

The Productivity Conundrum, Explanations and Preliminary Analysis

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Abstract

This article follows on from an earlier paper on the recent productivity conundrum published on 24 August 2012. It examines movements in aggregate output and employment since the start of the 2008 recession, pulling together a range of evidence that helps understand the puzzle. Factors such as the behaviour of companies, the flexibility of the labour market, the structure of the economy, the role of the financial sector, and the behaviour of supply are discussed, as well as possible measurement errors in GDP. The article also includes further analysis of the UK market, in particular, the role of underemployment and self-employment in explaining the observed divergence between output and employment. It examines relative movements in output in different sectors of the economy and how this can contribute to productivity changes at the whole economy level.

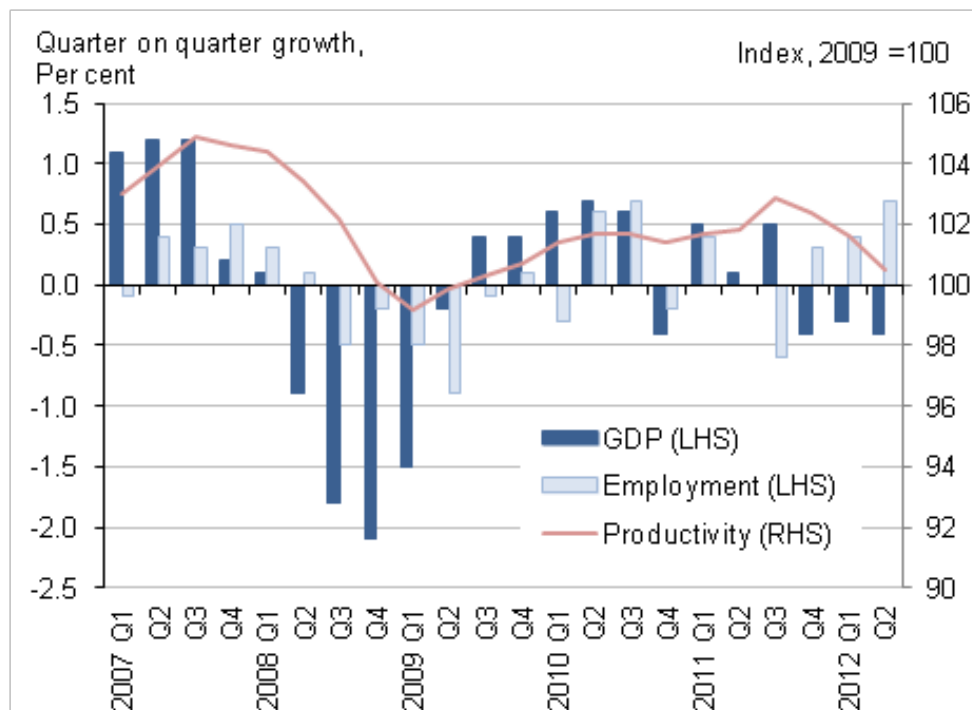
Acknowledgements

1. The author would like to acknowledge input from Mavis Anagboso, Michael Hardie, George House, Frederick Perry, Andrew Damant and Khush Patel. Comments from Joe Grice, Graeme Walker, Jamie Jenkins and Nicholas Palmer are also acknowledged.

Introduction and context

Since the beginning of the financial crisis in 2008, movements in aggregate output and employment in the UK have posed a 'productivity puzzle'. In the initial phase of the recession, between the first quarter of 2008 and the second quarter of 2009, real GDP fell 6.3 per cent. Employment, by contrast, fell just 2 per cent, significantly less than an analysis of previous UK recessions would suggest. In the course of the second phase of falling output between the third quarter of 2011 and the second quarter of 2012, real GDP has fallen 1 per cent, while employment has grown by 1.4 per cent.

Chart 1: UK output, employment and output per worker productivity, 2007-2012, seasonally adjusted



Source: Office for National Statistics

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The resulting decline in productivity has generated significant debate among economists and is the focus of this article, which builds on a previous paper by Joe Grice in August 2012, "[The Productivity conundrum, Interpreting the recent behaviour of the economy](#)". While it does not provide a complete solution, it examines some of the forces at work that may help to understand the puzzle – forces emanating from the behaviour of companies, the flexibility of the labour market, the structure of the economy, the role of the financial sector, and the behaviour of supply. All of these factors may have played a role in generating a break in productivity behaviour from past trends.

The unusual divergence of output and employment data has prompted speculation that the official statistics – either the GDP or labour market figures or both - must be wrong. To address these concerns, ONS is publishing alongside this article two articles focussed on:

- ONS's record on the reliability of early estimates of GDP growth, as measured by revisions performance.
- An analysis of the relationship between ONS GDP estimates and the results of business opinion surveys.

