2000s. By 2016, there were just under 6,000 DB schemes in the UK, but 85 per cent were closed to new members and 35 per cent were also closed to future accrual. The 6,000 schemes covered 10.9 million members, but just 13 per cent of this group was actively contributing (with just 1.6 per cent of the group also aged under-30). Around

7 That is, those who have contributed to the pension within the survey pay period. Those with deferred access to a pension schemes are therefore not counted.

two-in-five (40 per cent) DB members were already in receipt of their pension and 47 per cent had deferred membership.[8]

The second thing to note in Figure 6 is the sharp increase in defined contribution (DC) schemes after 2012 which produced an overall increase in coverage. The proportion of employees contributing to DC schemes increased steadily from 10 per cent to 17 per cent between 1997 and 2012, but subsequently jumped to 38 per cent by 2016.

i Box 1: Defined benefit and defined contribution pensions

Defined benefit (DB) pensions are occupational schemes which specify the rates of benefits to be paid in retirement. Most frequently DB schemes are salary-related, with benefits based on the number of years of pensionable service, the accrual rate and either the employee's final salary, some form of career average salary or the best year's salary within a specified period before retirement.

In contrast, the pay-outs associated with defined contribution (DC) schemes are determined by the magnitude of contributions paid in, the investment performance of those contributions and the type of annuity (if any) purchased at retirement. DC pensions can be occupational, personal or stakeholder based.

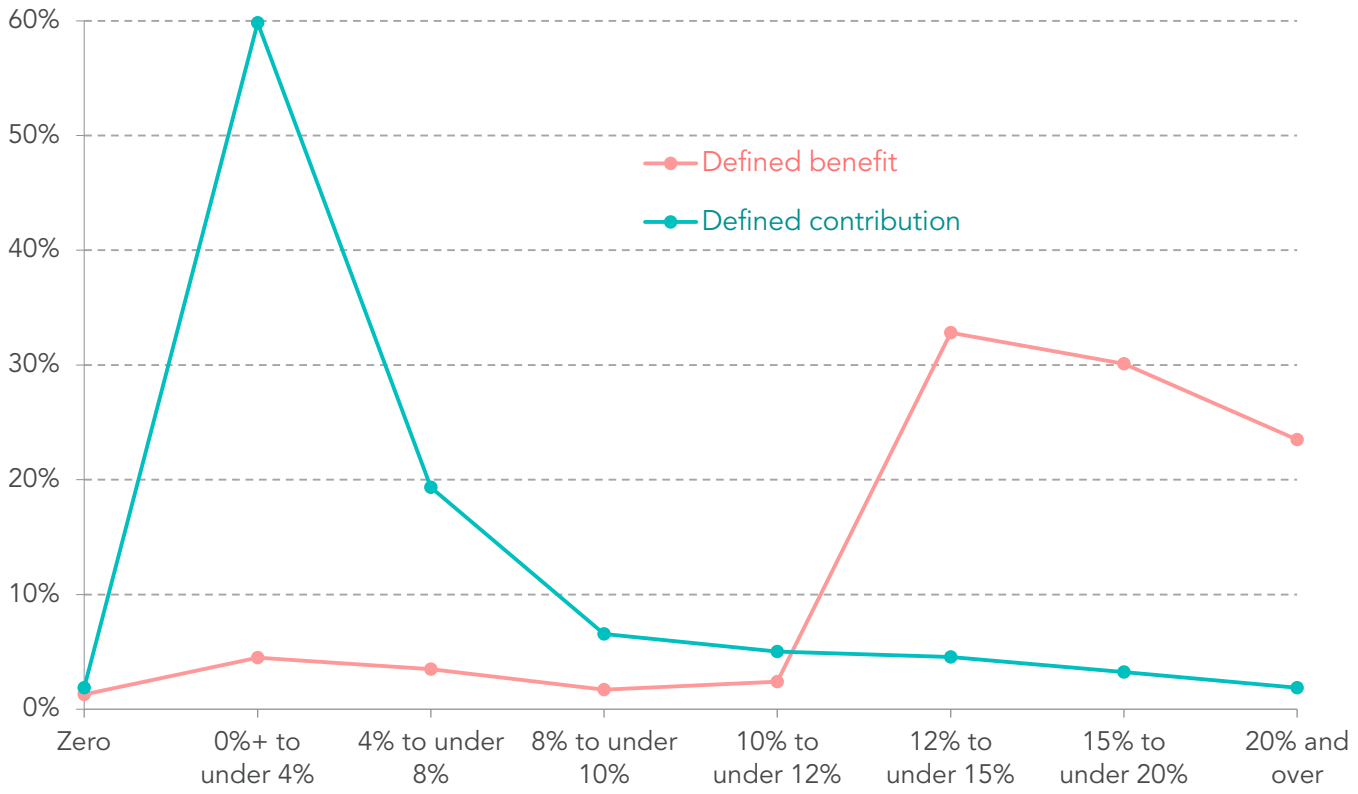
Combining the findings from Figure 5 and Figure 6 then, we see that the period in which employer pension contributions rose most sharply (post-2000) was also a period in which workplace pension *coverage* was falling. The implication is that the average employer contributions must have been increasing over the period.

