3. The productivity puzzles[1]

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Summary

- There are now more people in employment in the UK than before the recession. But output remains below pre-recession levels. At the same point after the recessions of the early 1980s and 1990s, the reverse was the case: employment levels were still lower than before the recessions, but output had more than recovered its pre-recession level. The result is a fall in labour productivity since 2008 that is much larger and more persistent than in previous recessions.

- In 2012Q3, measured real output per worker was 3.2% lower than in 2008Q1 and 12.3% below its pre-recession trend. Part of the fall comes from an increase in part-time work and the resulting reduction in average hours. However, output per hour has also fallen – by 2.6% between 2008Q1 and 2012Q3 – and is 12.8% below its pre-recession trend.

- Changes to the industrial composition of the economy do not explain any of the fall in aggregate labour productivity, and we conclude that changes in the types of people employed can explain only a small part of the fall.

- Real wages have fallen since 2008. Labour supply appears to have been more robust, and the labour market more flexible, than was the case during previous recessions. This has likely contributed to lower real wages, which in turn allow firms to retain more workers than they otherwise would during periods of falling demand, and thereby to lower labour productivity.

- In contrast to previous recessions, there has been no surge in levels of economic inactivity – i.e. in the numbers of people of working age neither in employment nor looking for employment. This seems likely to be associated with a benefit system that has tighter job search requirements.

- The evidence in favour of continued 'labour hoarding' is weak: flows into employment have remained strong and we would expect the majority of firms to have adjusted their labour inputs by now.

- Business investment has fallen significantly during the recession and remains 16% below the pre-recession high. To the extent that this has reduced either the level or quality (or both) of available capital, we expect low investment to have contributed to lower labour productivity. In addition, a higher cost of capital relative to wages combined with uncertainty over future demand may have led firms to substitute some labour for capital.

- The movement of capital to high-productivity projects may have been inhibited by a combination of bank forbearance and financing constraints that reduce the exit of low-productivity firms and restrict the entry of new firms. Aggregate labour productivity will be adversely affected during any period of capital adjustment.

- In contrast to the private sector, public sector employment has contracted sharply since the recession – the 6% fall since the end of 2009 largely reverses the increase in public sector employment over the previous decade. At the same time, output of government services, as measured in the National Accounts, has increased slightly since 2009. This suggests that public sector productivity has grown in recent years. However, we present this conclusion with some caution given the particular difficulties in measuring output of the public sector.

3.1 Introduction

The 2008–09 recession entailed a sharp fall and ensuing stagnation in national income, alongside relatively resilient employment. As a result, measured output per worker fell by 3.2% in absolute terms between 2008Q1 and 2012Q3. Almost five years after the start of the recession, labour productivity was 12.3% below its pre-recession trend. This experience is in marked contrast to the recessions in 1979–81 and 1990–91, when labour productivity fell by substantially less (driven by relatively smaller falls in output and larger falls in employment) and resumed growth a year after the start of the recession. The puzzle is what caused such a large and persistent fall in labour productivity? Alternatively, why has employment performed much better than we would have expected given the fall and then stagnation of output?

In this chapter, we analyse some of the factors that may have contributed to lower UK labour productivity. We don't purport to have solved the puzzles. But, based on the available evidence, we offer our tentative conclusions on which factors are likely to have played a more important role.

Section 3.2 discusses changes in measured labour productivity since the recession and relates these to the experiences in previous recessions. Section 3.3 discusses changes in the industrial composition of the economy and specific productivity falls within industries. Section 3.4 discusses changes in the composition of the workforce, which now contains more part-time workers and more self-employed workers (likely to be less productive on average than full-time employees) but also more workers with higher qualifications and more work experience. Section 3.5 demonstrates the large fall in real wages and highlights evidence that labour supply has increased. Section 3.6 considers the effect of the level and allocation of capital on labour productivity.

Trends in the public sector present their own puzzles. Historically, measured public sector productivity growth has been close to zero. This apparently slow growth, alongside a rapid expansion in public sector employment over the previous decade, was among the many factors underlying the coalition government's determination to 'rebalance' the economy away from the public sector and towards the private sector. In contrast to the private sector, public sector employment has contracted sharply since the recession while public sector output, as measured in the National Accounts, has slightly increased. This is somewhat surprising given that a large part of public sector output is measured based on the volume of inputs (such that a fall in employment would be expected to decrease output and leave productivity broadly unchanged). The evidence points to an overall increase in labour productivity in the government sector, although the difficulties in measuring government output lead us to present this conclusion with some caution. Section 3.7 considers trends in public sector productivity and a final section concludes.

Productivity matters

What has happened to labour productivity – the scale of the fall, what caused it and whether it is temporary or permanent – matters for economic policy. Some of the factors we discuss – including an underutilisation of labour and misallocation of capital – suggest that part of the fall in the level of productivity may be temporary such that we would expect productivity (but not necessarily the number of jobs) to increase again when the economy recovers. However, some of the fall in labour productivity may have had more structural causes, such as an increase in labour supply (which puts downward pressure on wages) or a shift in demand away from high-productivity sectors. In addition, a period of depressed output itself may feed through into lower future productivity if, for example, the skills of workers depreciate or if new ideas that were unable to secure finance or were deterred by uncertainty do not now come to fruition. As a result, both the level and the growth rate of productivity may be permanently lower, and therefore there may be only a weak recovery in productivity and limited increases in real wages when output recovers.

The degree to which the fall in productivity is expected to be permanent affects estimates of potential output (and therefore of the output gap) and of expected future growth. This in turn affects the policy prescriptions – in particular, how much of the increase in public sector net borrowing since the financial crisis and associated recession can be expected to be temporary and how much can be expected to be impervious to recovery and potentially necessitate tax rises or spending cuts (see Chapter 5). It also has implications for how we expect to see the labour market fare during a recovery.

3.2 The trend in measured labour productivity

Labour productivity is measured as the amount of output produced in a given period, divided by the amount of labour input in that same period. In the figures that follow, we measure labour productivity using data from the Office for National Statistics (ONS). Measures of output and labour input are always subject to some error, and there may be reasons to suspect this to be worse during the recent recession. In particular, it is possible that measurement issues are distorting the size of the change in labour productivity since the recession (see Box 3.1 for a discussion). However, we expect that the trends discussed below would continue to hold even if there were relatively large revisions to the output or employment figures.

Box 3.1. The measurement of labour productivity

Labour productivity is the amount of output produced for a unit of labour input, commonly measured as either the number of workers or the number of hours worked. This is the average output of labour. An accurate measure of labour productivity requires accurate measures of the amount of labour input and the associated output.

Labour input

Labour input is commonly measured as either the total number of workers employed or the total number of hours worked. The aggregate estimates used by the ONS and the numbers in this chapter come from the Labour Force Survey (LFS) – a continuous survey of a large number of households.

Employment is relatively well measured. The LFS definition of employment includes employees, the self-employed and those working on government schemes. This follows international standards (set by the International Labour Organisation) and has been consistent over long periods of time. The inclusion of those on government schemes and doing unpaid work has been subject to criticism.[a] In absolute terms, the ONS measure of total employment shows an increase of 500,000 (1.8%) in the year to 2012Q3, a fifth of which can be attributed to people on government schemes. Excluding these workers does not qualitatively change the trend in labour productivity (see Figure 3.1). Moreover, the LFS estimate of total employment appears to tell a similar story, as do alternative sources such as the series 'workforce jobs', which are jobs figures collected from employers.

It is also possible that there was some measurement error in employment figures before the recession as a result of increased immigration: migrant workers may be less well captured in both the LFS and employer surveys. If there were more migrant workers before the recession than currently, then output per worker would be more overestimated before the recession.

Hours may be subject to more measurement error than employment, not least because it is harder for an individual to recall the precise number of hours worked than to say whether they worked at all. Measurement error may have increased during the recession, although we do not have evidence on this or, indeed, on whether hours are more or less likely to be over-/under-reported. For example, hours may be more likely to have been overestimated since the recession if workers are not accurately reflecting a fall in the number of hours they actually work. This would lead to an underestimate of labour productivity. In contrast, measurement could have improved – because, for example, there is now less overtime work, which may be reported less well.

Output

Gross domestic product (GDP) – or national income – is the total value of all goods and services produced within the country. It is estimated and updated by the ONS using the data collected for the National Accounts.

There are three approaches used to measure GDP. The production approach estimates the value of all production activity in the economy, net of the value of intermediate inputs and net taxes (i.e. it measures gross value added, GVA). The income approach estimates the incomes earned by all factors of production (notably capital and labour) as a result of individuals and corporations producing goods and services. And the expenditure approach estimates the sum of all households' final consumption, government final consumption, gross capital formation and net export (Y= C+G+I+NX). The ONS reconciles the three estimates into a single GDP figure.[b]

Measuring GDP is not an exact science and initial estimates are subject to subsequent revisions as more extensive data become available. Estimates are based on a combination of business surveys, consumer surveys and income data. Usually, initial estimates are based on a subset of responses and may not be fully reconciled across the three approaches until later. This is inevitable in a modern economy with many complex transactions.

One of the concerns in considering the evolution of productivity over the recession is that the large fall in output may be revised down (such that the productivity gap is reduced). The falls in output seen during 2011Q4–2012Q2 and in 2012Q4 could even be revised away. Indeed, the last time the ONS reported a double-dip recession, in the early 1990s, it was later revised away: GDP was thought to recover briefly in 1991Q3 and fall again (back into recession) in 1991Q4–1992Q2, but later revisions showed no recovery in 1991Q3 and therefore technically no 'second' dip. However, the cumulative peak-to-trough fall in GDP during the recession of the early 1990s was very similar to the initial estimate.

ONS analysis claims that, based on the size of previous revisions, future revisions to GDP figures are unlikely to increase GDP by more than 1 percentage point between 2009 and 2012 (current data show a fall in output of 3.0% from 2008Q1 to 2012Q3).[c] Historical evidence suggests that the majority of revisions in terms of absolute magnitude happen within two years of the initial estimate and that revisions have become smaller in magnitude since the early 1990s.[d] However, GDP may be harder to measure now than before the recession. For example, there may be additional error caused by the difficulty of measuring growing online trade or by firms and workers engaging in activities that produce less-easy-to-measure outputs (such as spending effort to generate more business).

[a] See, for example, http://www.guardian.co.uk/uk/2013/jan/15/statistics-doubt-coalition-500000-jobs.
[b] The three approaches theoretically should give the same GDP figure, but in practice they differ due to measurement errors. When data on all three approaches are available, the ONS reconciles estimates from the three approaches into a single GDP measure.
[c] See P. Patterson, 'The productivity conundrum, explanations and preliminary analysis', ONS, 2012 (http://www.ons.gov.uk/ons/dcp171766_283259.pdf).
[d] See chart 5 in ONS, A. Walton and G. Brown, 'Updated analysis of revisions to quarterly GDP', ONS, 2012 (http://www.ons.gov.uk/ons/guide-method/method-quality/specific/economy/national-accounts/articles/updated-analysis-of-revisions-to-quarterly-gdp.pdf).

Labour productivity has fallen substantially

During the recession from 2008Q2 to 2009Q2, real national income fell cumulatively by 6.3%, while employment fell by 2.1% (see Figure 3.1). The large fall in output relative to employment led to a 4.3% fall in labour productivity, as measured by output per worker.

National income grew slowly in the two years following the end of the recession and has been weak since. The latest available data show that national income contracted for three consecutive quarters, before increasing in 2012Q3 and dipping down again in the last quarter of 2012. A recovery in employment initially lagged the recovery in output in 2009 such that measured productivity briefly started to recover.[2] However, employment increased sharply from 2011Q3 to 2012Q2 such that measured labour productivity fell again.
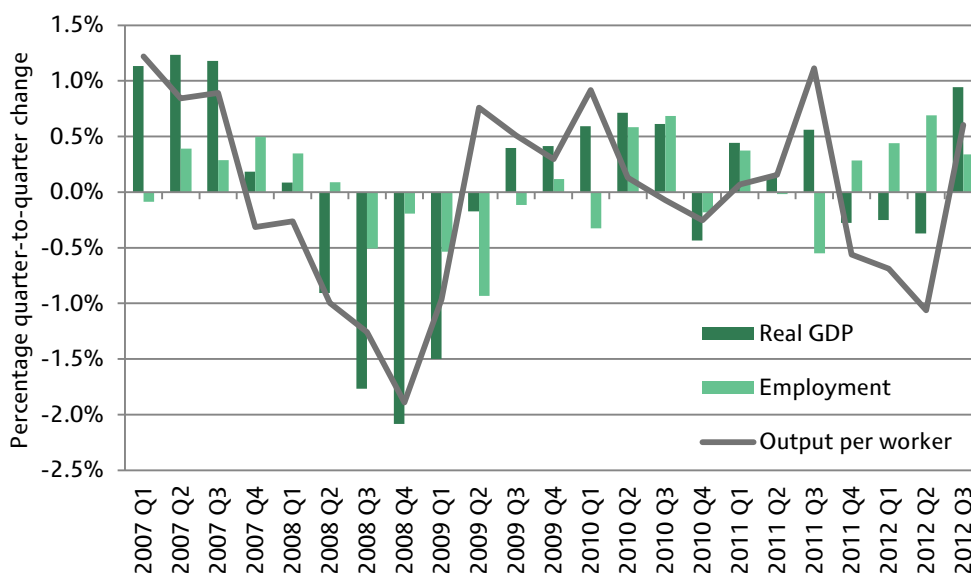
Across the whole period 2008Q1 to 2012Q3, output fell by 3.0% and employment increased by 0.2% such that output per worker is now 3.2% below its pre-recession level.

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[2] That employment changes lag changes in output has been established as a stylised fact in references to US business cycles. See J.H. Stock and M.W. Watson, 'Business cycle fluctuations in US macroeconomic time series', in J.B. Taylor and M. Woodford (eds), *Handbook of Macroeconomics*, vol. 1, Elsevier, 1999. This implies that any given quarter may not provide an accurate picture of the trend in labour productivity.

Most recently, output is estimated to have fallen by 0.3% in 2012Q4, while employment held up well to November (latest month available at the time of writing). This means output per worker is likely to have fallen further in 2012Q4. This period of increasing employment alongside no growth in output is a puzzle in its own right.