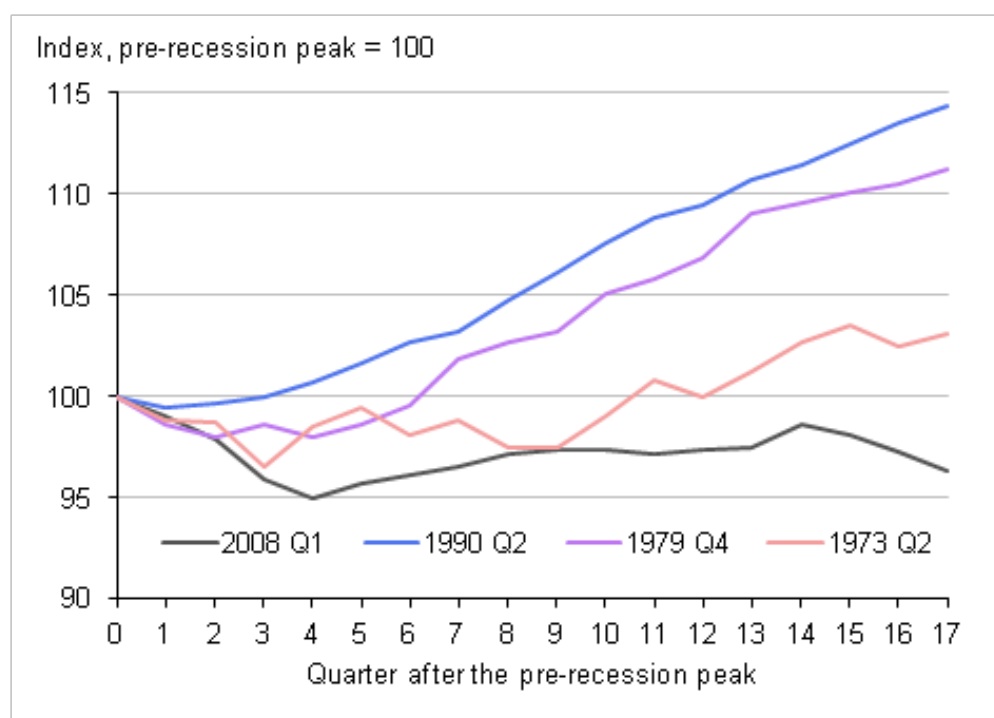
The conclusions of this article, and the accompanying papers, are:

- There is no single factor that explains the productivity puzzle. It is likely that there are several forces at work, which together can help to understand recent productivity behaviour.
- Factors such as the impact of the banking crisis, the reaction of companies, the flexibility of the labour market, and the sectoral composition of the economy are important considerations in explaining the productivity puzzle.
- It would require implausibly large revisions to current estimates of GDP growth to explain a significant fraction of the productivity puzzle, so there must be other forces at work.
- There is no evidence of bias in early estimates of GDP growth, and the absolute size of revisions remains small, and smaller than in periods up to the early 1990s. However there are tentative signs that the size of revisions since 2005 has increased a little.
- ONS estimates of GDP growth are consistent with the information provided by business opinion surveys such as the Purchasing Managers' Indices, and with information on tax revenues.

Productivity compared with previous recessions

Between its peak in the first quarter of 2008 and the trough in the second quarter of 2009, real GDP in the UK fell by a total of 6.3 per cent. On the basis of previous recessions, total employment would be expected to have fallen on a similar scale. In fact, the fall in employment over the same period was only 2.1 per cent. As a result whole economy labour productivity (expressed as output per worker) fell by 4.3 per cent.

Chart 2: UK productivity levels, output per worker during UK recessions, seasonally adjusted