Yet this is counter to what we might expect from a shift from DB to DC, with the former typically attracting higher employer contributions. Figure 7 shows the distribution of employer contributions across employees in DB and DC schemes as of 2016. It shows that the majority (62 per cent) of employees with a DC pension received contributions equivalent to between 0 per cent and 4 per cent of their salaries. In total, a cumulative 88 per cent received less than 10 per cent; whereas the equivalent proportion of employees in occupational DB pensions was just 11 per cent. Instead, almost one-quarter (24 per cent) of those with DB pensions received employer contributions equivalent to 20 per cent of their salary or more.

8 Pension Protection Fund, *The Purple Book: DB Pensions Universe Risk Profile*, 2016

Figure 7: **DB pensions attract significantly larger typical employer contributions than DC**

Proportion of employees by banded rate of employer contribution to workplace pension: April 2016



Notes: The occupational defined contribution category includes employees who have pensions with the National Employer Savings Trust (NEST).

Source: ONS, *ASHE*

The concentration of DC contributions between 0 per cent and 4 per cent is likely to in part reflect the current minimum contribution levels in place under automatic enrolment (see Box 2). In earlier periods – before DC numbers started to pick-up –average contributions were a little higher. Likewise, as the minimum contribution rules change we should expect to see an increase in DC contribution rates over the coming years. However, the trend holds in broad terms even over the longer-term: DC pensions attract significantly lower employer contributions than DB pensions do.[9]

9 ONS, *ASHE*

i Box 2: Auto-enrolment

Faced with a chronic decline in pension coverage over the course of the 2000s – as detailed in Figure 6 – the government acted on the recommendations of the Turner Commission on pensions by introducing the Pensions Act 2008. Central to this legislation was the planned introduction of 'automatic enrolment' (or auto-enrolment), whereby all UK employers would be required to put eligible employees into a pension scheme and contribute towards it. The policy subsequently began its roll out in October 2012.

It is being introduced in stages, based on the size of the employer's PAYE scheme on 1 April 2012. The initial wave covered employers with over 120,000 employees, and full roll-out is due by 2018. Workers are able to opt out of their employer's scheme if they wish but, if they are still eligible, they will be re-enrolled after a three-year period.

In order to be considered a qualifying pension scheme, schemes will eventually have to receive minimum contributions of 8 per cent of an employee's qualifying earnings, with at least 3 per cent of this coming from the employer by April 2019. However, lower contributions are allowed during the phasing-in period. Until April 2018 the minimum contribution is 2 per cent of an employee's qualifying earnings, with at least 1 per cent coming from the employer.

Certainly the stark difference between typical employer contributions under DB and DC pensions suggests that the shift from the former to the latter that we have seen over recent decades should have *lowered* the overall scale of non-wage compensation rather than increasing it. That it didn't owed much to the opening up of black holes in many private sector pensions over this period.

As noted in Box 1, DB pensions have specified pay-out levels which are not related to the level of contributions made by employees and their employers during the accumulation phase. Instead, contributions are established based on judgements of the level required to meet the promised commitments in retirement. Given that this involves predicting a number of things over a medium- to long-timeframe, it can be difficult to get right.

During the 1990s, strong equity market performance supported DB fund values and allowed some firms to take contribution holidays as they ran down apparent scheme surpluses. Yet from around 2000, asset returns started to falter. With people living longer than had previously been predicted and falling interest rates lowering the discount rate (the expected risk-free return associated with the investment) as well, DB schemes were increasingly assessed as being in deficit. A shift away within DB funds from equities towards government bonds around the financial crisis amplified the effect of falling yields after 2008 too. By the end of 2016, between 90 per cent and 95 per cent of the near-6,000 DB schemes were estimated to be in deficit.[10]

Under the enhanced obligations set out in the *2004 Pensions Act*, firms cannot walk away from their DB promises. Nor are they simply able to decide for themselves how to deal with any deficits that develop in their schemes (see Box 3 for details of pension fund legislation). Where gaps appear, employers must make 'special contributions' – with the level agreed with the pension trustees and signed off by the independent Pension Regulator – over and above the 'normal' contributions that relate to current scheme members.

10 DWP, *Security and Sustainability in Defined Benefit Pension Schemes*, Cm 9412, February 2017, para 84

Box 3: Pension fund legislation

The rules relating to DB pension plans in the UK are currently governed by the 2004 Pensions Act and the associated establishment of both the Pensions Regulator and the Pension Protection Fund (PPF). A key aim of this Act is to ensure that DB schemes are funded appropriately given the expected value of liabilities and reasonable assumptions regarding asset returns.