The lower level of output per worker is not simply explained by lower average hours per worker. Average hours per worker fell by 0.7% between 2008Q1 and 2012Q3, compared with a small increase in employment. However, output per hour has also fallen significantly – by 2.6% from 2008Q1 to 2012Q3.[3]

Figure 3.1. Changes to output, jobs and productivity

Notes: Quarterly percentage change to GDP is based on ONS series ABMI, real GDP seasonally adjusted. Quarterly percentage change to employment is based on ONS series MGRZ, total in employment aged 16 and over. The percentage change to output per worker equals the percentage change to GDP minus the percentage change to employment.

Labour productivity has fallen by more than in previous recessions

Figure 3.2 compares the trajectory of output and employment since 2008Q1 to those following previous recessions. The recent recession was associated with a deeper fall in output but a less severe fall in employment than the previous two. Output fell by 6.3% from peak to trough from 2008Q1 to 2009Q2, compared with 2.9% from 1990Q2 to 1991Q3 and 4.6% from 1979Q4 to 1981Q1. Moreover, in the early 1980s and 1990s, output recovered to its pre-recession level within three years of the start of the recession. By contrast, output is still substantially below the 2008Q1 level, almost five years after the start of the recession. Of course, the previous recessions differed in other ways. For example, the recession of the 1980s was associated with a large industrial restructuring.
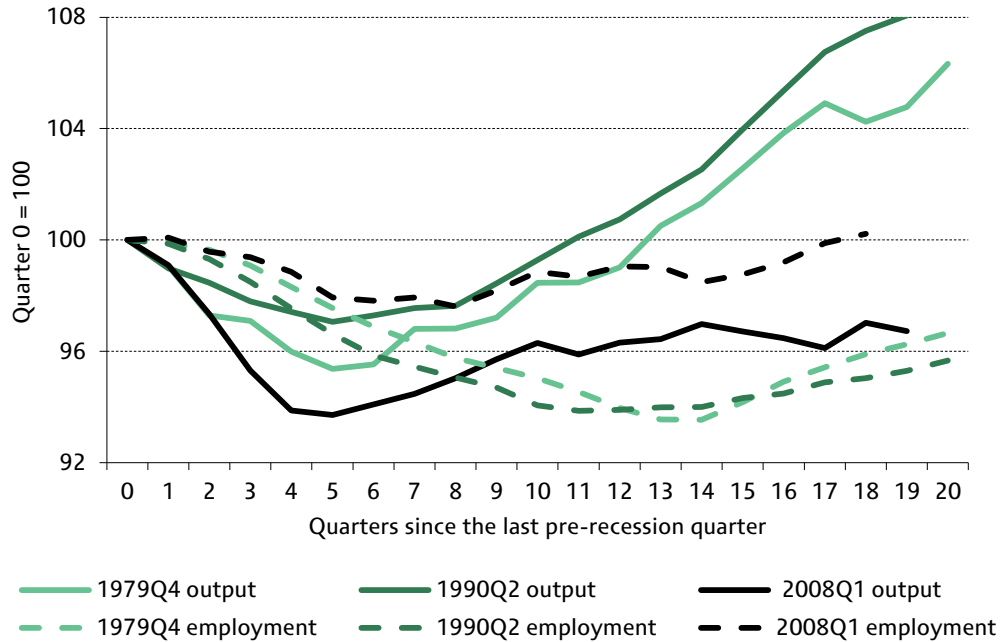
Employment following 2008Q1 fell for about a year, flatlined for another year and then started to recover. In contrast, in both the early 1980s and 1990s, employment fell by substantially more and continued to fall for about three years before recovering.

As a result of a larger fall in output and a relatively subdued fall in employment, labour productivity (measured as output per worker) has also taken a different path since 2008

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[3] Source: ONS series YBUV (average hours per worker), YBUS (total hours) and ABMI (real GDP).
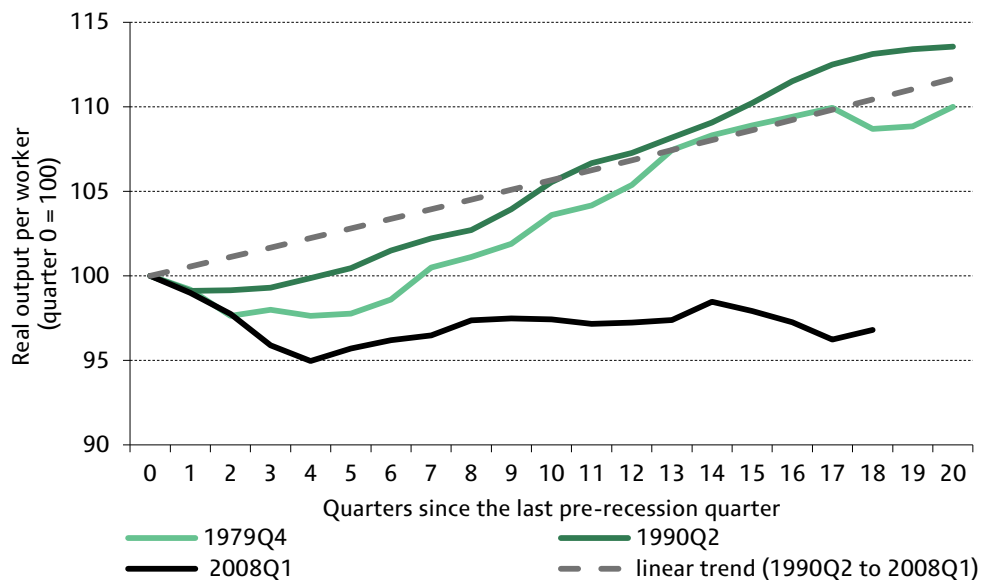
from that following previous recessions (Figure 3.3). At the end of 1979 and the start of 1990, there were temporary falls or stagnation of output per worker, but growth resumed within two years. In comparison, the fall in labour productivity since the start of 2008 has been noticeably larger, and there is no sign yet of a sustained recovery.

Figure 3.2. Real output and employment following recessions

Source: Output from ONS series ABMI; number of workers from ONS series MGRZ.

Figure 3.3. Real output per worker following recessions

Source: Authors' calculations using sources in Figure 3.2. The linear trend in real output per worker is the average quarterly growth rate from 1990Q2 to 2008Q1 (0.553%). The choice of slope is arbitrary to some extent and matters for the exact measure of the productivity gap. However, the trend growth rate is similar to that observed before the start of the recessions in 1979Q4 (0.503% per quarter from 1975Q1 to 1979Q4) and 1990Q2 (0.532% per quarter from 1979Q4 to 1990Q2). Had we used the average quarterly growth rate from 1998Q1 to 2008Q1 (0.503%), the gap between the trend and the actual output per worker would be 11.6% instead of 12.3%.
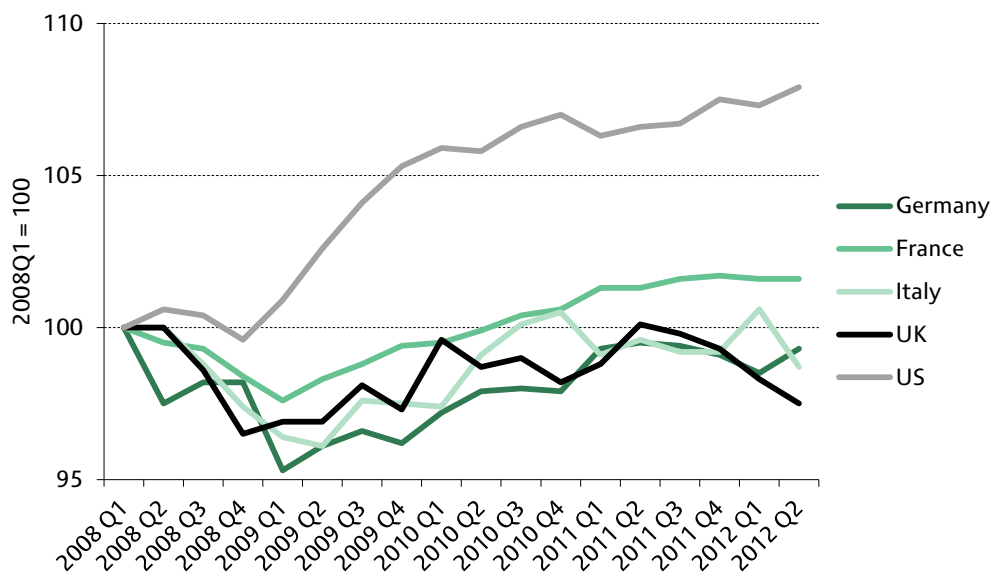
Labour productivity is substantially below the pre-recession trend

The dashed line on Figure 3.3 shows the trajectory for real output per worker had it continued to grow at the same average rate as before the financial crisis. This implies a gap of 12.3% between measured productivity in 2012Q3 and what it would have been had the pre-crisis trend continued. Output per hour worked is 12.8% lower in 2012Q3 than that associated with the pre-crisis trend.[4]

The UK experience is similar to that of some other European countries

The UK's experience of weak labour productivity since 2008 is similar to that of most other European countries but is different from that of the US (see Figure 3.4).[5]

Figure 3.4. International comparisons of output per hour

Source: Eurostat, Bureau of Labour Statistics and ONS (data available from chart 6 in http://www.ons.gov.uk/ons/dcp171766_283259.pdf).

In continental Europe, labour productivity in most countries (except Spain, where employment has plummeted) remained weak after the recession. In Germany and Italy, output per hour in 2012Q2 was still below 2008Q1 levels. Most notably, the employment rate in Germany has been higher since the 2008–09 recession than before it, which has been attributed to short-time working and to low real wages.[6] In contrast, US real output per hour hardly fell in 2008 and has grown rapidly since early 2009 to almost 8% above its pre-recession level. In addition, there has been no fall in real wages in the US. In many ways the US experience looks more similar to that of the UK in previous recessions.

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[4] Source of total hours figure: ONS series YBUS. Output per hour grew faster than output per worker in the two decades before 2008. Output per hour grew at an average rate of 0.617% per quarter from 1990Q2 to 2008Q1. We use this trend to calculate the productivity gap in 2012 in terms of output per hour.

[5] For a discussion of UK labour productivity from 2007 to 2009 and a comparison with the US, see R. Griffith and H. Miller, *UK Productivity in the Recession*, IFS Briefing Note 97, 2010 (http://www.ifs.org.uk/bns/bn97.pdf).

[6] For more on the resilience of German employment, see J. Boysen-Hogrefe and D. Groll, 'The German labour market miracle', *National Institute Economic Review*, October 2010, R38–50 (http://ner.sagepub.com/content/214/1/R38).

In the following sections, we consider some of the factors that may have contributed to the large fall in aggregate labour productivity.

3.3 Composition of industries

A change in the composition of the economy, and specifically an increase in the relative share of low-productivity industries, could cause lower aggregate labour productivity. This could have happened if, for example, there was a greater fall in demand for high-productivity industries (such as 'finance') relative to low-productivity industries (such as 'administrative and support services').

There have been significant differences in the changes in both output and hours worked across industries that have translated into different changes in both the level and growth of labour productivity. Table 3.1 shows relative output per hour across industries in 2008, and how labour productivity changed in the 10 years before the recession and in the four years after. It also shows industries' hours shares in 2008Q1 and how these have changed since the recession. Real output per hour has fallen in absolute terms in most industries in the table, with these industries together representing almost 50% of the workforce.

The financial and insurance industry, which represented 10.9% of GVA in 2008Q1 and was a relatively high-productivity sector, saw a large fall in output (such that it now represents a significantly smaller share of the economy) and a fall in productivity. In contrast, there are some low-productivity sectors that now represent a relatively larger share of total output (and employment), notably including administrative & support services, arts, entertainment & recreation, and government services. Indeed, the public sector has had a different experience from the private sector: the share of output produced by the 'government services' sector and the associated productivity have increased since 2008.[7] We return to discuss public sector productivity in Section 3.7.

To understand the role of different industries in the absolute fall in labour productivity, we decompose the overall change between 2008Q1 and 2012Q3 into two effects. The 'between' effect asks what aggregate labour productivity would be if the productivity of each industry is held fixed and only the share of an industry's hours changes. The 'within' effect asks what aggregate labour productivity would be if the share of an industry's hours is fixed and only productivity changes. Overall, we calculate that the 4.4% fall in labour productivity seen in these data is composed of a 0.6% 'between' effect and a –5.0% 'within' effect.[8] That is, the overall change in the composition of industries that has occurred does not help to explain the aggregate fall in labour productivity: if real output per hour in each industry had remained unchanged and only the relative shares of industries' hours had changed, aggregate output per hour would have increased by 0.6%.

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[7] The measure of 'government services' is not strictly equivalent to the 'public sector'. The former includes private school and healthcare providers, and excludes some services provided by local authorities (for example, rubbish collection is in 'arts, entertainment, recreation and other services').

[8] Authors' calculations using data from the ONS. The real estate sector has been excluded from this analysis. See the notes and source to Table 3.1 for the sources and an explanation of the discrepancy between the –4.4% figure and that used earlier in the text. While the precise sizes of the 'within' and 'between' effects are affected by the time period chosen, the qualitative conclusion that the within-industry effect dominates is robust to the choice of time periods.

This implies that the aggregate fall in labour productivity is the result of falls within sectors, with some sectors experiencing larger falls than others.
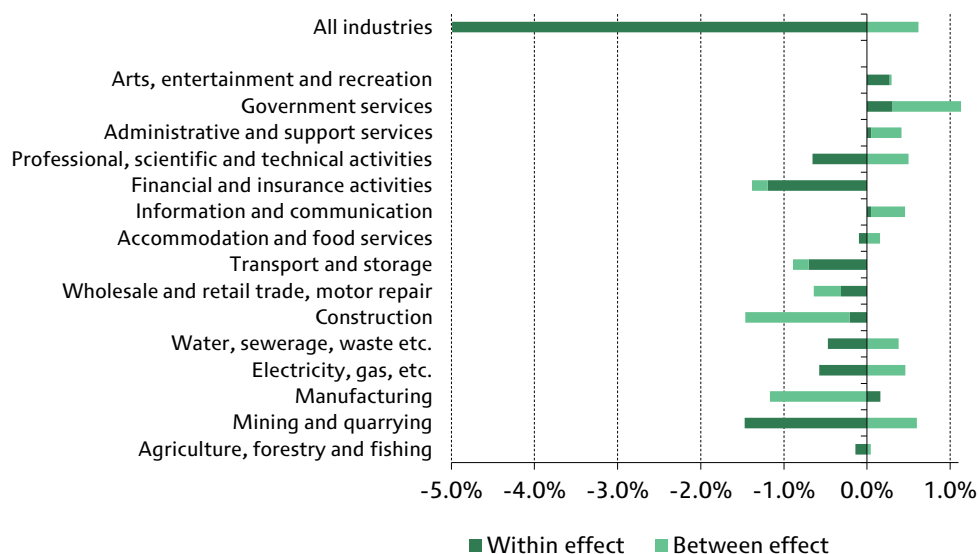
Figure 3.5 shows the aggregate 'between' and 'within' effects as well as the contribution from each industry. The figure shows that the fall of productivity within the finance industry alone would have reduced the aggregate productivity by 1.2% (i.e. a quarter of the total 5.0% fall caused by within-industry effects). The mining and quarrying industry also saw a large fall in productivity, which accounts for about a third of the absolute fall.