Source: Office for National Statistics

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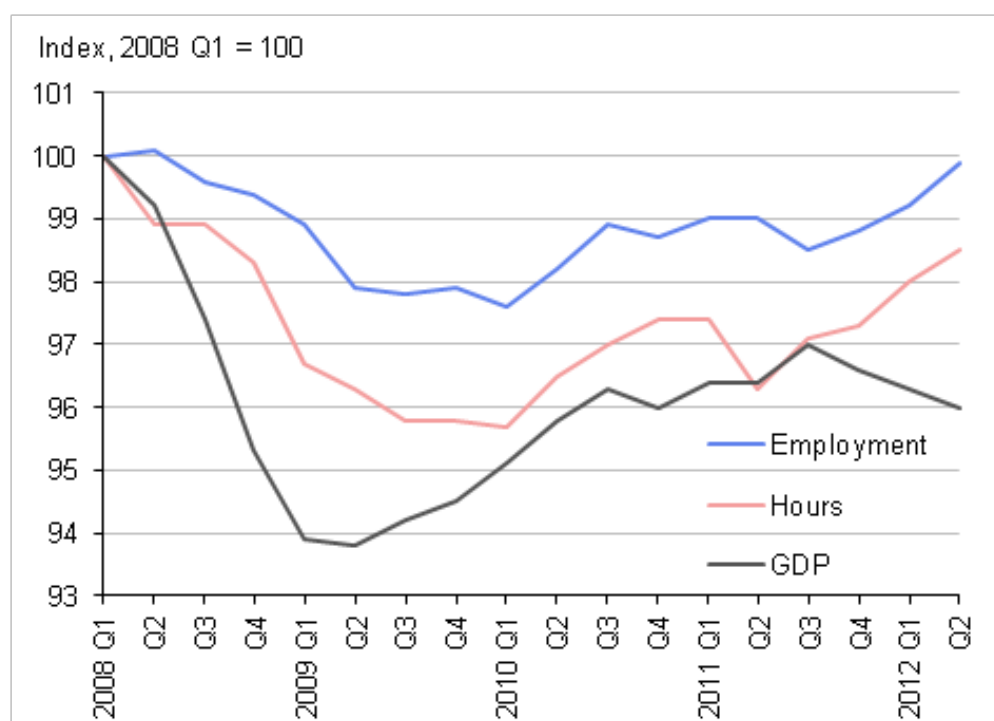
This produced a weaker productivity performance during the recession in 2008 and 2009 than in previous post-war recessions.

The initial drop in productivity during a downturn is typically short-lived. In the previous two recessions, productivity began to rise again after only a few quarters, and regained its peak level quite quickly as employment fell while output began to recover.

This pattern was not repeated in the latest episode. Between early 2009 and mid-2010 productivity rose at a rate only slightly slower than in previous recessions. But whereas productivity growth then started to pick up quite sharply, this time it has flattened off since the middle of 2010. It did not rise further over the next year as output and employment both experienced sluggish recoveries.

Since the third quarter of 2011, GDP has contracted while employment has been rising, generating a renewed fall in productivity. As a result, more than four years after the start of the recession, productivity remains 3.7 per cent below its pre-recession peak. At the corresponding stage of the recessions in the early 1980s and 1990s, productivity was more than 10 per cent higher than at the start of the recession. The current level of productivity, measured as output per worker, is around 15 per cent lower than might be expected on the basis of previous experience.

Chart 3: UK output, employment and total hours worked, seasonally adjusted



Source: Office for National Statistics

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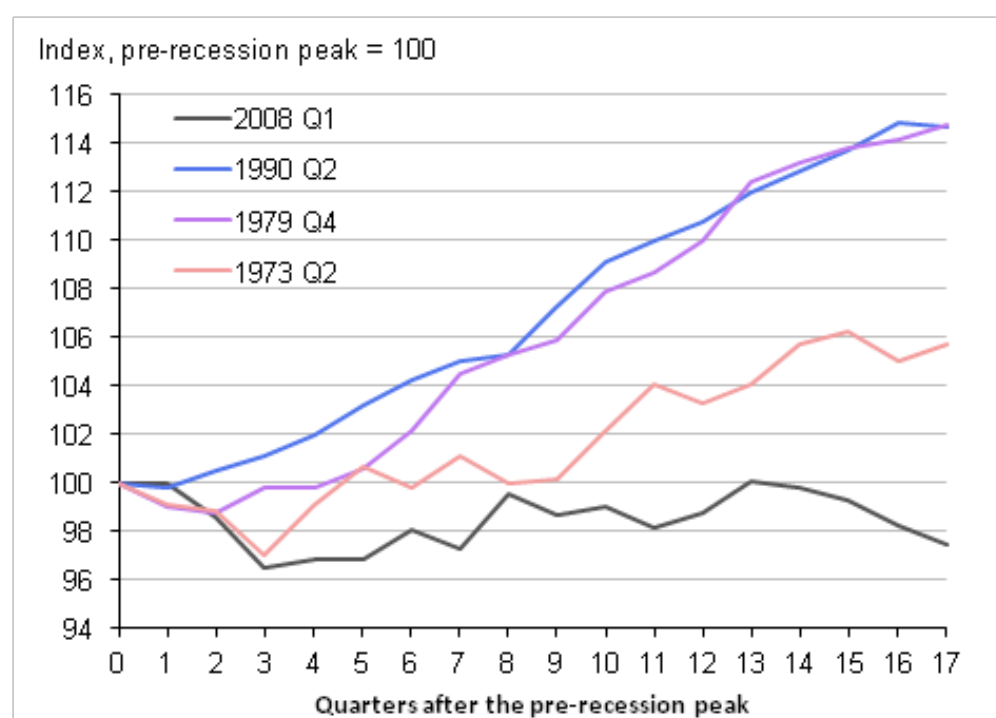
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Productivity is also measured in terms of output per hour. There was a sharp drop in average weekly hours worked during the recession, driven by a significant shift from full-time to part-time working. Total hours worked fell by almost twice as much as employment during the recession itself, and has followed a similar trajectory to employment in the subsequent years – see chart 3.