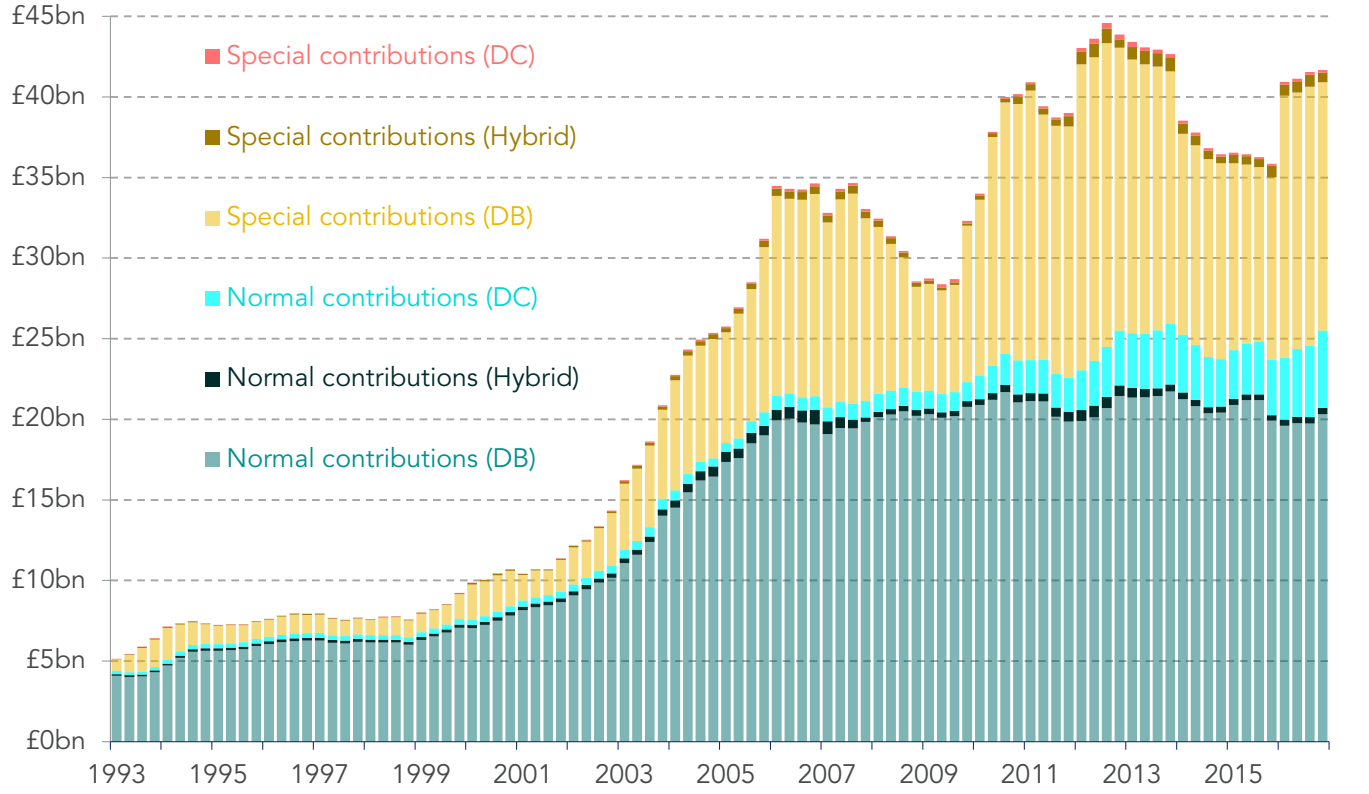
DB schemes are required to have a formal actuarial valuation every three years. This valuation determines the funding level of the scheme that triggers increased contributions by the sponsoring employer if a deficit exists and is unlikely to be eliminated without action. The trustees of the pension scheme must negotiate with the employer to establish a recovery plan. The resulting plan generally involves a sequence of deficit payments over subsequent years, which must satisfy the Pension Regulator. Firms can cut their losses by transferring risk to an insurer, but this is expensive – liabilities are valued at a much lower discount rate upon a buy-out than for funding purposes.

If the firm becomes insolvent and the scheme remains in deficit, the DB scheme enters the PPF. The PPF is funded by annual levies on all DB schemes. Generally under PPF the level of compensation available is 100 per cent for retired members; 100 per cent for ill-health retirees; and 90 per cent for deferred and active members, subject to a £37,000 cap. Deferred and active DB scheme members therefore gain from deficit payments to the extent that it keeps the scheme funded and entitles them to 100 per cent of benefits at retirement, whereas already-retired and ill-health scheme members gain 100 per cent irrespective of whether the recovery plan is adhered to.

Figure 8 shows the balance between different forms of 'normal' and 'special' employer pensions contributions since 1993. Several points are worthy of note. First, the majority of contributions relate to DB schemes, reflecting both the higher share of workplace pensions accounted for by DB in most of this period (Figure 6) and the higher employer contributions rates associated with such schemes (Figure 7). The size of normal DC contributions starts to rise from the mid-2000s as the share of employers in such schemes starts to rise, with a clearer increase following the arrival of auto-enrolment. In relative terms this increase is very significant, though normal DC contributions continued to account for just 11 per cent of all employer pension contributions by 2016.

Figure 8: **The increase in employer pension contributions since 2000 is a product of both rises in 'normal' and 'special' contributions**

Employer pension contributions, nominal



Notes: 'Hybrid' schemes are part-DB, part-DC.