Table 3.1. Industry-level change in employment and productivity

Industry	Hours share		Productivity (output per hour)		
	2008Q1	% change 2008Q1– 2012Q3	Relative to total economy 2008	Annual % change 1998Q1– 2008Q1	Annual % change 2008Q1– 2012Q3
Total economy excl. real estate sector	100.0%	0.0%	100.0	2.3%	−1.0%
Government services	23.0%	1.0%	85.0	0.7%	0.3%
Wholesale and retail trade, motor repair	15.4%	−0.4%	78.1	2.4%	−0.6%
Manufacturing	10.9%	−1.1%	109.9	4.7%	0.3%
Construction	8.4%	−1.3%	97.0	0.7%	−0.6%
Administrative and support service activities	7.6%	0.5%	68.3	2.9%	0.2%
Professional, scientific and technical activities	7.5%	0.5%	106.6	4.1%	−1.8%
Transport and storage	5.5%	−0.2%	98.1	2.0%	−3.1%
Accommodation and food service activities	5.5%	0.3%	56.8	2.1%	−0.7%
Arts, entertainment, recreation and other services	4.8%	0.0%	70.9	0.2%	1.7%
Information and communication	4.4%	0.3%	137.3	7.0%	0.2%
Financial and insurance activities	4.2%	−0.1%	258.7	4.6%	−2.6%
Agriculture, forestry and fishing	1.6%	0.1%	41.4	3.9%	−5.0%
Water, sewerage, waste etc.	0.5%	0.2%	264.2	0.9%	−7.4%
Electricity, gas, etc.	0.4%	0.1%	390.9	3.3%	−7.8%
Mining and quarrying	0.3%	0.1%	968.6	−3.2%	−13.4%

Notes: Industries are ordered by employment share in 2008Q1 (column 1). The real estate sector (SIC 2007 Section L) is excluded because output of this sector includes the imputed rent of owner-occupiers, which requires no labour input. The data underlying this table show a fall in output per hour in the overall economy excluding real estate activities of –4.4% from 2008Q1 to 2012Q3. There are two reasons this is different from the 2.6% quoted in the main text: (i) the exclusion of real estate activities (output per hour falls by 3.5% if included) and (ii) different sources of statistics on weekly hours of work. This table's statistics on hours are based on business surveys and imply a 0.4% increase in total hours. By contrast, the LFS (a survey of households) data that we use above points to a 0.4% reduction in total hours for the same period. Source: Authors' calculations based on ONS published ad hoc data tables 'GDP(O) low level aggregates at constant and current prices' and 'Productivity jobs and hours (whole economy), market sector workers and hours - 2012 Q3' (reference numbers 000965 and 000950, http://www.ons.gov.uk/ons/about-ons/what-we-do/publication-scheme/published-ad-hoc-data/economy/index.html). For a definition of the industry groups, see http://www.companieshouse.gov.uk/infoAndGuide/sic/sic2007.shtml.

Figure 3.5. Within- and between-industry changes in productivity

Notes: For each industry, the 'within' effect is the change to productivity between 2008Q1 and 2012Q3 multiplied by the average hours share between the two time points. The 'between' effect is the change to hours share between 2008Q1 and 2012Q3 multiplied by average productivity between the two time points. Source: See Table 3.1.

In addition, as seen in Table 3.1, growth in productivity since the recession has slowed significantly in most industries and been negative in many. This has been particularly notable in high-productivity industries (including finance & insurance and information & communication). The slowdown of productivity growth within industries since 2008 is important in explaining the aggregate productivity shortfall relative to the trend. The extent to which industries recover to their pre-recession trends in productivity growth will affect aggregate productivity growth going forward. Again, the trend is driven by within-industry effects and not changes in the composition of industries: our calculations suggest that had productivity continued to grow at the pre-recession rate within each industry, the changes to output shares across industries since the recession would not lead to any slowdown of overall productivity growth.[9]

3.4 The composition of the workforce

The characteristics of the workforce also have implications for aggregate labour productivity. For example, if the workforce shifts in composition towards less-skilled or less-experienced workers, we would expect aggregate labour productivity to fall, all else being equal. In this section, we therefore document the changes in worker characteristics since the recession. In summary, we observe a move towards more part-time workers and more self-employed workers, which, to the extent that these workers are less productive than full-time employees, would tend to reduce labour productivity. However, there has also been a continued increase in the length of workers' experience and the share of workers with degrees, which, if these skills are being adequately utilised, would

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[9] At any given point in time, the growth rate of aggregate productivity is simply the average of the growth rate of each industry weighted by output share. If the industries with fast productivity growth shrink in terms of output relative to those with slow productivity growth, there would be a negative effect on the aggregate growth rate of aggregate productivity.

tend to increase productivity. We are not able to put a number on the extent to which the changing composition of the workforce has acted to reduce labour productivity – there are insufficient data to do so. However, we draw the conclusion that while the increased share of part-time and self-employed workers has likely made some contribution to a fall in aggregate labour productivity, it explains much less than a fall in productivity within given types of workers does.

More part-time workers

There has been a noticeable increase in the proportion of workers who are part-time, from 25.5% in 2008Q1 (a figure which was stable over the previous decade) to 27.5% in 2012Q3.[10] Part-time workers typically produce less output than full-time workers simply because they spend less time working. The shift towards part-time workers has been the main reason behind a reduction in average hours a week worked per worker, which fell from 32.2 in 2008Q1 to 32.0 in 2012Q3 (a 0.7% reduction).[11] This explains why output per worker has fallen by more than output per hour. If the only effect of an increase in the number of part-time workers were to reduce the number of hours worked, then the effect on the fall in productivity would be captured by considering output per hour.

However, the hourly productivity of part-time workers may be different from that of full-time workers. Part-time workers may be less (or more) skilled and experienced than full-time workers and may be working in different types of jobs or sectors of the economy. Even for the same worker in the same job, working fewer hours may be associated with lower productivity if, for example, it is more difficult to coordinate with co-workers or to utilise equipment fully when part-time.

We cannot measure the productivity of full- and part-time workers separately. Average hourly wages are substantially lower for part-time than for full-time workers – £10.08 versus £13.97 in 2012Q3.[12] Lower wages may be evidence of lower productivity of part-time workers, although this figure does not account for differences in worker or job characteristics. If part-time workers are less productive, it means that a shift of the workforce towards part-time workers could reduce overall hourly productivity (assuming that the average hourly productivity of full-time and part-time workers remains unchanged).

To get a sense of the rough magnitude, we calculate what an increase in the share of part-time workers would mean for aggregate productivity under an assumption about their productivity relative to full-time workers. If we assume that the average hourly productivity of part-time workers is 70% of that of full-time workers (which is similar to the unconditional wage ratio), then a 2 percentage point shift towards part-time workers (i.e. the scale of change seen since the recession) would reduce aggregate hourly productivity by about 0.4% (compared with a fall of 2.6% since 2008).[13] However, this

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[10] Source: ONS table 'EMP01' (http://www.ons.gov.uk/ons/rel/lms/labour-market-statistics/december-2012/table-emp01.xls).

[11] The average hours among the full-time didn't change much over the period and the average hours among part-timers increased slightly. Source: ONS series YBUV for the overall average, YBUY for full-timers' average and YBVB for part-timers' average.

[12] The corresponding figures in 2008Q1 were £9.06 and £12.78. Source: hourly earnings, mean £ per hour, in ONS table EARN08 parts 2 and 3 (http://www.ons.gov.uk/ons/rel/lms/labour-market-statistics/january-2013/table-earn08.xls).

[13] The share of total hours accounted for by part-time workers is less than their employment share (25.5% in 2008Q1 and 27.5% in 2012Q3). The share of part-time hours rose from 0.255*15.6/(0.255*15.6+0.745*37.3) = 12.5% in 2008Q1 to

simple calculation is sensitive to the assumption that part-time workers are 30% less productive per hour than full-time workers – for example, if we assumed they were 20% less productive, the change in composition would contribute only a 0.2% fall in aggregate hourly productivity.

It is also worth remembering that these calculations do not account for any change in the average characteristics (for example, skills or experience) of part-time workers or in the types of jobs they are doing as their numbers increase. There may be a difference in the hourly productivity of those who have become part-time workers as a result of the recession. For example, a full-time worker whose hours are reduced may have a higher (or lower) productivity than workers who were part-time before the recession. To the extent that the productivity of part-time workers is higher than we have assumed (or there is an offsetting increase in the average productivity of the newly part-time), the calculations will be an overestimate of the effect of a greater number of part-time workers.

More self-employed workers

There has also been a substantial increase in self-employment, from 13.1% of all those in work in 2008Q1 to 14.2% in 2012Q3.[14] In absolute terms, the number of self-employed people rose from 3.86 million to 4.19 million, a 9% increase. If the self-employed are less productive than employees, an increase in the share of self-employed workers could reduce aggregate productivity. Productivity of the self-employed is notoriously difficult to measure; we do not have data on the productivity of the self-employed compared with that of employees.

As in the discussion concerning the increase in part-time workers, we can consider the effect on aggregate productivity of an increase in the share of self-employed under an assumption about how productive they are. If the productivity of the self-employed, including those who are newly self-employed following the recession, is 80% that of employees, then the increase in the share of self-employed workers would reduce aggregate output per worker by 0.23% (relative to the total fall of 3.2%).[15] However, 80% is an arbitrary number. Were the self-employed 40% less productive, the effect of an increase in the share of the self-employed on aggregate productivity would be a fall of 0.46%.

It is also likely that the productivity of workers who are currently self-employed is different from that of those who were self-employed before the recession. For example, those who became self-employed after losing their jobs during the recession might be less productive than the pre-existing self-employed, and may be producing less due to lack of demand. In the extreme case where all the additional self-employed workers produced

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0.275*15.6/(0.275*15.6+0.725*37.3) = 13.7% in 2012Q3. This implies an average hourly productivity in 2008Q1 of 0.125*0.7+0.875*1 = 0.9625 and in 2012Q3 of 0.137*0.7+0.863*1 = 0.9589 and therefore a change of (0.9589/0.9625)–1 = –0.37%. If we assume that the hourly productivity of both part-time and full-time workers grows at the same rate as the historical aggregate trend (2.5%), then the 0.4% fall in productivity that can be attributed to the increase in part-time workers can be compared with the 12.8% aggregate shortfall relative to trend. However, it is plausible that the trend growth rates in productivity of the two types of workers differ, such that the compositional change would affect the aggregate trend.

[14] The proportion of workers who are employees decreased from 86.2% to 84.9%. Employees and the self-employed do not add up to 100% of all people in work – the difference comes from unpaid family workers and government trainees.

[15] (14.2%*0.8+85.8%) / (13.1%*0.8+86.9%) – 1 = –0.23%.

nothing (i.e. were disguised unemployment), we would be overestimating the total number of workers by 0.33 million, or 1.1% of the total workforce in 2012Q3. This would mean the current output per worker is underestimated by 1.1% and therefore this would account for about 1 percentage point of the fall in measured productivity. However, this is an upper bound on the effect of additional self-employed workers.

More workers who are better qualified, older and have longer job tenure

Table 3.2 shows the changing characteristics of the workforce. There is a clear long-term shift towards workers with degrees or equivalents – the proportion of which rose from 24.4% in 2002 to 35.1% in 2012 – and away from those without GCSEs. We expect higher skills to be associated, on average, with higher productivity.

Table 3.2. Characteristics of the workforce

Worker characteristic	2002	2007	2012 (Q1–Q3)
Qualifications			
Share of workers with:			
a degree or equivalent	24.4%	28.8%	35.1%
A levels or GCSEs or equivalents	46.5%	46.1%	46.8%
no GCSEs or equivalents	29.2%	25.1%	18.1%
Age			
Share of workers aged:			
16–17	2.6%	2.0%	1.3%
18–25	13.2%	13.7%	12.4%
26–45	50.2%	47.9%	47.2%
46–64	32.8%	34.9%	37.0%
65 or above	1.2%	1.6%	2.2%
Tenure			
Share of workers with the same employer for:			
less than 1 year	19.0%	17.7%	14.6%
1 to 2 years	12.5%	11.9%	10.2%
2 to 10 years	37.1%	40.5%	42.0%
10 years or more	31.4%	29.9%	33.2%

Note: All statistics refer to the 16+ population except those about qualifications, which relate to the 16–59 population (due to a discontinuity in survey questions).
Source: Authors' calculations from quarterly Labour Force Survey.

There has also been a long-term shift in the composition of the workforce away from younger workers (under-25s) towards older ones (notably those aged 65 and over), which has continued since the recession. Insofar as older workers are typically more experienced than younger ones, this compositional shift should increase labour productivity. Similarly, we would also expect an increase in the job tenure of workers to be associated with higher productivity because workers who stay with the same employer for longer are likely to have accumulated more on-the-job experience. Longer job tenure may also signal higher productivity as lower-productivity workers are more likely to be laid off.[16] The proportion of workers who have been with the same employer

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[16] It is possible to argue the other way round. For example, those with longer job tenures may be better at ensuring their job security than producing direct output; a higher ratio of senior to junior staff may mean a less efficient organisational structure.

for less than two years fell from 29.6% in 2007 to 24.8% in 2012. Meanwhile, the proportion of workers with at least 10 years of experience with the same employer, which was falling steadily in the 2000s before the recession, increased significantly from 29.9% in 2007 to 33.2% in 2012.