As a result, while productivity measured as output per hour has also been weaker than in previous recessions, the discrepancy has been a little less marked than for output per worker. Output per hour briefly regained its pre-recession level for a period in 2011, although it has since fallen back again – see chart 4. It is 2.5 per cent lower now than immediately prior to the recession. In contrast, productivity on this basis at the corresponding stage of the two previous UK recessions was around 15 per cent higher than the pre-recession level.

Chart 4: UK productivity levels, output per hour during UK recessions, seasonally adjusted



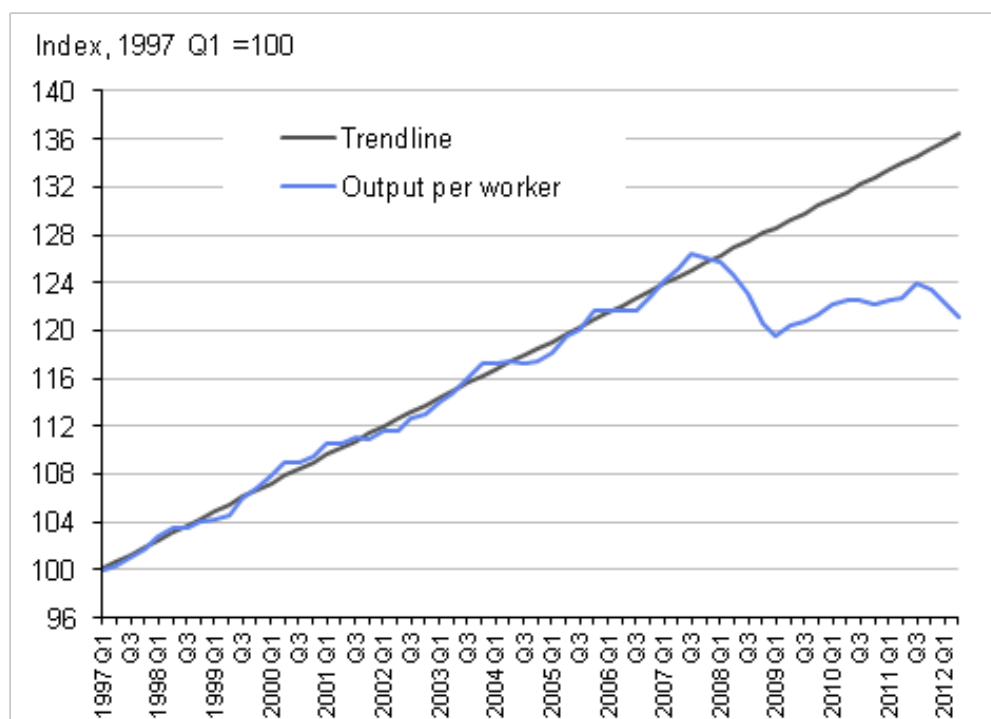
Source: Office for National Statistics

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Whole economy output per worker is now more than 10 per cent lower than if it had continued on the pre-crisis path of around 2.4 per cent annual average growth.

Chart 5: UK output per worker compared with pre-crisis trend, seasonally adjusted

Source: Office for National Statistics

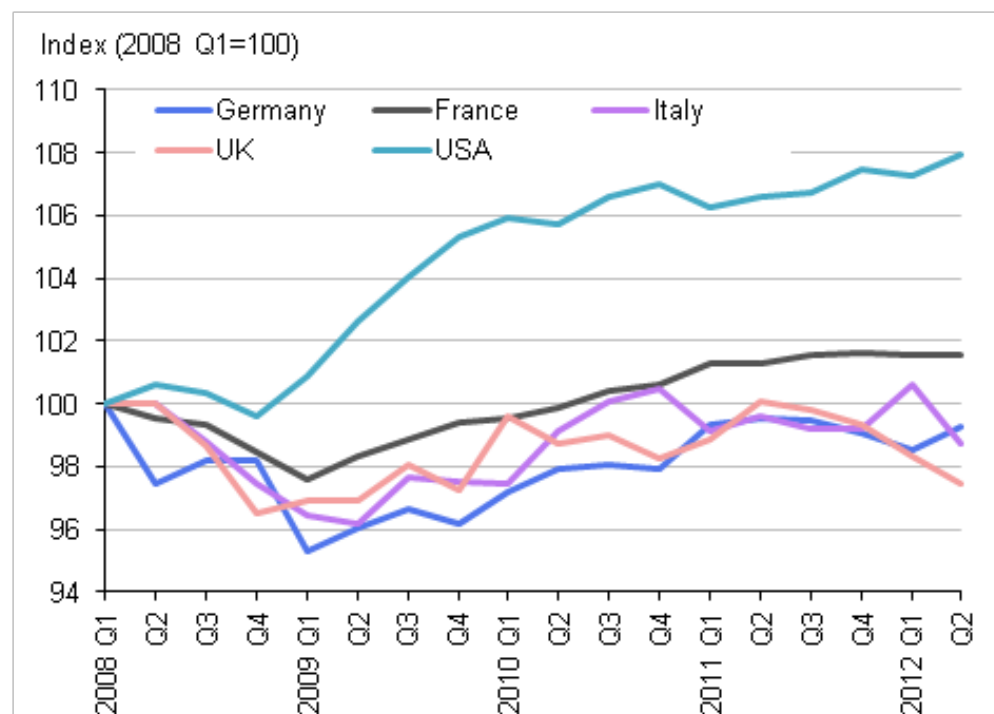
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International experience of productivity performance