Source: ONS datasets

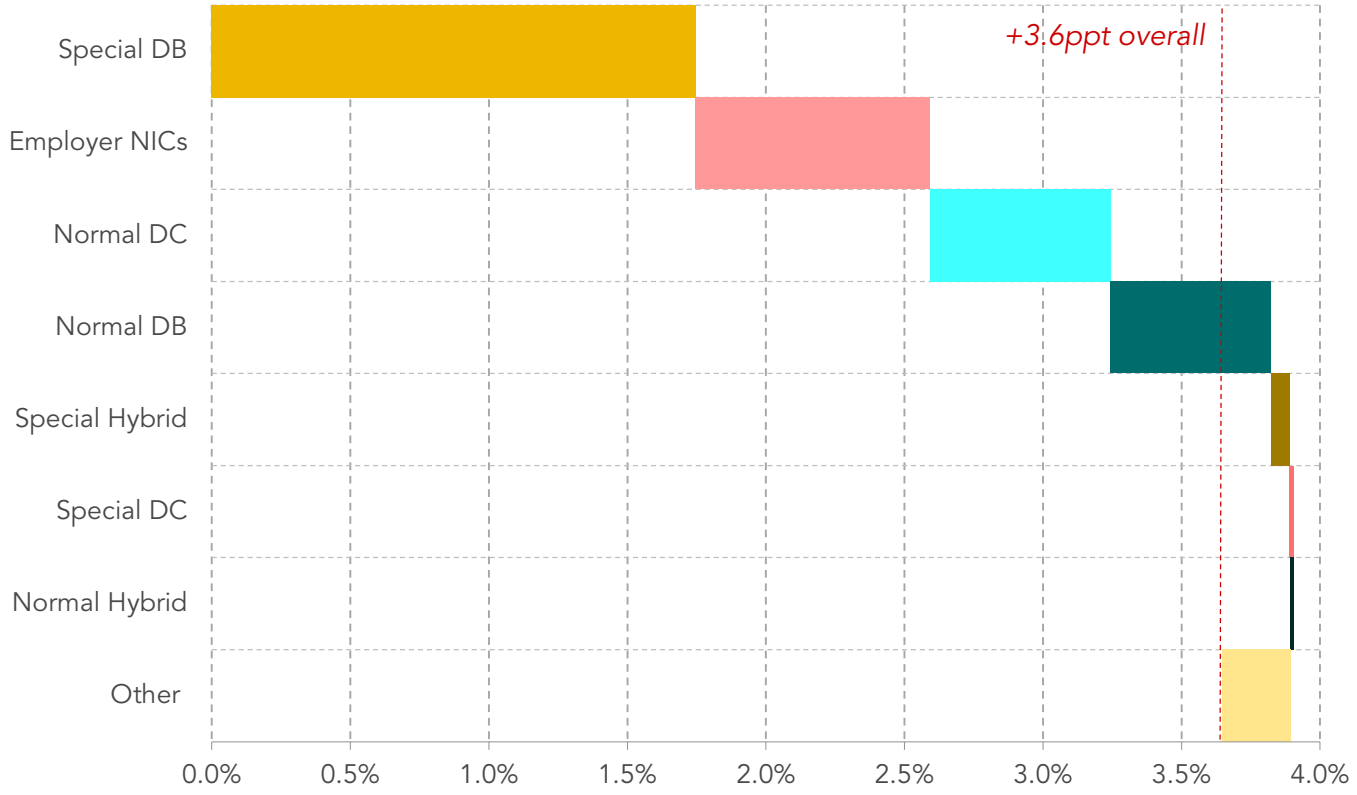
Second, the increased payment of 'special' contributions from the turn of the century is very clear. Such payments shift from accounting for an average of 17 per cent of overall employer contributions before 2000 to a peak of 46 per cent in 2012 and an overall post-2000 average of 33 per cent.

The final thing to note from Figure 8 is that, alongside this increase in 'special' payments, the scale of 'normal' DB contributions also increased sharply. The value (in nominal terms) roughly doubled between 1999 and 2003, reaching £20 billion a year by 2006 before subsequently remaining relatively flat. This increase (even as DB coverage dwindled and schemes increasingly closed to new members) reflects the fact that the same pressures which caused deficits to open up in DB schemes also required increased contributions outside of specific recovery plans.

Using a combination of the data in Figure 5 and Figure 8 we can decompose the overall increase in the share of employee compensation accounted for by non-wage elements into its constituent parts. As Figure 9 shows, of the 3.6 percentage point increase in the non-wage share, roughly half (1.7 percentage points) was due to an increase in 'special' DB contributions. Employer NICs accounted for 0.8 percentage points, with normal DC (0.7 percentage points) and normal DB (0.6 percentage points) contributions adding similar amounts.

Figure 9: **Special payments into DB schemes account for nearly half of the overall increase in the non-wage share of compensation**

Contribution to 3.6 percentage point increase in share of employee compensation accounted for by non-wage elements: 2000-2016



Source: ONS datasets

The clear implication from this analysis is that increased DB deficit payments after 2000 drove an increase in the share of employee compensation accounted for by non-wage employer social contributions. Of the £37 billion elevation in non-wage compensation in 2016 and the £26 billion increase in employer pension contributions noted above, deficit payments account for around £19 billion.

Understanding the relationship between deficit payments and wages requires formal modelling

Yet, despite the very large numbers involved (the aggregate deficit across DB schemes stood at £197 billion on a Section 179 basis[11] in January 2017[12]), this association is not enough to allow us to conclude that increased pension contributions are directly affecting pay and therefore acting as a primary driver of any structural slowdown in pay growth.

Clearly affected firms have obligations to meet the recovery schedules set out for them, but the analysis above tells us nothing about where the ultimate burden has lain to date. Indeed, in a standard competitive labour market model, DB deficit payments would be assumed to have no effect on wages in the firm. That's because not all businesses are af-

11 This is the estimated cost of securing PPF compensation levels.

12 DWP, *Security and Sustainability in Defined Benefit Pension Schemes*, Cm 9412, February 2017, para 19

fected and they are assumed to be price-takers for labour, with a perfectly elastic supply curve (that is, if they offered lower wages than their competitors they would be unable to fill their posts). Instead, any effect on firm spending associated with increased deficit payments would be expected to manifest itself in terms of lower dividend payments and/or reduced investment.

However, if the deficit payments yield a benefit to the employee (in terms of securing their future pension payment) then there *can* be a wage fall: in this instance, firms are price-takers in relation to overall compensation. If this is the case, then we should observe larger wage falls for those gaining the most from the DB deficit payment (higher earners for instance). Moreover, there are many reasons why the environment might not be perfectly competitive, with the presence of variations in worker bargaining power across sectors and firms for instance.