We would expect each of these trends – i.e. a better-qualified, older and longer-tenured workforce – to have worked to continue or even accelerate the pre-recession growth in labour productivity. As such, these compositional changes do not help to explain the observed fall in labour productivity.
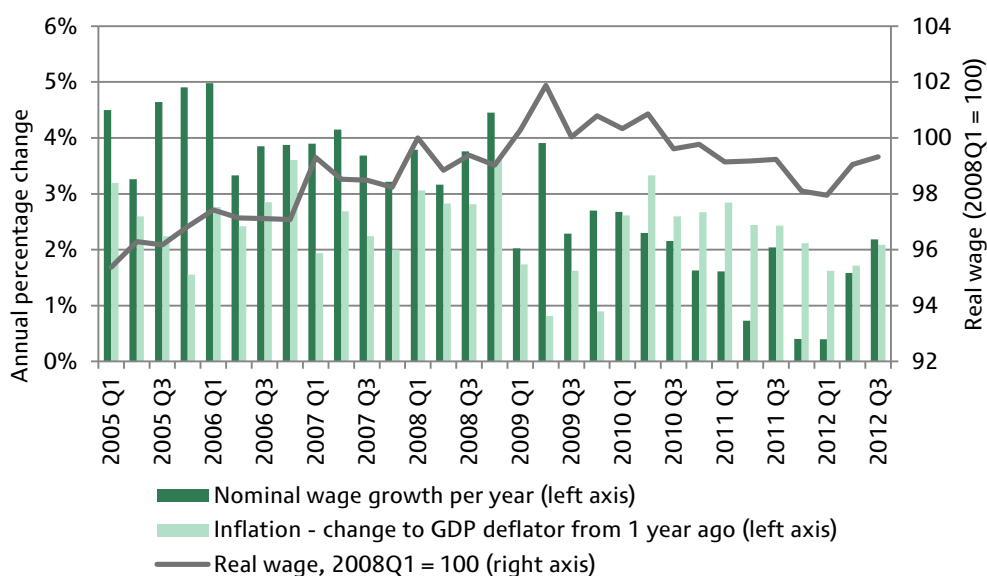
However, it may be the case that the experience and skills of workers are being underutilised if, for example, a weak labour market and low real wages (see Section 3.5) are leading workers to accept positions for which they are overqualified or if the skills are not well matched to those being demanded. To the extent that such factors are important, we would expect a reduced effect of seemingly higher-productivity workers on actual productivity.

3.5 The labour market

Reductions in real wages

Since the start of the recession in 2008, wages have been growing more slowly than prices. Figure 3.6 shows year-on-year percentage changes to employees' average nominal hourly wages and to inflation, alongside changes to average real wages.[17] For these purposes, we measure inflation, and hence real wages, using the GDP deflator. This can be thought of as the real cost to the employer rather than the real value to the employee. The choice of price index matters, as we discuss below.

Figure 3.6. Annual percentage change to wages and prices

Source: Nominal wages from ONS reference table EARN08 part01, which is based on the LFS and not seasonally adjusted; GDP deflator at market prices, ONS series YBGB.

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[17] We consider mean real wages here, but median real wages have also stagnated.

In the 10 years to 2008Q1, the average real wage grew by 2.2% per year, similar to the growth rate of real output per hour (2.3%). There was a notable slowdown in real wage growth around 2003, such that the mean wage growth rate was only 1.5% p.a. in the five years to 2008Q1 compared with 2.6% in the preceding five years.[18] The growth rate of output per hour also slowed down, from 2.7% to 1.9%, between the two five-year periods.[19] The average real wage increased slightly at the start of 2009 when inflation was particularly low, but has fallen steadily since as inflation has outstripped nominal wage growth. In 2012Q3, four-and-a-half years after the start of the recession, the average real wage was 0.7% below the level in 2008Q1, and about 10% below its historical trend.[20] This has been driven by falls in private sector real wages. Public sector real wages have not fallen (see Chapter 6 and Section 3.3 for a discussion of public versus private sector pay).

The measurement of real wages is sensitive to the choice of inflation measure. Since our interest here is in the cost of labour to employers, we use the GDP deflator because it reflects changes in the price of total output and therefore is arguably a better measure when considering changes in real productivity. If instead we use the consumer price index (CPI) – which is a better measure for analysing living standards as it only includes

Figure 3.7. Average male hourly real wages following recessions

Notes: The wage series is the mean gross hourly wage excluding overtime for male full-time employees in Great Britain from the New Earnings Survey and Annual Survey of Hours and Earnings. This and the corresponding female time series are the only time series of average hourly wages that are available from the 1970s.
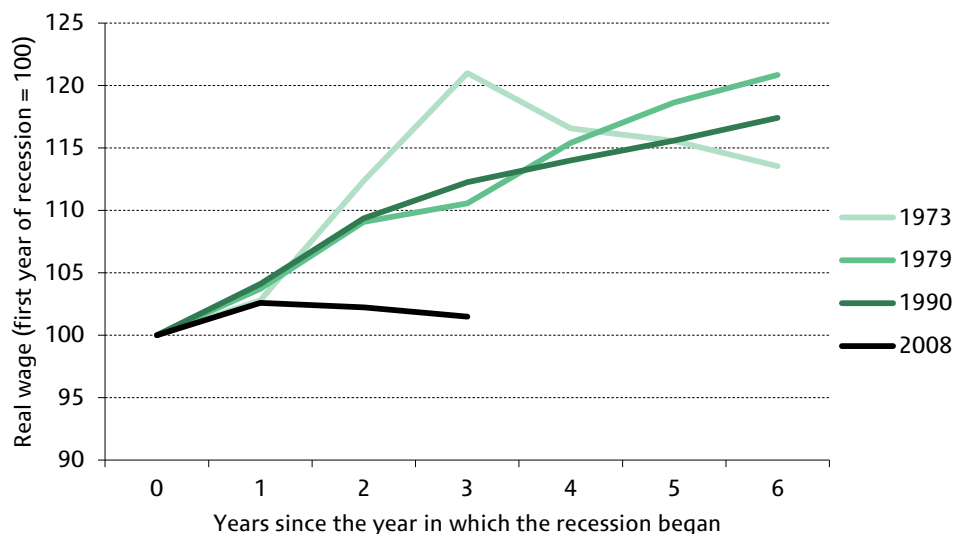Source: Authors' calculations based on ONS statistics. ONS ad hoc release of labour market data, table reference 000012 (http://www.ons.gov.uk/ons/about-ons/what-we-do/publication-scheme/published-ad-hoc-data/economy/index.html). The wage series is deflated by GDP deflator, ONS series YBGB.

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[18] For source of average real wage figures, see Figure 3.6. The slowdown of real wage growth since 2003 has been highlighted by P. Gregg and S. Machin, 'Real wages and unemployment in the big squeeze', 2012 (http://www.iza.org/conference_files/FutureOfLabor_2013/machin_s416.pdf).

[19] Source: total hours – ONS series YBUS; real GDP – ONS series ABMI.

[20] Real wage growth averaged 2.2% per year in the 10 years to 2008Q1. Had this growth rate continued to 2012Q3, real wages would be 10.2% higher than the 2008Q1 level, rather than 0.7% below it (99.3/110.2 – 1 gives –9.8%).

Figure 3.8. Average female hourly real wages following recessions

Notes and source: See Figure 3.7.

the costs of goods and services purchased by households – we see a 5.7% fall in the average real wage between 2008Q1 and 2012Q3.[21] The larger fall in real wages is driven by the fact that the prices of consumer goods and services, including imports, have increased more quickly than the overall price of UK output.

Figure 3.7 compares average hourly real wages among men working full-time in the recent recession with those in the recessions that started in 1973, 1979 and 1990. Figure 3.8 makes the same comparison for female wages. During and following both the 1979 and 1990 recessions (and the 1973 recession for women), real wages grew strongly. In contrast, real wages have fallen since 2008. This is more similar to the experience of average male wages in the 1973 recession. Indeed, we have not seen a lack of real wage growth lasting three years or more since the 1970s. Though note that the experience of the 1970s was very different in that inflation and nominal wage growth were both very much higher than we have experienced since 2008.

Are low real wages a cause or effect of low productivity?

It is possible that a fall in the amount of output that (at least some) workers produce for a given hour of work following the recession has led to lower wages. For some industries and occupations, measured productivity would fall when demand falls. For example, a machine that is running at reduced capacity, but that requires the same number of workers to operate it, will be associated with lower productivity. (We discuss the utilisation of labour further below.) Demand may have fallen in a way that reduces the value of what can be produced in an hour of work. For example, following the recession, some financial services may require the same amount of worker effort to produce them but result in a lower value of output. When worker productivity falls, firms may choose to offer lower wages and some may only be able to afford lower wages.

It is possible, however, that the direction of causality between wages and productivity runs the other way – that is, that a decline in real wages has contributed to the resilience of employment relative to output and therefore to the fall in labour productivity.

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[21] Source of CPI: ONS series D7BT.

Specifically, low wages allow firms to retain more staff than they otherwise would have, given the fall in output demand. Low wages also reduce the pressure to lay off the least-productive employees and may have enabled some low-productivity firms to carry on operating rather than go bust. In addition, as labour has become cheaper relative to capital (see Section 3.6), some firms may have been choosing to create output with relatively more labour and less capital. A lower level of capital per worker can be expected to reduce labour productivity.

Why have real wages fallen so much?

Wages and employment are affected by many factors that work simultaneously and that take time to adjust towards a new equilibrium. As such, we cannot isolate the causality between wages and productivity. Here we consider wages and employment as the outcome of labour demand, labour supply and the adjustment to a new equilibrium, and discuss what we learn from comparisons with previous recessions, in which we typically saw a large fall in total hours worked and not in real wages.[22] In contrast, in this recession, there has been a large fall in real wages and a relatively mild fall in employment.

We know that labour demand – i.e. the number of hours demanded by firms for given hourly wages – has fallen as a result of the recession and expect this to reduce both employment and wages. The size of the falls in wages and employment (and particularly the relative size of the falls) depends on labour supply and on how the labour market adjusts to a new equilibrium, both of which may have changed compared with previous recessions.

Labour supply affects the equilibrium that the economy moves to following a shock. If, in comparison with previous recessions, more people are willing to work at a given real wage or people are less responsive to a fall in the real wage, then we would expect to see a larger fall in wages and a more muted fall in employment in response to a fall in labour demand.

One piece of evidence that is consistent with an increase in labour supply is a relatively low level of economic inactivity since the recession. Figure 3.9 shows the share of the working-age population that are economically inactive (neither in paid work nor looking for paid work) following the last four recessions. Following the recessions in 1979 and 1990, there was a sharp increase in inactivity rates, as individuals either gave up looking for jobs after a period of unemployment or chose not to enter the labour market. The inactivity rate fell quickly from 1983, driven by the increase in female participation, though inactivity rates among men remained high.[23] Inactivity rates remained high for many years after the recession of the 1990s.
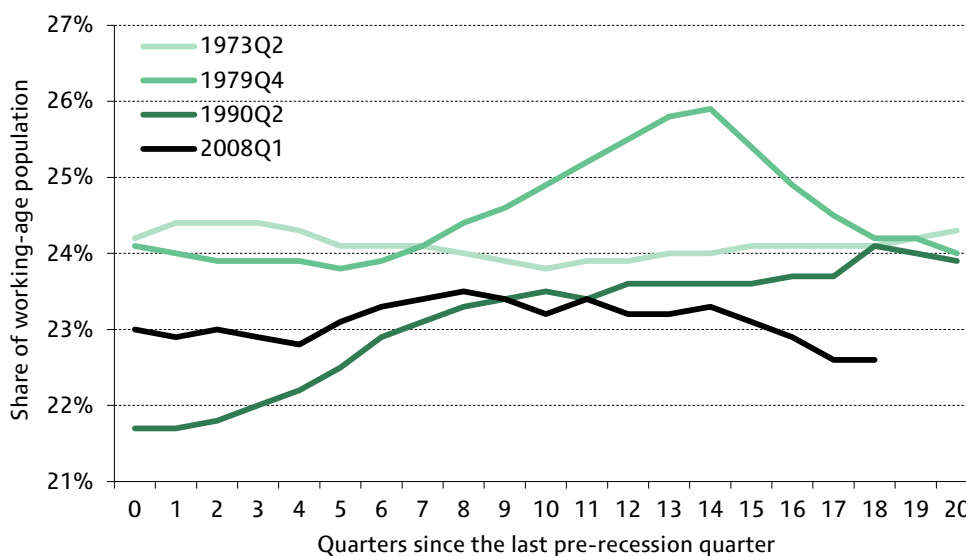
In contrast, the proportion of the working-age population who are economically inactive today is low by historical standards. The last time the inactivity rate was below the current level was in 1991, when a lower proportion of young people were in university. In the most recent year of data (2011Q3 to 2012Q3), the rate of economic inactivity has fallen significantly, while employment has increased. In fact, more than half of the 500,000 increase in employment during that year was the result of a fall in inactivity

[22] We are, of course, considering a simplification of the labour market. In reality both workers and employers are heterogeneous, there are labour market frictions, and at any point the market may be out of equilibrium.

[23] Note that inactivity rates of males aged 25 or above did not fall in the mid-1980s.

(rather than a fall in unemployment). Initially, the stable rate of inactivity may have been aided by an attempt by Jobcentre Plus – which saw a large temporary increase in employment when the recession started – to prevent the short-term unemployed from becoming long-term unemployed. Increased economic activity could also partly be a response to policy reforms. For example, individuals who no longer qualify for disability benefits may have to seek work to comply with Jobseeker's Allowance (JSA) rules. More active searching by the workless (combined with relatively lower unemployment) could have put more pressure on real wages compared with in previous downturns.[24]

Figure 3.9. Inactivity rate of the working-age population by recession

Note: Working age is defined as 16–64.
Source: ONS series LF2S.

There are a number of other possible reasons why labour supply may have behaved differently in this recession from in previous ones.

First, there has been a large negative shock to household wealth due to the financial crisis. This would increase labour supply if people seek to work more hours in order to compensate for their lost wealth. Additional workers may seek to start working if, for example, a family member has experienced a large negative wealth shock. A fall in wealth may be particularly important for older workers if they see their retirement savings become less adequate.[25] Institutional changes that mean that fewer people are effectively protected by defined benefit occupational pension schemes and instead rely on their own personal pensions may mean that a fall in retirement savings has a larger effect now than in the past. Note that there has been an increase in the share of older workers in employment since the recession, although (as highlighted in Section 3.4) this continues a pre-recession trend. All workers (including younger workers whose savings have not shrunk much in absolute terms) may also be willing to work more for a given wage

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[24] Gregg and Machin argue that the sensitivity of real wages to unemployment has increased since 2003 (P. Gregg and S. Machin, 'Real wages and unemployment in the big squeeze', 2012, http://www.iza.org/conference_files/FutureOfLabor_2013/machin_s416.pdf).

[25] See J. Banks, R. Crawford, T. Crossley and C. Emmerson, 'The effect of the financial crisis on older households in England', IFS Working Paper W12/09, October 2012 (http://www.ifs.org.uk/wps/wp1209.pdf).

because they have become more pessimistic and possibly more uncertain about future earnings growth.