The puzzle of weak productivity performance since the financial crisis is not confined to the UK. In particular the UK experience is in line with that in several other European countries. In the US, productivity has in contrast been strong and employment correspondingly weak.

Chart 6: International comparisons of output per hour productivity growth since 2008 Q1, seasonally adjusted



Source: Office for National Statistics

Notes:

1. Real productivity per hour for the United States only covers the business sector as a total productivity measure is not publicly available
2. Data for Italy, France, and Germany was provided by Eurostat
3. Data for United States was provided by U.S. Bureau of Labor Statistics

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The fact that the UK's experience in 2008 and 2009 was consistent with that of other countries suggests that some common factors might be involved. However since mid-2011, there has been a renewed weakening in UK productivity, something not experienced to the same extent elsewhere. With output growth similarly weak in other European countries, the difference in the UK is due primarily to strong employment figures, which could therefore be explained by UK-specific factors.

Analysis of this period is complicated by the presence of special factors in the UK which may have affected output, but not employment or hours to the same extent. For instance, the Diamond Jubilee bank holiday resulted in one working day fewer than normal in the second quarter of 2012. While output is likely to have been lost, especially in sectors of the economy which do not operate at weekends or over holiday periods, employee numbers will not in most cases have been affected. The main impact on employment will be through a loss of work for those on output-related contracts, including the self-employed. There may have been a slightly larger impact on hours.

The UK's productivity performance has fallen further from pre-recession trends than in other countries. Average annual productivity growth in the UK of around 2.5 per cent in the decade 1997-2007 was much stronger than in other European economies. The present weakness in the UK therefore stands out more starkly.

Table 1: Average annual growth in output per hour in major economies

	1997 Q1 -2007 Q4	2009 Q2-2012 Q2
Germany	1.7	1.1
France	1.7	1.1
United Kingdom	2.4	0.2
USA	2.7	1.7

Table source: Office for National Statistics

Table notes:

1. Real productivity per hour for the United States only covers the business sector as a total productivity measure is not publicly available
2. Data for Italy, France and Germany was provided by Eurostat
3. Data for United States was provided by U.S. Bureau of Labor Statistics

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Factors contributing to the productivity puzzle

There are many potential drivers of the UK's productivity performance during the recession. They can be considered under a number of headings:

1. structure of the economy,
2. role of the financial sector,
3. behaviour of supply,
4. behaviour of companies,
5. flexibility of the labour market,
6. measurement errors in GDP estimates.

1. Structure of the economy

The make-up of the economy has a direct bearing on the behaviour of productivity at whole economy level depending on the relative movements in output in different sectors. If high productivity sectors of the economy are growing, then the average level of productivity will rise. Conversely if low productivity sectors are growing, the average will fall.

High value-added sectors, such as manufacturing and mining & quarrying, saw large falls in productivity during the recession in 2008 and 2009 while output of government services – a low productivity sector as measured in the national accounts – actually increased. This compositional effect generates as a matter of arithmetic a smaller fall in employment in the UK as a whole than the drop in output.

Table 2: UK output growth during the 2008-2009 recession

	Output weight, 2009 (%)	Employment weight (productivity jobs), 2009 (%)	Productivity level (index numbers, UK economy = 100)	% change in output, 2008Q1-2009Q2
Agriculture, forestry & fishing	0.6	1.3	46	-6.8
Mining & quarrying	2.4	0.2	1200	-7.3
Manufacturing	10.5	8.7	121	-12.5
Utilities	2.7	0.9	300	-8.3
Construction	6.8	7	97	-17.8
Distribution & catering	14	21.9	64	-7.8
Transport & communications	10.6	8.6	123	-7.8
Finance & business	29.1	19.5	149	-5.2
Government & other services	23.3	32.1	73	1.6
Whole economy	100	100	100	-6.3

Table notes:

1. Workforce jobs figures, benchmarked to Labour Force Survey totals

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The annual average rate of UK productivity growth fell from 2.4 per cent in the eleven years to the start of 2008 to only 0.1 per cent in the three years since the second quarter of 2009 – see table 3. Productivity growth in both the manufacturing and services sectors in aggregate has also been more than 2 percentage points a year slower than in the decade before the crisis, in line with the whole economy's behaviour.