Because economic theory is non-conclusive on where the burden of increased deficit payments might fall, varying claims have been made. Survey data suggests that rising pension costs (since 2013) *have* impacted on pay rises in some instances, but firms point to profit reductions and hiring slowdowns too.[13] As the government's recent consultation on DB puts it:

> *22. A number of commentators have suggested it is not fair to preserve the current level of benefits payable to retired, or older workers in DB schemes when their younger colleagues are unlikely to enjoy the same level of benefits themselves when they retire. Some go further and argue that the increasing costs to employers of meeting their DB pension pledges is crowding out investment in jobs, wages, and dividends and affecting employers' ability to contribute adequately to the pension pots of predominantly younger workers in DC pension arrangements.*
>
> *23. The counter argument, which others have set out, is that there is no evidence that DB costs are impacting on investment or the provision of wages or pensions for younger workers.*[14]

Understanding just where the balance has fallen in the period since the early-2000s requires empirical testing. The Bank of England has looked at whether deficits have impacted on business investment[15] but, until now, no similar studies have been undertaken in relation to pay.

Forthcoming work from Adrjan and Bell which we draw on below corrects this, marking the first attempt to quantify the impact of deficit payments since 2000 on individual levels of pay.[16] In so doing it provides a description of what has happened over the period, but it does not of course speculate on how firms *should* have behaved or how things might evolve in the future. Nevertheless, it marks a very important step forward in understanding just which groups have paid the price for increased DB pension deficit payments.

The analysis draws on data from the annual reports of 475 UK-listed companies, two-thirds of which have exposure to at least one UK DB scheme (open or closed). The sampling frame for the firms requires them to have been among the 300 largest (by market

13 J Cumbo, *"QE is harming business via greater pension costs, survey finds"*, *Financial Times*, 15 November 2016

14 *Ibid.*

15 "Defined-benefit pension fund deficits and the real economy", *Inflation Report*, Bank of England, November 2016, pp14-15

16 More details on data sources and the methodology are available in the Annex.

capitalisation) UK-domiciled businesses on the London Stock Exchange at some point between 2000 and 2010. Taken together, the sample firms account for around one-third of all DB payments made over the period 2004-2015.

Because firms do not have to report deficit payments separately in their accounts, they are instead identified by removing 'current service costs' (the increase in the present value of a DB obligation resulting from employee service in the current period) from total employer contributions.[17] Payments are then weighted by the firm's total wage bill. Across those firms with DB exposure in the sample , these payments average 6 per cent of the wage bill, with a standard deviation of 9 per cent. They range from a minimum of -7 per cent (i.e. a surplus) to a maximum of 50 per cent.

This business-level data is matched to individual wages via the *Annual Survey of Hours and Earnings* (which contains a firm identifier), covering 50,000 workers in firms with DB schemes over the period 2002-2015.

The evidence suggests that workers in firms with defined benefit deficits *have* experienced a wage penalty relative to those in firms without such legacy costs, though the macro pay effects appear modest

Controlling for individual and firm characteristics, regression analysis isolates the impact of variations in deficit payments (weighted by the firm's total wage bill) on wage levels. In effect, this analysis considers how the wages of similar-looking workers in similar-looking firms vary with the scale of DB deficit payments made by employers.

Table 1 summarises the findings for all workers in the sample, showing ranges that reflect the results produced with different control factors included.[18] The coefficients show the hourly wage effect associated with increasing DB deficit payments by 1 per cent of a firm's total wage bill. The results show that a shift of this magnitude has a statistically significant negative effect on the pay of employees in DB-deficit firms, lowering hourly pay by around 0.1 per cent (ranging from -0.08 per cent to -0.12 per cent across the six models).

Table 1: Pension deficit payments and workers' wages: regression results for all workers

Hourly wage effect associated with an increase in DB deficit payments equivalent to 1% of the firm's total wage bill				*Significant*	*Average age*
All workers in DB deficit firms	-0.08%	to	-0.12%	yes	39.5

Notes: Six models are run in total, with differing numbers of controls. These vary from (1) individual fixed-effects and year dummies to (6) match fixed-effects, measures of firm performance (sales and profitability) and industry-time effects. The ranges shown in the table cover the minimum and maximum coefficients across these six models. All figures are statistically significant at least at the 10 per cent level (model 1) and frequently at the 1 per cent level (models 5 & 6).

Source: P Adrjan & B Bell, forthcoming

17 Comparison with actual deficit payments in those firms that *do* directly report them suggests this is a very good proxy.

18 More formal regression outputs are again available in the Annex.

By way of linking the micro firm-level findings in the regression with the macro pay growth slowdown discussed above, we can use these coefficients to estimate an aggregate effect of DB deficit payments on pay. That is, if we assume the UK is a single 'firm' we can estimate how much lower hourly pay is for all workers in this 'firm' than would have been the case if deficit payments were in line with historic averages.

Using the £19 billion increase in deficit payments that we identified above, we see that increased deficit payments in 2016 were equivalent to around 2.5 per cent of the UK's total wage bill. The implication is that employee hourly pay was therefore between 0.2 per cent and 0.3 per cent lower in 2016 than it would have been in the absence of the post-2000 increase in deficit payments. Converting this hourly pay effect into an aggregate annual one (multiplying through by total employee hours worked) implies that somewhere between £1.4 billion and £2.2 billion (or in the region of 10 per cent) of the £19 billion elevation in deficit payments in 2016 is associated with lower pay.