Second, there have been changes to pensions and benefits that make it more likely that some workers will seek employment (or seek to stay in employment for longer). Since April 2010, the State Pension Age (SPA) for women started to increase, and it will be 65 by 2020. Women may choose to delay retirement in order to make up for the loss of up to five years' worth of state pension.[26] However, there has also been an increase in means-tested benefits for families with an individual aged over the female SPA, which has worked to reduce work incentives.

From October 2011, employers can no longer force employees to retire when they reach 65, which makes it easier for people to delay retirement. In addition, workers are now able to draw on an employer pension while continuing to work for that employer, making continued employment more attractive. Early retirement may be a less attractive option in this recession because it is now harder to claim Incapacity Benefit or Employment & Support Allowance.[27]

For the working-age population, one example of a policy change that appears to have increased labour supply is added requirements for lone parents with young children to seek work. Currently out-of-work lone parents are required to look for work once their youngest child reaches 5 (i.e. they stop being entitled to Income Support and become entitled to Jobseeker's Allowance). This threshold was gradually reduced, from age 16 in 2008. Figure 3.10 shows the employment rate of lone mothers by age band of their youngest child. The vertical lines indicate when the job-searching conditionality for claiming benefits kicked in for each group. Following the policy changes that affected lone mothers with youngest child aged 7–9 and 10–11, there was a substantial increase in employment rate of the affected groups.

Third, certain groups of workers may be more willing to accept lower real wages in this recession as a result of working tax credits, which have increased in generosity and coverage since the late 1990s and effectively reduce the impact of a fall in real wages.
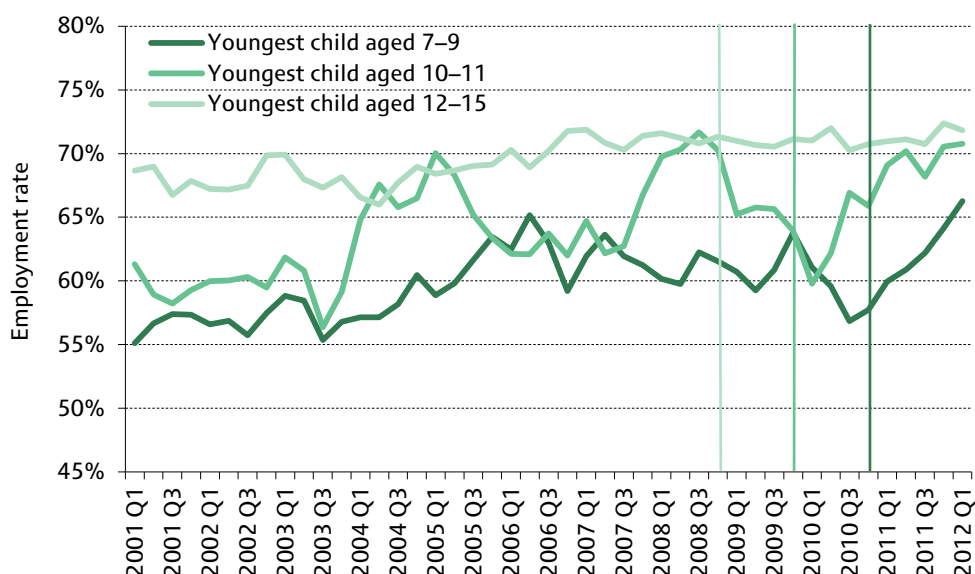
The UK labour market may also have changed as a result of increased immigration, in particular following 2004 when the citizens of the A8 countries became eligible to work in the UK.[28] This would have worked to increase the labour supply (at least in some sectors of the economy), but also possibly to increase the flexibility of the workforce: immigrants may be more willing to work on flexible contracts. The flow of A8 immigrants into the UK has slowed substantially since the start of the recession (likely encouraged by a depreciation of the pound) and net migration has fallen. This would likely act to offset some of the previous effects on labour supply.

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[26] There could be an additional effect on their partners' employment, if individuals prefer to retire at the same time as their partners.

[27] For a discussion of health- and disability-related transfers in the UK over the last thirty years and their relation to changes in labour force participation, see J. Banks, R. Blundell, A. Bozio and C. Emmerson, 'Disability, health and retirement in the United Kingdom', IFS Working Paper W11/12, February 2011 (http://www.ifs.org.uk/wps/wp1112.pdf).

[28] The eight accession countries are the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. For a discussion of the sectors and locations that immigrants from A8 countries worked in before and during the recession, and how flows have changed since 2008, see D. McCollum and A. Findlay, 'Trends in A8 migration to the UK during the recession', *Population Trends*, ONS, Autumn 2011 (http://www.ons.gov.uk/ons/rel/population-trends-rd/population-trends/no--145--autumn-2011/ard-pt145-a8-migration.pdf).

Figure 3.10. Employment rate of lone mothers following changes to the age threshold when they are moved from Income Support to JSA

Notes: Lone parents generally lose entitlements to Income Support (unless they meet other criteria such as disabilities) and have to claim Jobseeker's Allowance instead once their youngest child reaches a certain age. This figure shows employment rate of lone mothers. This age threshold used to be 16 and was reduced to 12 in November 2008, 10 in October 2009, 7 in October 2010 and 5 in May 2012.
Source: Authors' calculations from quarterly LFS.

There have also been institutional changes that can be expected to affect the labour market's adjustment to a new equilibrium.

When firms want to reduce their labour costs, there are three ways – reducing the number of workers they employ, the number of hours that are worked or the wages that are paid. The UK labour market has changed in ways that make it more likely that any adjustment will come through hours or wages rather than headcount compared with previous recessions (and particularly recessions in the 1970s and 1980s). Wages today are less sticky, in part because there is less extensive union bargaining and therefore less protection for 'insiders' wages'.[29] There are also more flexible working practices in the form of short-term or temporary contracts that allow firms to more easily adjust hours worked. Even where there is significant unionisation, there are examples of unions having explicitly traded lower wages or greater flexibility in working practices for job security.

In summary, this recession has seen employment fall by less, and real wages by more, than previous recessions. Inactivity rates are at historically low levels and have not risen since the recession. There are a number of possible explanations for why the labour market has behaved differently in this recession. In our judgement, two are likely to be particularly important. The first is a change in what is commonly called labour market flexibility. Institutional changes have reduced the power of 'insiders' in wage setting,

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[29] Unions may help coordinate pay restraint if a substantial proportion of jobs are at risk. But they have no incentive to lower wages so that employers could take on new recruits. Barwell and Schweiter find that the incidence of real wage rigidities has fallen over time and suggest that the UK labour market has become more flexible since the 1970s (R. Barwell and M. Schweiter, 'The incidence of nominal and real wage rigidities in Great Britain: 1978–98', 2007, *Economic Journal*, 117, F553–69).

allowing real wages to be flexible downwards, and more flexible working practices have allowed firms to more easily adjust the number of hours worked. The second is an increase in labour supply. Changes to wealth stocks and to the pension regime may have helped this. Changes to the benefits system have almost certainly been important. Work conditionality regimes are much tougher and more extensive than in the 1980s and 1990s, and it is much harder to get on, and stay on, incapacity benefits.

In conclusion, we expect that low real wages – by keeping employment higher than it would otherwise have been – play a part in explaining the large fall in labour productivity.

Underutilisation of labour

One possible explanation of both low output per hour and low hourly wages is that hours worked are not as well utilised as before the recession. The underutilisation of workers, sometimes called labour hoarding,[30] could arise as a result of a range of adjustment costs. Employment protection, redundancy packages, existing workers having firm-specific skills, and potential costs of recruitment and training during the following upturn all mean that firms might want to hold onto their existing workers during temporary downturns. These factors could explain why employment fell less than output, but not why average hours haven't fallen by more (underutilisation implies a potential to produce the same amount of output with fewer hours).

It is possible that contractual and social norms played a role here. For example, there are twenty times more jobs at 35 hours per week than at 34 hours. It seems unlikely that any firm would reduce the weekly hours of an employee from 35 to 34 in response to, say, a 3% fall in demand for the employee's output. It is also the case that the nature of certain occupations is such that their weekly hours cannot be easily cut to restore hourly productivity. For example, an asset manager needs to work roughly the same hours whether the amount being managed doubles or shrinks. And a bartender needs to work the same hours whether there are five or ten customers.[31]

In general, maintaining labour that is underutilised is plausible only if firms expect demand to improve in the near future. If demand is expected to be permanently low, then the long-term cost of keeping more labour than necessary would outweigh all the adjustment costs. Given the stagnation of GDP in the past three years, we would expect the majority of firms to have adjusted their labour input. Importantly, however, as we showed above, real wages have fallen substantially since 2008–09. As a result, the marginal product of labour may be closer to the real wage than we would normally associate with underutilised labour. Low real wages make it more feasible than in previous recessions for firms to continue to employ workers who are less productive (but could be more productive if demand were to pick up).
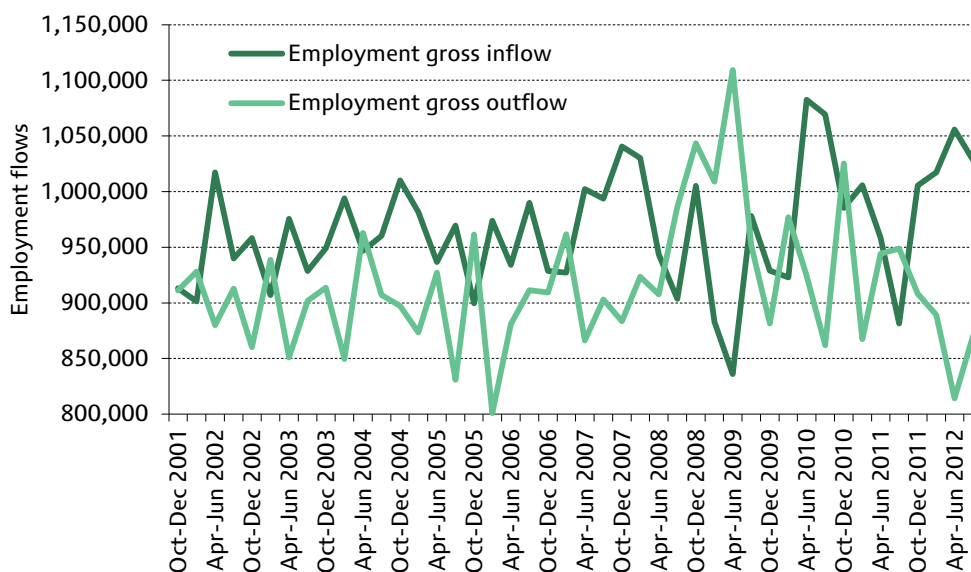
Analysis by the Bank of England shows that capacity utilisation as measured by a range of survey indicators did fall during the recession but has been recovering after mid-2009,

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[30] An underutilisation of workers is a similar concept to labour hoarding, in the sense that firms do not cut the workforce enough in response to negative demand shocks. Narrowly defined, labour hoarding refers to the phenomenon that firms retain workers during temporary downturns without reducing the real wage. Given that the real wage has fallen since the recent recession, it is unclear that the term 'labour hoarding' is still appropriate.

[31] In this bartender example, capital is also underutilised because the capital is indivisible.

suggesting that many firms have adjusted their labour input.[32] In addition, the continued wide-scale underutilisation of labour seems incompatible with the scale of employment flows. Firms with underutilised labour should not typically hire more workers or increase their hours.[33] However, the data show that total hours have risen in every quarter since mid-2011.[34] And the relative buoyancy of employment is not driven simply by firms maintaining workers. Since the recession, there have been large flows into and out of employment. For example, in 2009Q2, there were 840,000 people leaving employment and 1.1 million people moving into work (compared with a total workforce of around 30 million) – see Figure 3.11.

Figure 3.11. Flows into and out of employment

Source: ONS Labour Market Flows: November 2012 (Experimental Statistics).

Strong employment flows are not definitive evidence against the story of underutilisation; it is possible that some sectors or firms have underutilisation (and are therefore not increasing labour input) while others are creating new jobs to meet recovering demand.[35] However, the scale of employment flows, and the fact that 2013 marks the fifth year of poor GDP growth, are evidence against significant underutilisation. In addition, the main effect of these factors should be on the level rather than the growth

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[32] See chart 2.7 of Bank of England, *Inflation Report November 2012* (http://www.bankofengland.co.uk/publications/Documents/inflationreport/ir12nov.pdf). We note that direct survey measures of spare capacity can involve substantial misreporting. For example, businesses may report full capacity when in fact working hours were spent on attracting custom rather than producing output. In addition, they are typically not informative about the degree of spare capacity.

[33] In practice, there is a distribution of firms with varying degrees of spare capacity. If those with more spare capacity experienced increases to their spare capacity and those with little spare capacity saw even less spare capacity, then it is possible for the overall spare capacity to increase at the same time as hiring increases.

[34] Source: ONS series YBUS.

[35] Martin and Rowthorn argue that underutilisation of labour could be concentrated in high-productivity sectors associated with more higher-skilled and overhead labour, whereas the most new job creation has occurred in low-productivity sectors where less underutilisation would be expected (B. Martin and R. Rowthorn, *Is the British Economy Supply Constrained II?*, UK-Innovation Research Centre, 2012).

rate of productivity. As the gap between actual productivity and the historical trend continues to widen, the proportion of the gap that is potentially attributable to underutilisation becomes smaller.

3.6 Investment

The amount of output produced for a given amount of labour input (i.e. labour productivity) will be affected by the amount and quality of capital used as well as how efficiently it is used. Business investment fell following the 2008–09 recession and has been low since. A reduction in investment leads directly to a reduction in output (investment is a component of GDP). It can also be expected to have reduced both the level and quality of capital employed. In addition, at the margin, firms may have been substituting labour for capital (thereby reducing the amount of available capital per worker) as a result of a lower cost of labour relative to capital. Both of these factors would directly reduce labour productivity.

The economy may also be in a situation where capital is misallocated across sectors. That is, capital may be inhibited in moving to the sectors for which demand is now relatively high. A misallocation of capital will reduce total factor productivity – a measure of the efficiency with which inputs are used – and, indirectly, aggregate labour productivity (see Box 3.2).

Box 3.2. Total factor productivity

Total factor productivity (TFP), sometimes also called multifactor productivity, is a measure of the efficiency with which all inputs are combined to produce output – it is effectively a measure of overall productivity that is calculated as the change in output that cannot be directly attributable to a change in capital, labour or any other measured inputs. TFP is often used to measure technological progress. It will also reflect the efficiency with which inputs are allocated to the projects or sectors in which they have the highest return.