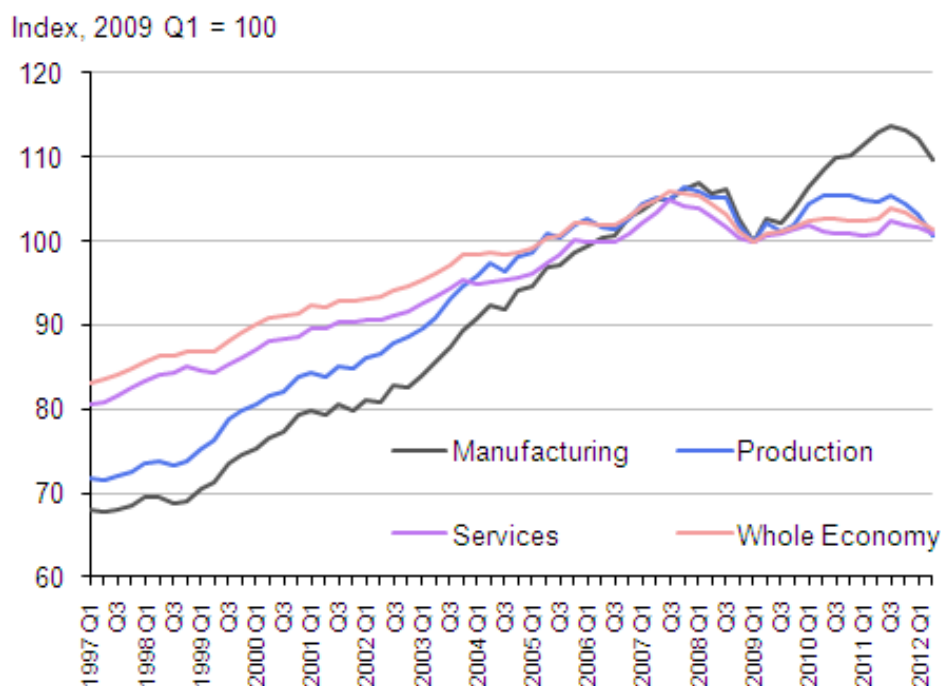
The biggest falls occurred in finance & insurance activities, followed by information & communication, production (apart from manufacturing), and transport & storage.

In contrast, productivity growth was higher than prior to the recession in the construction industry, and in the services sector in real estate, arts, entertainment and recreation, and government services.

Productivity in the manufacturing sector appeared to be resuming growth close to its pre-recession trend in 2010 and 2011, before it turned down again in mid-2011. But other parts of the production sector have fared worse.

As well as manufacturing, the production sector includes mining and quarrying, gas and electricity, and water supply and sewage. These activities account for only a third of the output of the entire production sector, but they contributed to a marked slowing of productivity growth compared with the pre-recession period.

Chart 7: Productivity levels in manufacturing, production and services, seasonally adjusted



Source: Office for National Statistics

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In particular, oil and gas extraction – part of the mining and quarrying sector - has been falling for more than a decade. In addition, the maintenance requirements of ageing platforms have increased, taking them out of service for lengthy periods, while the explosion on the Elgin platform in March 2012 has also reduced output.

This is a capital-intensive, and therefore high productivity, sector of the economy. A certain level of staffing is required to supervise the activities on North Sea installations, but the process of extraction

is highly automated, and variations in output do not entail changes in employment on the same scale.

Hours worked have therefore fallen much less than the fall in output, and productivity has weakened sharply reflecting the intrinsic characteristics of oil and gas production. Output per hour in the mining and quarrying sector has dropped by more than 40 per cent since 2007. As a result, productivity growth in the non-North Sea sector over the period since the first quarter of 2008 has grown by one percentage point more than in the economy as a whole.

Table 3: UK productivity growth (output per hour) before, during and after the 2008-2009 recession

Annual average growth rates, per cent

	Pre-recession decade	Recession	Post-recession	Fall between pre- and post-recession periods
	1997 Q1 - 2008 Q1	2008 Q1 - 2009 Q2	2009 Q2 - 2012 Q2	(% points)
Whole Economy	2.4	-2.4	0.2	-2.3
Production	3.6	-1.3	-0.9	-4.5
Manufacturing	4.2	-1.5	1.9	-2.3
Construction	0.8	-11.1	4.3	3.5
Services	2.3	-1.4	0	-2.3
Wholesale and retail trade; repair of motor vehicles and motorcycles	2.2	-1.8	-0.2	-2.4
Transportation and storage	2.1	-8.4	-1.2	-3.3
Accommodation and food service activities	2.3	0	-0.3	-2.6
Information and communication	6.2	1.1	0.6	-5.6
Financial and insurance activities	4.1	-0.6	-2.8	-6.9
Real estate activities	-2.3	6.9	0.4	2.7