The implication is that the macro effect appears modest, representing a lowering of average annual pay levels of just £50-£80 per employee across the economy. Non-trivial perhaps, but not the primary cause of any structural slowdown in wage growth from the early-2000s.

This effect would of course be larger if we also included any effects associated with other forms of pension contributions (covering the £26 billion elevation in 2016 relative to pre-2000 norms of contribution rather than just the £19 billion flowing from special DB payments). Given that increases in such payments after 2000 will have been motivated by many of the same factors driving the appearance of deficits (increased longevity, a lower discount rate and falling asset returns) and given the scale of the increase, this is likely to be another important factor for further consideration.

The modelling above doesn't account for this, but we can use a very simple thought experiment by way of establishing a ball park figure. That is, if we assume a drag on pay from normal pension contributions that is in line with the level we have identified in relation to special contributions (-0.08 per cent to -0.12 per cent for every 1 per cent change in payments relative to the wage bill), then the aggregate pay effect rises from around £1.4 billion-£2.2 billion to roughly £1.9 billion-£2.9 billion.

But the micro firm-level effect is sizeable, with the pay penalty higher for members of affected DB schemes

While the macro effect appears modest, the fact that deficit payments appear to have a strongly significant negative effect on the pay levels of workers in affected firms is a new and important finding.

And at the micro level, the wage impact has the potential to be sizeable. In practice, all of the aggregate pay effect estimated above is concentrated on employees working in firms that are making DB deficit payments. This group comprises just under half of all private sector employees. Sharing the £1.4 billion-£2.2 billion across this group suggests that the average pay effect among those working in DB-deficit firms rises to somewhere between £145 and £225 a year. And of course, some will be even more adversely affected. As noted, across the sample of firms and dates covered in this analysis these special payments ranged as high as 50 per cent of the wage bill: in such cases the impact on individual pay could be very marked.

Moving beyond the average impact, Table 2 presents further results from the regression and shows that the wage effect varies across different types of workers. The sec-

ond block of results compares the hourly wage reduction associated with an increase in deficit payments equivalent to 1 per cent of the wage bill for three different sets of employees in firms that are making such payments: those who are current members of the DB scheme; those who are deferred members (where the scheme is closed to future accrual or they have opted out); and those who have never been a member of the DB scheme.

Table 2: Pension deficit payments and workers' wages: regression results for different pension membership groups

Hourly wage effect associated with an increase in DB deficit payments equivalent to 1% of the firm's total wage bill				*Significant*	*Average age*
All workers in DB deficit firms	-0.08%	to	-0.12%	yes	39.5
Those who are current members of the DB scheme	-0.12%	to	-0.18%	yes	42.8
Those who have previously been members of the DB scheme	-0.07%	to	-0.15%	yes	42.8
Those who have never been members of the DB scheme	-0.03%	to	-0.08%	no	36.2

Notes: See notes to Table 1. Where statistical significance is denoted it varies from the 10 per cent level (deferred DB members under model 1) to the 1 per cent level (deferred and current members under models 2, 5 & 6).

Source: P Adrjan & B Bell, forthcoming

In line with theory, the findings suggest that the pay impact is greatest for those who yield the most benefit from the deficit payment. Holding all else constant, current members face hourly wage levels that are between 0.12 per cent and 0.18 per cent lower per 1 per cent increase in deficit payments (as a share of the wage bill). This compares with figures of 0.07 per cent and 0.15 per cent for deferred members. The coefficients are smaller again for those workers in DB-deficit firms who have never been members of the scheme and, in this instance, the findings are not statistically significant.

Workers at the bottom of the wage distribution have been affected by deficit payments even when they've never been members of the pension scheme

Yet there *is* a statistically significant effect on employees who have never been part of the DB scheme when we focus specifically on those in the bottom quarter of the wage distribution.

The final two blocks of Table 3 compare findings in the bottom and top quartiles of the pay distribution.[19] The results imply that the magnitude of wage effects associated with deficit payments are both larger for lower paid employees than for higher paid workers and significant even for those who have never been in the scheme.

19 Established by ranking all the workers in the sample each year and then taking their average rank across years and allocating them to a fixed quartile.

Table 3: Pension deficit payments and workers' wages: regression results for different parts of the pay distribution

Hourly wage effect associated with an increase in DB deficit payments equivalent to 1% of the firm's total wage bill				*Significant*	*Average age*
All workers in DB deficit firms	-0.08%	to	-0.12%	yes	39.5
Those who are current members of the DB scheme	-0.12%	to	-0.18%	yes	42.8
Those who have previously been members of the DB scheme	-0.07%	to	-0.15%	yes	42.8
Those who have never been members of the DB scheme	-0.03%	to	-0.08%	no	36.2
Bottom quartile of pay distribution:					
Those who are current members of the DB scheme	-0.22%			yes	44.7
Those who have previously been members of the DB scheme	-0.20%			no	44.5
Those who have never been members of the DB scheme	-0.22%			yes	34.7
Top quartile of pay distribution:					
Those who are current members of the DB scheme	-0.16%			yes	43.4
Those who have previously been members of the DB scheme	-0.08%			no	43.4
Those who have never been members of the DB scheme	-0.04%			no	40.4

Notes: See notes to Table 1. The coefficients for the top and bottom quartiles of the pay distribution relate to model 6. Where statistical significance is denoted in relation to the top and bottom quartile, it is at the 5 per cent level.