In practice, any measure of TFP is subject to error. It will capture the contribution to output of any unmeasured inputs (importantly, these will include intangible assets) or any unmeasured change in the quality or utilisation of inputs – for example, if the quality of the capital stock changes in a way that is not reflected in the measure of capital input.
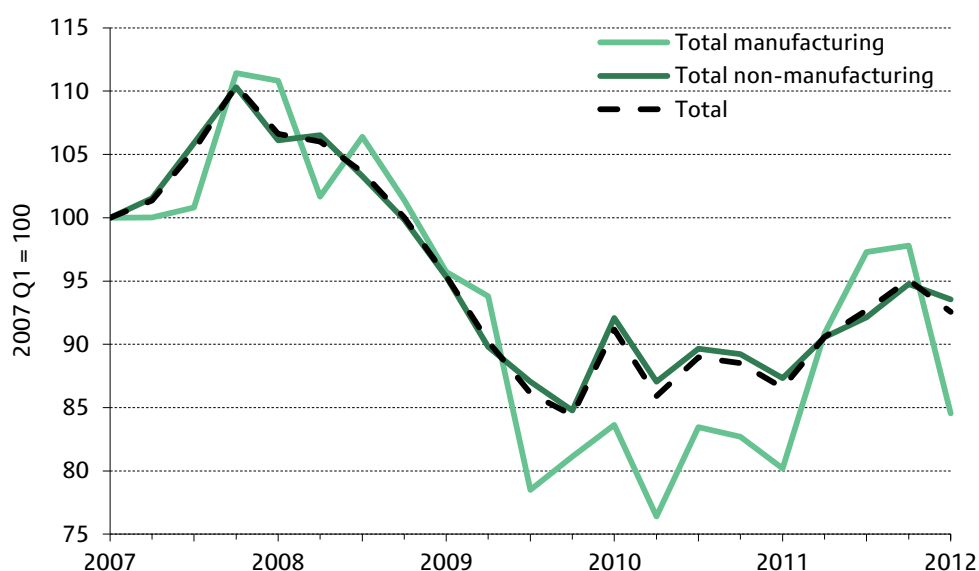
A fall in TFP will lead to a reduction in labour productivity. The ONS has produced a decomposition of labour productivity into the contributions that can be attributed to changes in the composition of labour, the capital stock and TFP. They find that TFP explains most of the fall in labour productivity in 2008 and 2009.[a] However, due to the measurement issues outlined above, this could be capturing a number of effects, including a misallocation of capital and any unmeasured changes in the quality or utilisation of capital or labour.

[a] J. Appleton and M. Franklin, 'Multi-factor productivity, Indicative estimates to 2010', ONS, September 2012 (http://www.ons.gov.uk/ons/dcp171766_278729.pdf) – see figure 2.

Low business investment

Business investment – i.e. capital expenditure on assets, not accounting for depreciation or capital scrapping – fell by over 23% from the high at the end of 2007 to the low in late 2009, as shown in Figure 3.12. The non-manufacturing sector – which includes construction, distribution and services and accounts for around 90% of business investment – largely dictates the pattern in total investment. Within this, however, some sectors have seen much larger falls in investment. For example, investment in both the construction and distribution sectors fell over 45% from the start of 2008 to the post-recession lows. Investment in the manufacturing sector fell by over 30% between the high at the start of 2008 and the low in early 2010. There has been only weak growth in investment since late 2009, and by 2012Q1 total annual investment remained 16% below the previous high. Business investment did show some signs of recovery in 2012 and Oxford Economics forecast that it will continue to pick up this year and next, largely as a result of growing confidence (see Chapter 2).

Figure 3.12. Business investment

Source: Authors' calculations using ONS Business Investment, series DSI3, DS44 and NPEL. Seasonally adjusted, constant 2009 prices. Indexed to 100 in 2007Q1.

It is usual for business investment to fall during downturns as companies revise their expectations of future demand. However, business investment has fallen by substantially more and has remained subdued for longer in this recession than in previous ones.[36] Gross fixed capital formation (GFCF) – the value of acquisitions less disposals of fixed assets, not accounting for depreciation – has also fallen by more in this recession and remains low – see Figure 3.13.
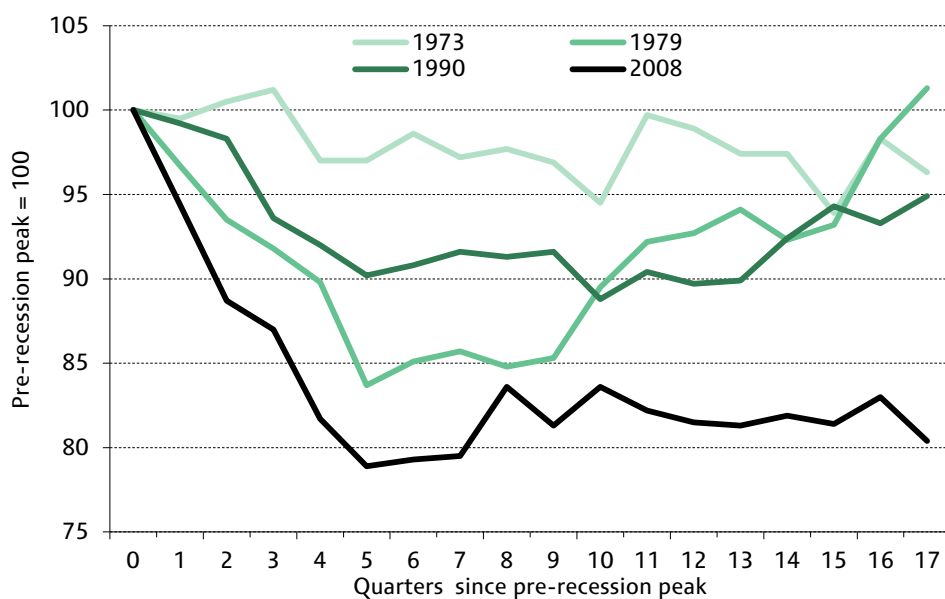
There are likely a number of factors contributing to the fall in and continued low level of business investment. In large part, low investment will have resulted directly from firms revising down their desired capital stock (and therefore their required level of

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[36] See chart 8 of A. Benito, K. Neiss, S. Price and Ł. Rachel, 'The impact of the financial crisis on supply', *Bank of England Quarterly Bulletin*, 2010 Q2, 104–14. Note that, due to recent problems with data consistency, the ONS does not currently make available data on business investment before 2007 or data on capital stocks after 2009.

investment) in response to depressed consumer demand. In addition, firms face uncertainty over both future demand and the future availability of finance, and possibly an increase in the cost of capital and financing constraints. See Box 3.3 for a discussion. Reduced investment can be expected to feed through into a smaller, and possibly less technically advanced, capital stock and therefore to directly affect labour productivity.

To the extent that labour is a more flexible input than capital – i.e. can be more easily adjusted downwards or turned to an alternative use – uncertainty may also mean that some firms are choosing to substitute investment away from capital to labour. This substitution is likely encouraged to the extent that falls in real wages (and possible increases in the cost of capital) are making capital a more expensive input relative to labour. This will again reduce the capital-to-labour ratio, which would be expected to reduce labour productivity.

Figure 3.13. Gross fixed capital formation

Source: ONS National Accounts aggregates, gross fixed capital formation, chained-volume measure. Gross fixed capital formation includes information on investment and dwellings for business and government.

Box 3.3. Factors contributing to low investment

Uncertainty

A key factor restraining investment is uncertainty over future demand. The large 2008–09 recession has been followed by a weak and faltering recovery. UK growth, which has been below forecast, is not predicted to be strong in the near future. And this is against the backdrop of large uncertainty in the eurozone. Business confidence – as measured by surveys of firms – is volatile, but substantially lower than pre-crisis. Evidence from the end of 2012 suggests that firms' intentions to invest are low.[a] Results from a new survey conducted by the Department for Business, Innovation and Skills showed that, in Autumn 2012, firms had become less optimistic in their expectations for output growth over the next three months and almost two-thirds did not expect to make any new capital investment in the period October–December 2012.[b] A diminished risk of a eurozone break-up may bolster confidence going forward but there remains a large amount of uncertainty surrounding UK growth forecasts (see Chapter 2).

The period following the financial crisis has also likely been marked by uncertainty over the future availability of finance (such that firms want to retain earnings with a view to being able to invest when the economy recovers).

Uncertainty can cause firms to delay or cancel investment plans. In cases where investments are not easily reversible (for example, investing in a new machine or type of technology that produces a specific output), there is a value to firms from waiting until conditions improve before making a decision over what to invest in.[c]

Increased cost of capital

The cost of capital is the cost that firms face when raising finance to undertake investments. It accounts for the expected risk of an investment and varies across firms and types of finance (for example, between debt and equity-based finance and between working capital and longer-term investment capital). For the majority of firms, the cost of external finance will be higher than the market interest rate. The Bank of England presents evidence that there was a sharp fall in the gross cost of capital for UK-quoted firms directly following the recession but that there has been an increase in the last two years such that the cost of capital is now higher than before the crisis.[d] An increase in the cost of capital works to directly reduce labour productivity by deterring capital formation. As there is no evidence of a fall in the cost of capital, but there is evidence of a significant fall in the cost of labour, we expect labour to be a relatively cheaper input for most firms.

Financing constraints

There is little evidence that large firms face financing constraints. On average, they have large stockpiles of cash (such that they have access to internal finance) – as of 2012Q3, private non-financial companies had £672 billion in cash, the equivalent of 43% of national income (see Chapter 2 for figures and discussion). Since the start of the recession, many firms have been paying down debt. In aggregate, repayments have outstripped new lending such that net debt has been falling.[e]

There is some evidence that smaller firms may be facing financing constraints. Small and medium businesses (SMEs) – which are more likely to have experienced an increase in borrowing costs than larger firms – have reduced the extent to which they are using external finance (including overdrafts). However, recent survey evidence suggests that 66% of SMEs are 'happy non-seekers' of external finance – that is, many firms are not seeking to secure external finance.[f] The latest credit survey by the Bank of England suggested that lending had increased at the end of 2012, but this was mainly to large and medium-sized companies.[g] The Funding for Lending Scheme was introduced in part to increase the availability of credit to small companies.

[a] See page 8 of ITEM Club, *Special Report on Business Investment*, November 2012 (available at http://www.ey.com/).
[b] The English Business Survey asks 3,000 workplaces questions on investment (current and intended) and capital utilisation. See Statistical Release October 2012, 21 December 2012 (https://www.gov.uk/government/organisations/department-for-business-innovation-skills/series/english-business-survey).
[c] There is an academic literature on the effect of uncertainty on firm investment. For example, N. Bloom, S. Bond and J. Van Reenen, 'Uncertainty and investment dynamics', *Review of Economic Studies*, 2007, 74, 391–415, find that a higher level of uncertainty is associated with a slower adjustment of the capital stock following a demand shock.
[d] See chart 7 of speech by Ben Broadbent, 'Productivity and the allocation of resources', 12 September 2012 (http://www.bankofengland.co.uk/publications/Documents/speeches/2012/speech599.pdf).
[e] See chart 1.1 of Bank of England, *Trends in Lending*, October 2012 (http://www.bankofengland.co.uk/publications/Documents/other/monetary/trendsOctober12.pdf).
[f] See SME Finance Monitor (http://www.sme-finance-monitor.co.uk). A lack of data on financing conditions before the recession means that there is not an accurate counterfactual on availability of credit.
[g] Bank of England, Credit Conditions Survey, 2012Q4.

Leading to a falling and depreciating capital stock

The flow of investment is relatively small compared with the stock of capital.[37] This limits the initial impact that lower investment has on the capital available and therefore on the absolute fall in productivity. However, lower investment has larger impacts over time such that the growth in, and future levels of, productivity will have been affected by lower investment following the recession.

In an assessment of the gap between actual labour productivity and its pre-crisis trend, the Office for Budget Responsibility (OBR) finds that a reduction in the capital-to-labour ratio that has occurred following the recession can explain about one-tenth of the gap.[38]

However, looking at only the level of the capital stock does not account either for the quality of that capital or how it is being utilised (i.e. for the services that firms are receiving from capital), both of which may have changed over the recession.

On the one hand, lower investment affects the rate at which firms replace current capital such that the capital stock depreciates and becomes less technologically advanced. Reducing the replacement of old capital is likely to affect how productive the capital stock is. On the other hand, lower investment in new capital may lead firms to use current capital more intensely than was the case before the recession, such that a given level of capital now translates into a higher capital-services-to-labour ratio. These factors will produce opposing effects on labour productivity. Given this, and the OBR's estimate that the change in the capital-to-labour ratio has had only a limited impact, it seems unlikely that changes in capital can explain a large part of the productivity shortfall.

And a possible misallocation of capital

Since the recession, demand may have fallen by different amounts across different sectors or across different investments within sectors. Aggregate output would be expected to be below the aggregate supply potential of the economy until a reallocation of capital and labour has taken place. In other words, labour productivity may be temporarily low if there is a misallocation of capital following the recession – i.e. if capital is stuck in what are now low-productivity projects and moving only slowly to what are now higher-productivity projects. Similarly, a lack of labour mobility could reduce productivity, in principle. Productivity may also be lower during the period of adjustment, as employees who change jobs, and potentially industry, need to learn new skills.[39]

Analysis by the Bank of England finds an increased dispersion of rates of return across sectors.[40] With a perfect financial system, divergence in rates of return should reflect only

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[37] Information on the capital stock can be found in ONS, *Capital Stocks, Capital Consumption and Non-Financial Balance Sheets*, 2010. The majority of UK capital is in the form of buildings.

[38] See box 3.2 of OBR, *Economic and Fiscal Forecast*, 2012 (http://budgetresponsibility.independent.gov.uk/economic-and-fiscal-outlook-december-2012/). The analysis considers the aggregate change in the capital-to-labour ratio and does not account for differences in that change across firms, which could matter for the overall effect on productivity. The figure does not account for any change in the quality or utilisation of capital.

[39] Capital misallocation would affect labour productivity by affecting TFP.