	Pre-recession decade	Recession	Post-recession	Fall between pre- and post-recession periods
	1997 Q1 - 2008 Q1	2008 Q1 - 2009 Q2	2009 Q2 - 2012 Q2	(% points)
Professional, scientific and technical activities	4.2	-4.4	-0.5	-4.7
Administrative and support service activities	3.3	-7.4	3.6	0.3
Government services	0.5	-1.6	1.5	1
Arts, entertainment and recreation	0.6	-1.1	3.2	2.6

Table source: Office for National Statistics

Table notes:

1. Due to rounding the change between pre- and post-recession periods may not equal the difference between the periods.

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In the services sector, which accounts for more than three quarters of the output of the whole economy, productivity growth since 2009 has also been slower than before the recession. Within the services sector, there are marked divergences in productivity performance.

Output of the finance and insurance sector grew by more than 5 per cent a year on average during the period between 1997 and the start of 2008, but has fallen at an annual rate of more than 3 per cent since the recession. In both periods the changes in employment were much less dramatic. Productivity growth of 4 per cent a year in the pre-recession period compares with annual declines of almost 3 per cent in the last three years, a drop in annual productivity growth of almost 7 percentage points.

There have been small falls in productivity in the last three years in several sectors – including distribution, accommodation & food services, and professional, scientific & technical services - as growth in hours worked has slightly exceeded the recovery in output.

In some areas – for instance retailing, and estate agents - the behaviour of productivity may be partly dictated by the need to maintain a certain level of service even if demand has fallen. This is especially true of small outlets, where indivisibilities in staffing make it difficult to cut employee numbers in proportion to the reduction in business. In other cases, it is possible to reduce staffing levels with a lag – for instance if business shows no sign of picking up, then firms may reduce their opening hours. This will also show up initially as weak productivity.

In other activities, associated with high levels of labour productivity as a result of the high capital intensity, the same relatively small number of staff may be required regardless of the volume of business. Examples include parts of the telecommunications industry, as well as North Sea extraction as mentioned above.

These sectors could see a relatively large reduction in productivity during the recession, although much of it should be reversible as demand growth resumes.

2. Role of the financial sector

The financial sector is an important sector of the economy in its own right. Financial and insurance activities accounted for more than 10 per cent of total UK gross value added in 2009, but less than 4 per cent of employment. As discussed above, productivity has fallen sharply since the end of the recession.

But the process of financial intermediation is also a vital input into the production process. There is an extensive economic literature (see Reinhart & Rogoff 2008, Kindleberger 1986, Minsky 1992) to suggest that recessions associated with banking crises are longer and deeper than usual, as the impairment of the financial sector inhibits efficient operation of the adjustment mechanisms that re-allocate resources between failing and prosperous sectors of the economy.

Joe Grice in his earlier [article](#), outlined an important channel through which this may have had harmful effects on the productive capacity of the economy. He described a possible mechanism as:

- The over-exuberant financial intermediation before the crisis may have led to poor economic outcomes with capital and resources going into activities with poor potential returns.
- In the aftermath of the crisis, the risk premium increased markedly. As a result, much of the existing capital stock would no longer be capable of generating the return required at the higher rate, and would thus become unviable.
- After the crisis, levels of financial intermediation declined sharply, again possibly hampering the formation of productive capacity.
- To the extent that earlier poor financial intermediation resulted in an allocation of resources that is non-optimal, there will be negative effects on human and physical capital, as the mis-allocation is unwound.

Firms require access to capital in order to expand their activities, either through investment or by generating new jobs. If the financial crisis means that banks cannot provide the amount of lending required by companies, then that expansion may be deferred temporarily or – if it results in failures of viable companies - permanently.

In a recent [speech](#), Ben Broadbent, a member of the Bank of England's monetary policy committee, suggested that a "capital mismatch" may have arisen either because the economy became less able to reallocate resources or if it faced a greater need to do so. The former might have arisen if small businesses with profitable ideas were unable to finance them, while banks have shown greater forbearance to existing business customers with poor loans.

Companies can have recourse to other sources of finance, for instance by issuing bonds or equities. However these channels are most easily accessible by larger firms, and are not available to all companies. There is anecdotal evidence that smaller firms may have had more difficulty in raising new finance during the recession and its aftermath. However it is unclear whether low levels of lending to non-financial companies are driven by constraints on the supply of credit or weak corporate demand for borrowing.

Doug McWilliams, CEBR ([September 2012](#)) has further suggested that the effects of over-exuberant financial sector intermediation might show up as an overstated level of productivity in the period before the recession. He indicates that this effect could be as much as 2.8 per cent of the level of productivity in the first quarter of 2008 – thereby accentuating the magnitude of the fall during the recession - based on the fact that output estimates for this period include the effects of a combination of "unrenewable business, some profits being accounted for that subsequently had to be written off, some ... over-charging".