Source: P Adrjan & B Bell, forthcoming

Indeed, the size of the pay effect on a lower paid worker who has never been in their firm's DB scheme appears to be roughly twice the size of the effect measured across all workers in firms with DB deficits. Importantly, looking across the different groups set out in Table 3, it is this particular group of lower-earning non-DB members which represents the youngest part of the population. The absence of any statistically significance when looking at higher earners who have never been members of their firm's DB suggests that relative labour strength may form part of the story too.

The extent to which those with the most to benefit from DB deficit payments have experienced the largest wage effects is further tested by considering variations by the duration of individuals' membership of the scheme. However, no significant results are returned in this instance.

The implication is that DB deficit payments are associated with lower wages for some and might continue to act as a headwind in the coming years

This analysis presents us with an important step forward, but there are more questions to answer. For example, the modelling assumes no 'spillover' effects within sectors. That is, if DB deficit payments act to drag on pay levels in some key firms within an industry (remembering that many DB pension schemes were often associated with large, market-leading firms), we might expect other businesses in that sector to lower their wage offers too. Yet the nature of the regression analysis is such that wage levels in DB-deficit firms are compared against a benchmark of other DB-deficit organisations, with no way of capturing whether the sector- or economy-wide wage benchmark is lower than it might be. This will be the subject of further work by Adrjan and Bell.

Another question worthy of further exploration relates to the distribution of the remaining burden of deficit payments between profits and investments – with this balance having important distributional consequences and implications for expected future rates of business growth. The analysis we have summarised in this paper suggests that the additional costs associated with increased deficit payments over the course of the 21st century have been shared between firms and workers, but further research will be required to understand how firms have responded to any squeeze on profits.

The phenomenon of post-2000 increases in employer pension contributions has many important implications, and merits further digging. The government is currently consulting on whether or not it needs to intervene on this issue,[20] but its focus is on the structural sustainability of deficit payments across firms rather than on any potential feed through to wages.

The fact that DB pensions are largely off-limits to younger workers makes such effects particularly interesting from an intergenerational perspective. Beneficiaries tend to be older – with two-fifths already in retirement. But those meeting the costs of the schemes cover both old and young – be they shareholders facing lower dividends, workers receiving lower wages or future generations enduring slower growth as a result of reduced investment. The distribution is complex, but this important new work has for the first time shown that at least some of the burden has fallen on employees – even those younger workers who have never been members of the DB pension.

How this landscape changes over the coming years is uncertain. However, the scale of the DB deficits currently in existence suggests that special payments will continue to act as a headwind to pay growth. That is not to say that it is inevitable – firms can choose how they share deficit burdens across workers and profits and the balance need not be fixed – but it does increase the urgency with which we should consider ways in which pay growth might be boosted more generally. It also means that policy makers concerned with DB deficits should have regard, not just for the sustainability of payment schedules within firms, but also for the consequences for different parts of society of how such payments are funded.

20 DWP, *Security and Sustainability in Defined Benefit Pension Schemes*, Cm 9412, February 2017

Annex

In this annex we provide a more formal presentation of the data, methods and results associated with the Adrjan and Bell analysis presented above.

Data

Data is collected from the annual reports of 475 UK-listed companies, subject to a sampling frame that requires them to have been among the 300 largest UK-domiciled firms ranked by market capitalisation at any point over the period 2000-2010. Of the 475 firms, two-thirds (65 per cent) report exposure to at least one UK DB scheme – with the remaining 35 per cent having either no pension exposure or only DC schemes.

For each firm with a DB scheme, annual data is collected from the accounts on:

(i) total employer contributions;

(ii) current service costs;

(iii) year-end assets, liabilities and surplus/deficit; and

(iv) triennial valuations.

Employee wage data for the years 2002-2015 comes from the *Annual Survey of Hours and Earnings* (ASHE). This data is a panel of 1 per cent of employees, based on their unique National Insurance number. The survey is conducted every April and wage data are submitted by employers.

To match the employee pay data to the listed firm sample, Dun and Bradstreet code is used. Of the 475 listed firms, at least one worker can be identified in 393 cases. There are two key reasons why workers are not matched for every firm. First, since ASHE is only a 1 per cent sample, firms with small employment levels will frequently not have an employee with the relevant National Insurance number. Second, some firms listed and domiciled in the UK have almost their entire operation outside of the UK. This is particularly true for energy companies. Since ASHE only covers UK workers, such firms' employees will not be in the data.

Deficit payments that firms are required to make to their DB schemes are defined as:

Deficit payment = Total employer contributions – Current service costs

Current service costs are defined as "the increase in the present value of a defined benefit obligation resulting from employee service in the current period".[21] They therefore represent the costs of providing a DB scheme for the financial year for the current employees. They exclude the cost of any re-evaluation of the present value of the obligations for previous employees (or previous years of service for current employees). If the scheme has been closed to future accrual, the current service cost is zero.

This approach is used to define the deficit payment because firms are not required to report regular and deficit-covering employer contributions separately. Some do however, and there is a good match between the constructed measure and the directly reported one.

21 International Accounting Standard Nineteen

Method

The basic empirical approach exploits the panel to identify the effect of DB deficits using the within-firm variation over time. The estimate models take the form:

$$y_{ijt} = \alpha_i + \beta_j + \gamma_t + \sum_{k=1}^{2} \delta_k DB_{Deficit_{jt-k}} + \pi X_{ijt} + \varepsilon_{ijt}$$

where is some measure of pay for individual *i*, in firm *j*, at time *t*. Individual- and firm-fixed effects (respectively and) are controlled for, and estimates are also reported with match fixed-effects. Common macroeconomic shocks and a set of other observables are also allowed for. The parameters of interest, , measure the effect on the outcome variable of up to two lags of the DB deficit measure. To generate a measure that is comparable across firms, the DB deficit measure is deflated by the initial wage bill.