[40] See chart 13 of speech by Ben Broadbent, 'Productivity and the allocation of resources', 12 September 2012 (http://www.bankofengland.co.uk/publications/Documents/speeches/2012/speech599.pdf). In this speech, Ben Broadbent, a member of the Bank of England's Monetary Policy Committee,

a divergence in risks. That may be part of what is happening, but it may also be evidence of a misallocation of capital. That is, rates of return may be diverging across sectors because capital is not moving to a sufficient degree from those sectors where there is a low rate of return to those with high rates of return. To the extent that this is happening, it would translate into lower TFP (i.e. the economy has become less efficient at producing output from a given stock of capital and labour inputs) and therefore indirectly into lower labour productivity. (See Box 3.2.)

That rates of return are more dispersed and capital possibly misallocated is consistent with a recent ONS analysis showing that labour productivity became more dispersed in 2008 and 2009. There is always a substantial difference between the least and most productive firms, but that difference seems to have increased since the recession as the more productive firms became more productive and the less productive firms less productive.[41]

Assisted by low firm turnover

Any increased dispersion in either rates of return or labour productivity may have been aided by an impaired financial system that is resulting in banks providing greater forbearance for some firms while being more risk averse in funding new projects.

There have been fewer firms exiting the market than in the aftermath of previous recessions. Between 2008 and 2010, company liquidations as a share of total companies increased by less than half a percentage point and have fallen back again slightly since. In comparison, between 1989 and a peak in 1993, the share of liquidations rose by over 1.5 percentage points.[42]

That fewer firms are exiting the market may be a result of low-productivity firms (and those receiving lower rates of return) that would otherwise have failed during the recession being supported by low interest rates and bank forbearance (i.e. a renegotiation or relaxation of loan terms rather than insistence on repayment when the original terms look set to be breached).[43]

We would also expect the entry of new firms to be lower during and immediately following a recession to the extent that there is uncertainty over demand that works to deter new investments. New entry could be further depressed if firms face credit constraints, which may be particularly binding for new ideas that are associated with greater risk. The latest data show that the number of 'firm births' fell by 5% between 2007 and 2008 and by 12% between 2008 and 2009.[44] A lack of new firms, and possibly a

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supports the view that capital is currently misallocated and that misallocation is evidenced by increased sectoral dispersion of rates of return.

[41] See figures 34 and 36 of S. Field and M. Franklin, 'Micro-data perspectives on the UK productivity conundrum', ONS, 16 January 2013 (http://www.ons.gov.uk/ons/dcp171766_295470.pdf).

[42] See figure 4 of Insolvency Service, statistics release, 3 August 2012 http://www.insolvencydirect.bis.gov.uk/otherinformation/statistics/201208/pressnotables.pdf. Company liquidations were 15,535 in 2008, rising to a height of 19,077 in 2009 (see http://www.insolvencydirect.bis.gov.uk/otherinformation/statistics/201208/table1.pdf). The number of firm deaths increased by 25% (from 222,555 to 277,435) between 2008 and 2009 (see footnote 44).

[43] For a discussion of forbearance, see box 2 of Bank of England, *Financial Stability Report*, June 2011 (http://www.bankofengland.co.uk/publications/Documents/fsr/2011/fsrfull1106.pdf).

[44] Figures are authors' calculations using ONS, Business Demography 2011 (http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-283124).

lack of finance for the expansion of current firms, may be preventing relatively high rates of return from being competed down.

A low level of firm turnover (i.e. low-productivity firms exiting and high-productivity ones entering) could be particularly damaging for the economic recovery if new firms are key to introducing new ideas and technologies.[45]

3.7 Public sector productivity

Historically, UK public sector productivity growth has been below that of the private sector.[46] Indeed, during the decade up to 2009, measures of public sector productivity growth suggest that the average growth rate was zero or even negative in that period. This reflects the fact that greater provision of public services was accompanied by a rapid growth in public sector employment. These factors – almost zero public sector productivity growth and a rising share of public sector employment – were among the many factors underlying the coalition government's determination to 'rebalance' the economy away from the public sector and towards the private sector.

The impact of austerity budgets on public spending since 2009 and the associated and unprecedented decline in public sector employment have sharply reversed these earlier trends. From its peak in 2009Q4, total public sector employment has fallen by around 366,000, or by 6%, to 2012Q1.[47] In the same period, output of 'government services' in the National Accounts has not fallen overall in real terms, and in fact has increased since 2008 by around 3%.[48]

Box 3.4 describes the measurement of public sector productivity. Notably, some components of government 'output' are measured broadly by the volume of inputs, such as in public administration and defence; in these sectors, if inputs decline, measured

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These data record the number of VAT or PAYE registered business births (active firms that were observed in data in a year but not in one of the previous two years) and deaths (firms that were not observed in data in a year but were active in one of the previous two years). There are no official statistics on the number of business start-ups and closures. Note: The ONS Business Population Estimates measure the total number of businesses, including unregistered businesses and central and local government businesses. The 2012 release shows an increase in the number of firms across the recession; this is mainly the result of an increase in businesses that do not have any employees.

[45] The 'creative destruction' view of exit and entry sees high turnover as a process that increases overall productivity: see R. Caballero and M.L. Hammour, 'The cleansing effect of recessions', *American Economic Review*, 2004, 84, 1350–68.
For evidence on the role of turnover of establishments in raising productivity in UK manufacturing, see R. Disney, J. Haskel and Y. Heden, 'Restructuring and productivity change in UK manufacturing', *Economic Journal*, 2003, 113, 666–94, and R. Disney, J. Haskel and Y. Heden, 'Entry, exit and establishment survival in UK manufacturing', *Journal of Industrial Economics*, 2003, 51, 93–115.

[46] For a general discussion, see H. Simpson, 'Productivity in public services', *Journal of Economic Surveys*, 2009, 23, 250–76.

[47] Employment fell by a further 303,000 to 2012Q3. However, part of this is the result of a reclassification of further education and sixth-form college corporations from the public to the private sector in 2012Q2. Public sector employment excluding financial corporations, English further education corporations and sixth-form college corporations fell by around 381,000 (6.4%) from 2009Q4 to 2012Q3. Source: ONS series C9KD (total) and KSM2, in Public Sector Employment (http://www.ons.gov.uk/ons/rel/pse/public-sector-employment/q3-2012/tsd-pse-time-series.html).

[48] Source: ONS published ad hoc data tables 'GDP(O) low level aggregates at constant and current prices'.

output also declines and output per head tends to remain broadly constant. This makes the overall rise in output per head in the public sector more striking. Unfortunately, although this evidence points to a sharp increase in public sector productivity since 2008, the ONS has not provided estimates of public sector productivity since 2009 and so official data cannot confirm the hypothesis.

Box 3.4. Measuring public sector productivity

There is a basic problem in assessing trends in public sector productivity. The public sector does not produce marketable output. And even if some public sector services are 'sold', they are largely not sold at prices or values that would be those set by a profit-maximising firm in a competitive market – for example, the National Health Service might be considered to have a quasi-monopsonistic position in the purchase of some types of workers and some pharmaceuticals.

Input measures of output

For many public services, measures of output in the National Accounts are simply calculated from measures of volumes of inputs. For example, an index of the value added ('output') in 'defence activities' is calculated directly from changes in the total strength of employment in the armed forces. The relationship between this index and cash spending on defence then gives an implied 'GDP deflator' used to calculate the 'value' of defence activities. A similar calculation is used for 'public administration', whereby the number of civil servants (albeit with differential weights attached to different grades) gives an index of the volume of 'output'; this is then adjusted by the central government final expenditure deflator to give a 'value' of public administration output. If 'outputs' are thereby broadly measured by the value of inputs, there can be no measured productivity growth. Actual productivity could, of course, increase or decrease in these sectors if the intensity or effectiveness of use of these inputs varies, but it will not show up in the National Accounts.

Output measures for some services

The unsatisfactory nature of input-based measures of government activity resulted in a review in 2005, chaired by Sir Tony Atkinson, which investigated whether public sector outputs could be identified using indicators that were distinct from volumes of inputs.[a] Recently, a number of government departments have incorporated partial measures of 'output' into their estimates of public sector production or value added. With independent measures of output that are no longer derived solely from measured inputs, productivity growth need not be constrained to zero.

In these cases (such as health, education and provision of welfare benefits), the volume of 'output' is measured by specific caseloads such as number of pupils, number of patients treated, throughput of claimants, delivery of welfare benefits and so on.[b] Efforts have been made to adjust these volume indices to measure 'quality' by limited outcome measures such as pupils' performances in school examinations, patient satisfaction and post-treatment mortality rates. So, for example, the productivity of 'education services' would increase if the pupil–teacher ratio rose without any reduction in pupil performance in tests or if, for a given pupil–teacher ratio, pupil performance improved. These measures are an improvement on the purely input-based measures, but will not fully capture all changes in productivity.

Difficulties remain

The whole area of measuring public sector output and productivity is a challenge and measurement issues are far from settled.[c] The difficulties in effectively measuring public sector productivity include (i) summarising multiple outputs by a single index; (ii) the treatment of capital inputs; (iii) the use of intermediate targets (such as patients treated) versus final outcomes (such as the impact of public services on the health of the population); and (iv) assessing the quality of public sector services that are delivered within the public sector.

[a] Sir Tony Atkinson, *Atkinson Review: Final Report – Measurement of Government Output and Productivity for the National Accounts*, Palgrave Macmillan, 2005 (http://ons.gov.uk/ons/about-ons/what-we-do/programmes---projects/completed-projects-and-reviews/atkinson-review/final-report/index.html).
[b] For further discussion, see http://www.ons.gov.uk/ons/guide-method/method-quality/specific/economy/index-of-services/index.html, various publications from the UK Centre for the Measurement of Government Activity (UKCeMGA) (http://www.ons.gov.uk/ons/guide-method/ukcemga/ukcemga-publications/publications/index.html) and C. Emmerson, C. Frayne and G. Tetlow, 'Challenges for public spending', in R. Chote, C. Emmerson, A. Leicester and D. Miles (eds), *The IFS Green Budget: January 2007*, IFS Commentary 102, 2007 (http://www.ifs.org.uk/budgets/gb2007/07chap7.pdf).
[c] See R. Murray, 'Measuring output from the public sector: a critical examination of the Atkinson Review', *Review of Income and Wealth*, 2010, 56, 413–23.

The remainder of this section examines trends in measured public sector productivity in the period up to 2008 and discusses the evidence on public sector output and employment since that time. We highlight the inferences and policy issues that may be drawn from these statistics.

No public sector productivity growth in the decade until 2009

Public sector measured output growth was substantial in the decade up to 2009. From 2000Q3 to 2009Q3, output of 'public administration and defence' rose by 17%, 'education' by 11% and 'human health and social activities' by 44%.[49] However, this increase in output was accompanied by an increase in input volumes, notably in the employment of such groups as civil servants, police officers and staff, teachers and nurses.
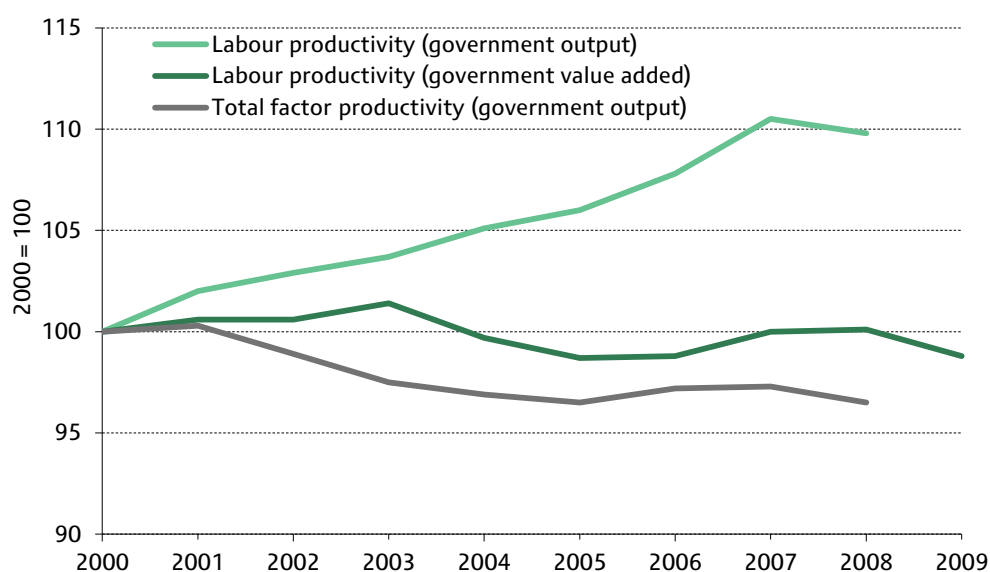
The ONS has produced a number of alternative measures of productivity growth in the production of government services over this period. Some of these are illustrated in Figure 3.14.[50] The two green lines show measures of labour productivity. What differentiates them is the measure of output used. The dark green line uses a measure of value added – effectively, this is output excluding all spending on intermediate inputs that are not labour. This is akin to the private sector figures discussed above. The light green line uses a measure of gross output derived from an index of spending on all inputs (labour and capital). Under this measure, labour productivity can increase if there is additional spending on non-labour inputs. The grey line is a measure of total factor productivity (defined in Box 3.2), which is an index of gross output relative to an index of capital and labour inputs. Two of the three measures show declining productivity, while

[49] ONS table 'GDP(O) low level aggregates at constant and current prices' (http://www.ons.gov.uk/ons/about-ons/what-we-do/publication-scheme/published-ad-hoc-data/economy/december-2012/gdp-o--low-level-aggregates-at-constant-and-current-prices.xls).

[50] A similar measure to the TFP series shown in Figure 3.14 – multifactor productivity growth for the public sector – is calculated for the period 1994–2008 by K. Long and M. Franklin, 'Multi-factor productivity: estimates for 1994–2008', *Economic & Labour Market Review*, 2010, 4, September, 69–72. This, too, is found to be negative for the period as a whole (see their figure 2).

one measure reports an increase over the period. Table 3.1 also showed a small increase in output per hour in total government services in the decade before the recession. However, more detailed studies of particular sectors confirm that there was little or no productivity growth in public services in this period. For example, in education, the volume of output is measured by pupil numbers, quality-adjusted by GCSE average point scores, and is divided by input volumes (primarily, numbers of teachers and teaching assistants) to obtain productivity. Using these calculations, the education productivity index between 1997 and 2008 was broadly stationary.[51] For health provision, with volume of output measured by number of treatments, admissions, and prescriptions of drugs, quality-adjusted by waiting times and survival rates, the health productivity index actually fell by 2.4% between 1997 and 2008.[52]

Figure 3.14. Measures of public sector productivity

Notes: The 'government output' measure of labour productivity is an index of total spending on public services divided by an index of total employment. The 'government value added' measure is similarly an index of value added (i.e. output excluding intermediate inputs) relative to an index of employment for a selection of government-dominated activities. The 'government output' measure of total factor productivity is an index of output relative to a range of inputs, including capital and labour, weighted by their relative contributions.
Source: Office for National Statistics, 'Public sector labour productivity', January 2011.

Of course, and as we mentioned above, these measures are imperfect. They may have understated (or overstated) productivity growth in the previous decade by inadequately capturing public sector output. Some would argue that these productivity indices do not measure any long-term wider productivity gains that would arise from, for example, reducing class sizes in schools or improving the general health of the population; they are simply the application of a formula for measuring input and 'quality-adjusted' output volumes. If these arguments were valid, such measures would therefore understate the

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[51] See Office for National Statistics, 'Public service productivity estimates – education 2010', March 2012 (http://www.ons.gov.uk/ons/rel/psa/public-sector-productivity-estimates--education/2010/index.html).

[52] See Office for National Statistics, 'Public service output, inputs and productivity: health care', March 2010 (http://www.ons.gov.uk/ons/rel/psa/public-service-productivity/public-service-output--input-and-productivity--healthcare/index.html).

scope for future productivity growth in the economy as a whole that arises from greater resource inputs into areas such as education and health.

Public sector employment and productivity after 2009

Total public sector employment increased steadily in the period after 1997, from just over 5.4 million in that year to a peak of just under 6.4 million in 2009Q4.[53] In contrast, the period from 2009 onwards has seen a rapid fall in employment in the public sector. From its peak, total public sector employment had fallen to 5.7 million by 2012Q3.[54] As a proportion of aggregate employment, the public sector has dropped from 21.9% in 2008 to 19.5% in 2012Q3. (For a discussion of public sector employment, see Chapter 6.)

These falls in employment have been disproportionately high in the field of public administration, rather than in areas such as health and education. For example, Civil Service employment fell from a peak of 571,000 in 2005 to 458,000 in 2012 (a fall of 20%), although this may include some outsourcing of services at junior levels.[55] The numbers in the Senior Civil Service (SCS) fell by 17% between 2010 and 2012, reducing them to levels not seen since the late 1990s. Over the same period, the SCS paybill fell from over £470 million to less than £390 million – a fall of 20%.[56] This is a case where the fall in employment would feed directly through into a fall in measured output (because the measured output is based on input volume) such that measured productivity would remain broadly unchanged. However, it is hard to believe that the workload has not increased for the remaining civil servants, especially at senior levels, given the numerous reforms and initiatives implemented by the coalition government. Whether this higher workload translates into higher productivity in practice depends on other factors such as the effectiveness of delivery relative to targets by senior public administrators.

Has public sector productivity increased since the recession?

Aggregate measured public sector output has increased since 2009 while total public sector employment has fallen. This suggests that labour productivity has increased.

In the absence of official data on public sector output productivity since 2009, a crude measure of the change in labour productivity can be obtained by utilising data on trends in output (as measured in the National Accounts) and employment in order to investigate movements in output per head in the public sector. But there are some caveats to bear in mind. First, the National Accounts measure of 'government services' includes some privately-provided services, particularly in health and social care. Second, there have been major changes in definitions of employment aggregates, especially in education where schools have been removed from local authority control. Data for these calculations are only safely done for the period since early 2010, and even here there are transitory fluctuations in output per head that cannot be fully explained.
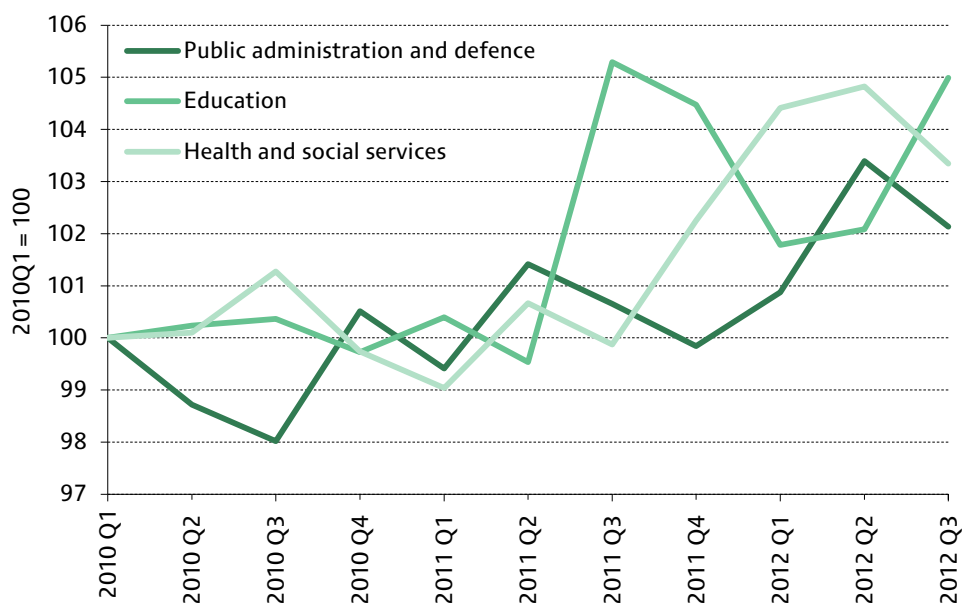
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[53] Source: ONS series C9KD in Public Sector Employment (http://www.ons.gov.uk/ons/rel/pse/public-sector-employment/q3-2012/tsd-pse-time-series.html).

[54] Source: ONS series G7AU in Public Sector Employment, headcount, seasonally adjusted.

[55] Source: ONS series C9KE (http://www.ons.gov.uk/ons/rel/pse/public-sector-employment/q3-2012/tsd-pse-time-series.html).

[56] For figures, see Cabinet Office, *Government evidence to the Senior Salaries Review Body*, December 2012.

Figure 3.15. Output per worker in government sectors

Source: Office for National Statistics, 'GDP(O) low level aggregates at constant and current prices', December 2012; *Labour Market Statistics*, several issues between August 2011 and December 2012.

Figure 3.15 shows indices of the volume of output in the three subsectors defined in the National Accounts as 'government services' – public administration and defence, education, and human health and social work activities – relative to indices of employment in these sectors derived from recent editions of ONS *Labour Market Statistics*, which contain broadly consistent time series of employment.

There are important differences across different parts of the 'government services' sector. Between 2009Q3 and 2012Q3, output fell by 5% in 'public administration and defence' (this should not be surprising given that measured output in these sectors is heavily dependent on the volume of inputs), fell very slightly in the education sector and actually rose by 8% in 'human health and social work activities'. A priori, a larger fall in employment relative to outputs suggests that, in the short run, measured labour productivity (and probably total factor productivity also) has increased in the public sector.

The figure shows a broad upward trend in output per worker in all three sectors of government services since 2012, which is slowest in 'public administration' and with a high degree of year-to-year variation in all the sectors. Should we take these statistics at face value? One possibility is that productivity has risen so substantially in the private components of these sectors as to swamp the low or negative growth in productivity in the public component. However, since private provision is a relatively small component of output in these sectors, this seems unlikely; moreover, for the two subsectors with a degree of private provision (education, and health and social services), there is no evidence of a break in trend in output in the post-2009 period in the data. The data seem consistent with a 'story' by which output volumes continued to grow somewhat faster than employment in these two sectors in this period of 2010 onwards.

In the parts of the public sector where 'outputs' are measured by input volumes, it is hard to form any clear judgement on whether public sector productivity has increased using data from the National Accounts. However, the previous discussion of the Senior Civil Service workload suggests that, implicitly, public sector productivity *must* have increased

in these sectors in the absence of evidence that total workloads have declined substantially. Any offset to this hypothesis of increased productivity growth must be motivated by evidence that the quality of decision-making in public administration has fallen as the total workforce has been reduced. Anecdotal evidence, such as the West Coast Main Line franchise debacle in late 2012, might be seen as evidence of reduced quality of output. [57] But the internal review of this particular decision, although noting that resources in the Department for Transport were 'extremely stretched', tended to focus on long-standing difficulties in handling government procurement contracts, weak organisational structure, management of decision-making and so on. Indeed, there have been a number of appointments of non-governmental figures tasked with improving what is perceived to be a long-standing weakness in public sector administration rather than a perceived reduction in quality of delivery arising from the austerity measures. The latest was the appointment of Lord Browne of Madingley in June 2010 as a lead Non-Executive Director – a key role in the Cabinet Office –to improve performance across government departments, particularly in contract negotiations.

It has also been noted by outside observers that, in some sectors, public sector wage bills have not fallen as fast as employment.[58] This may reflect in-built 'drift' arising from incremental pay structures when there are few new hires at the lower end of the pay distribution (see Chapter 6). But it should be noted that, to the extent that input volumes are indexed by the GDP deflator rather than an earnings index, this factor should not enter into the measured value of output and therefore productivity.

The data therefore suggest an at least temporary reversal of the long-standing trend of positive private sector productivity growth accompanied by zero or negative public sector productivity growth. Rising demands for public services coupled with a sharp retrenchment in the public sector workforce have produced measured productivity gains in the public sector in contrast to the low or indeed negative productivity growth of the previous decade.

Nevertheless, caution must be exercised in the interpretation of this change in the measured public sector productivity trend, which is in large part driven by the methods used to measure public sector activity in the National Accounts. Nor should the increase in measured public sector productivity of itself lead analysts to reconsider the 'rebalancing of the economy' away from public sector employment. On the one hand, these data may confirm what many members of the coalition government apparently believe: that there are previously-unexploited gains in productivity efficiency within the public sector to be achieved in such sectors as public administration, education provision and the police service, and that these underlying potential gains are now being realised. On the other hand, much of the increase in inputs into such sectors as education and health in the previous decade were rationalised as improving the *long-term* efficiency of the economy, through, for example, a better-educated and healthier workforce and a safer society. There may well be a trade-off between short-term gains in output per head in the public sector and these longer-term considerations of the overall efficiency of the economy. Care should therefore be taken to look for any early warning signs of a decline in the *quality* of public sector output – whether measured by explicit indicators or by

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[57] BBC, 'West Coast Mainline deal failure criticised', 6 December 2012, http://www.bbc.co.uk/news/uk-20620787.

[58] S. Flanders, 'Public sector jobs are well down, so why is the pay bill up?', 30 November 2012, http://www.bbc.co.uk/news/business-20561444.

failures of public administration – if short-term measured gains in productivity are not to be reversed in the future.

3.8 Conclusions

Measured output per worker fell by 3.2% in absolute terms between 2008Q1 and 2012Q3, bringing it 12.3% below its pre-recession trend. This chapter has considered some of the key factors that speak to the puzzle of why labour productivity has seen such a large fall.

The fall in output per worker can partly be explained by a fall in the average number of hours worked (driven mainly by an increase in part-time working). However, output per hour has also fallen, by 2.6% between 2008Q1 and 2012Q3, and is 12.8% below its pre-recession trend.

We find no evidence that the fall in aggregate productivity is the result of a change in the industrial composition of the economy. That is, it is not explained by the fall in the share of employment of relatively high-productivity sectors. Instead, it is driven entirely by productivity falls within industries, notably including finance & insurance and mining & quarrying. Almost half of the workforce is in an industry for which productivity has fallen.

We conclude that a change in the composition of the workforce is likely to have had some effect on aggregate productivity. There are now more part-time workers and more self-employed workers, and to the extent that these types of workers are less productive than full-time employees, their increased share in the workforce will have contributed to the fall in aggregate productivity. However, we expect this compositional effect to be less important than falls in the average productivity of all workers. In addition, there has been a continued trend towards better-educated, more experienced and longer-tenured employees that we would have expected to increase rather than reduce output per hour.

There are two notable differences between this and previous recessions.

First, there has been a sharp reduction in real wages since 2008 alongside a relatively restrained fall (and then rebound) in employment. This is in contrast to the trends seen following the 1979–81 and 1990–91 recessions. We would expect a fall in both the real wage and employment to result directly from a fall in labour demand. It is also plausible that workers are producing less per hour as a direct result of the fall in consumer demand and that this is restraining wages. However, there is also evidence to suggest that there has been an increase in labour supply of some groups. For older workers, this could have been driven in part by large negative wealth shocks and policy changes, not least the increase in female State Pension Age. For other groups, more active labour market policies and greater work search requirements for benefit recipients may have played a part. In contrast to previous recessions, inactivity rates have not risen. To the extent that these effects have increased labour supply, they could have worked to keep real wages relatively low and employment relatively high. In addition, increased flexibility in the current labour market makes adjustments through hours worked and wages (rather than just employment) more likely. We conclude that lower real wages have played a part (although we can't say how large a part) in allowing firms to continue to employ workers (even if they are producing less) and therefore in reducing aggregate labour productivity.

Second, business investment has fallen by more in this recession and remained subdued for longer. Uncertainty has been an important factor contributing to this. Low investment

may have reduced the level and the quality of capital that workers have access to. Firms may also have been substituting labour for capital to the extent that labour is now relatively cheaper and is more flexible in the face of uncertain demand. Lower levels of capital per worker, especially if the capital is of a lower quality, will reduce labour productivity.

Aggregate labour productivity will also have been adversely affected if there is a misallocation of capital following the recession. An increased dispersion of rates of return across sectors and of productivity across firms provides evidence consistent with a misallocation of capital. It is plausible that capital movements have been inhibited by an impaired financial sector that is extending forbearance to low-productivity firms while being more risk adverse in funding new projects. Constraints that reduce the exit and entry of firms are particularly important if the turnover of firms is an agent by which aggregate productivity increases.

The public sector presents a different puzzle from the private sector. Employment in the public sector has fallen sharply – the 6% drop since the end of 2009 largely reverses the increase in public sector employment over the previous decade – while the data available on government services show a small increase in output since 2008. There are particular difficulties in measuring public sector output and there are no official measures of public sector labour productivity after 2009. We interpret the available evidence as showing that labour productivity has increased in the public sector, although the difficulties in measuring government output lead us to present this conclusion with some caution. This is in contrast to the decade before the recession, in which measured productivity growth in the public sector was approximately zero. The apparent increase in public sector labour productivity is somewhat surprising given that the National Accounts measure of government output is often based on inputs (such that, by definition, productivity is constrained to be broadly zero).

The recent increase in productivity may suggest that there were unexploited productivity gains in the public service before the recession. However, it will be important to monitor the effects of lower inputs (notably employment) on the quality of decision-making in public administration, on the quality of public services and on the longer-term measures of public service outcomes (such as how educated and healthy the workforce is).