Results

Table 4 sets out the estimates of fixed-effect panel wage regressions, with ln(hourly wages) as the dependent variable. Each column introduces additional controls, in order to determine the robustness of the findings.

Table 4: Pension deficit payments and workers' wages: all workers

	(1)	(2)	(3)	(4)	(5)	(6)
db_wbill(-1)	-0.014	-0.024	-0.017	-0.019	-0.02	-0.027*
	(0.014)	(0.017)	(0.017)	(0.014)	(0.016)	(0.015)
db_wbill(-2)	-0.051**	-0.073***	-0.074**	-0.080***	-0.090***	-0.082***
	(0.025)	(0.026)	(0.029)	(0.030)	(0.031)	(0.031)
∑db_wbill	-0.066*	-0.097**	-0.092**	-0.099**	-0.115***	-0.109***
	(0.034)	(0.039)	(0.041)	(0.039)	(0.042)	(0.008)
Individual FE	x	x	x	x	x	
Year FE	x	x	x	x	x	x
5-digit industry FE		x	x	x		
Firm performance controls			x	x	x	x
Firm FE					x	
Match FE						x
1-digit industry * Year FE				x	x	x
Sample size	183,148	183,148	171,270	171,270	171,270	171,270

Notes: All regressions include age, age squared and tenure. Each panel reports the sum of the coefficients on the pension deficit measure, which have two lags included in all specifications. All standard errors are clustered at the individual level.

Focusing on the first column, controlling for individual fixed-effects and year dummies, there is a strongly significant negative effect of the deficit payments on workers' pay. A one standard deviation rise in this measure (0.09 or 9 per cent of the total wage bill) causes a 0.7 per cent reduction in pay. Moving across the columns, this key result remains and the coefficients tend to get larger in absolute magnitude as more controls are added. In the final column, controls for match fixed-effects, measures of firm performance (sales and profitability) and industry-time effects are all in place. Even with such extensive controls, consistently negative effects are reported.

Table 5 presents the results for three mutually exclusive groups of workers within these DB-deficit firms: those who have never been a member of the DB scheme; deferred members (where the scheme has closed to future accrual or the worker has chosen to opt out); and those who are current members of the DB scheme. This indicator is measured with some error. Only from 1997 onward is it known whether the worker has been a member of the DB scheme for every year of employment. So a worker who has not been in the DB scheme at any point since 1997, but was employed by the firm prior to 1997, may have been a member. The coefficients are consistently largest for current members, with strongly significant negative effects for deferred members too. The coefficients for those who have never been members of the DB scheme are negative, but not significant.

Table 5: Pension deficit payments and workers' wages: by pension membership

	(1)	(2)	(3)	(4)	(5)	(6)
∑db_wbill * DB never member	-0.032	-0.062	-0.052	-0.051	-0.065	-0.037
	(0.034)	(0.041)	(0.045)	(0.044)	(0.047)	(0.045)
∑db_wbill * DB deferred member	-0.058*	-0.110***	-0.096**	-0.116**	-0.128***	-0.138***
	(0.034)	(0.040)	(0.046)	(0.048)	(0.050)	(0.051)
∑db_wbill * DB current member	-0.109**	-0.135***	-0.140**	-0.155***	-0.164***	-0.172***
	(0.049)	(0.051)	(0.055)	(0.057)	(0.059)	(0.062)
Individual FE	x	x	x	x	x	
Year FE	x	x	x	x	x	x
5-digit industry FE		x	x	x		
Firm performance controls			x	x	x	x
Firm FE					x	
Match FE						x
1-digit industry * Year FE				x	x	x
Sample size	183,148	183,148	171,270	171,270	171,270	171,270

Notes: All regressions include age, age squared and tenure. Each panel reports the sum of the coefficients on the pension deficit measure, which have two lags included in all specifications. All standard errors are clustered at the individual level.

Table 6 presents the results for the same three groups of workers, this time split by their position in the wage distribution. Rather than a quantile fixed-effect regression, this approach ranks workers each year in the wage distributions and then allocates them to a quartile based on their average rank across years. The results show a significantly negative wage effect in the bottom quartile even among those workers who have never been members of the DB scheme.

Table 6: Pension deficit payments and workers' wages: by wage quartile

	Quartile			
	(1)	(2)	(3)	(4)
∑db_wbill * DB never member	-0.198**	-0.084	0.087**	0.037
	(0.081)	(0.053)	(0.041)	(0.036)
∑db_wbill * DB deferred member	-0.182	-0.192***	-0.099*	-0.068
	(0.115)	(0.070)	(0.056)	(0.050)
∑db_wbill * DB current member	-0.190**	-0.214**	-0.141**	-0.146**
	(0.077)	(0.093)	(0.068)	(0.065)
Year FE	x	x	x	x
Firm performance controls	x	x	x	x
Match FE	x	x	x	x
Proportion never DB member	78.6%	64.9%	40.6%	29.2%
Sample size	41,118	47,185	44,495	38,894

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For more information on this Report, contact:

Matthew Whittaker Chief Economist

matthew.whittaker@resolutionfoundation.org

020 3372 2958