3. Behaviour of supply

The economy's productive capacity may be reduced, either temporarily or permanently, as a result of factors arising because of the economic downturn, such as:

- Cuts in capital spending (leading to atrophying of the capital stock) and delayed replacement investment (which leaves plant and equipment to last for longer), resulting in lower efficiency during the downturn and an impaired ability to respond to rising demand when economic recovery eventually materialises.
- A reduction in the pace of innovation as firms cut back on their spending on research and development against a background of uncertainty about future demand.
- Loss of human capital as workers are cut off from the labour market for a lengthy period, especially if this hits hardest those such as young people who have little previous experience in the labour market to fall back on when applying for jobs.
- Lower levels of skills among the workforce if firms cut back on training expenditure.

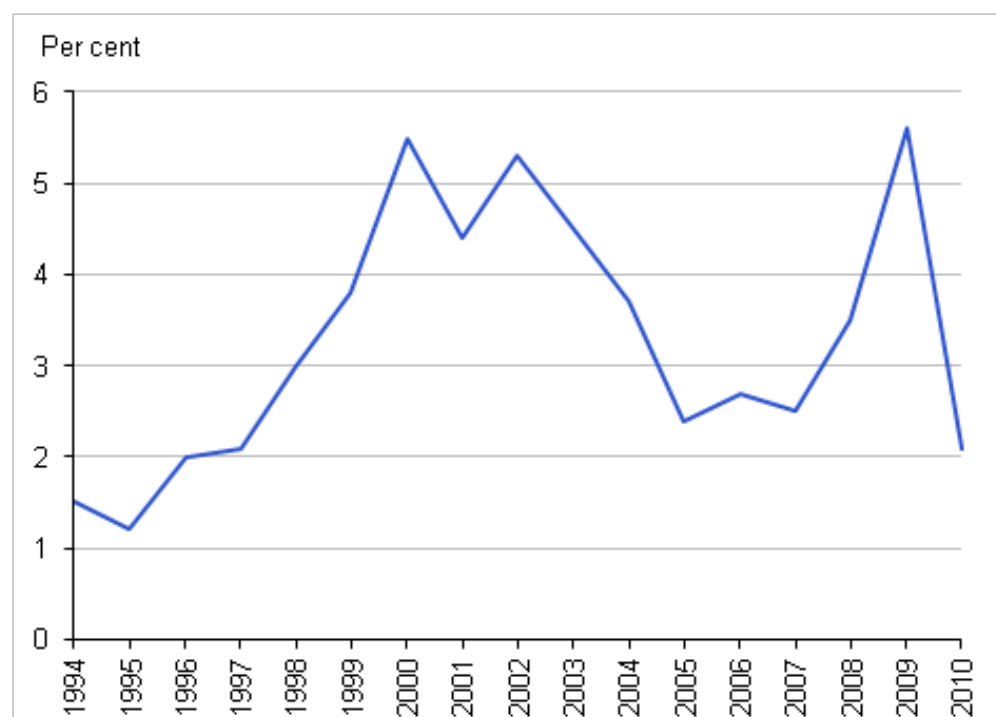
If there has been a marked reduction in the productive capacity of the economy for these reasons

- Or as a result of the poor quality of financial intermediation, as discussed in the previous section.
- Then a period of slow or negative productivity growth is inevitable.

Latest ONS estimates for [multi-factor productivity](#) show a slight increase in 2010, following two years of significant decline. This is predicated on estimates that capital deepening grew in the recession years of 2008 and 2009, before slowing in 2010.

The extent of capital deepening - where the ratio of capital employed per hour worked usually rises during a recession as the quantity of labour is cut – appears to have been lower than usual in this downturn. There has been a relatively subdued shake-out of labour in response to the decline in output, but there may also have been a reluctance to invest. This might result from the high degree of uncertainty about the economic outlook, and perhaps from greater difficulty than usual in accessing funds to finance investment plans. If firms are inhibited from undertaking capital investment that may be expensive and hard to reverse if the economic outlook is poor, this will encourage the substitution of relatively cheap labour for capital.

Chart 8: Growth in Capital deepening



Source: Office for National Statistics

Notes:

1. Capital deepening is defined as capital services per hour worked

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However research and development spending carried out by businesses appears to have held up during the recession. ONS estimates show a 0.9 per cent rise in business spending on R&D in real terms between 2009 and 2010, and although the level in 2010 was nearly 5 per cent lower than in 2007, it was higher than in any year between 2000 and 2006. As a share of GDP, R&D spending has risen in each year since 2007.

For policymakers, a key question is whether disruption to productivity levels is temporary or permanent. To the extent that there is an impact from the impairment of the financial sector, some of this might be expected to be temporary, and the effects should start to unwind as the problems of

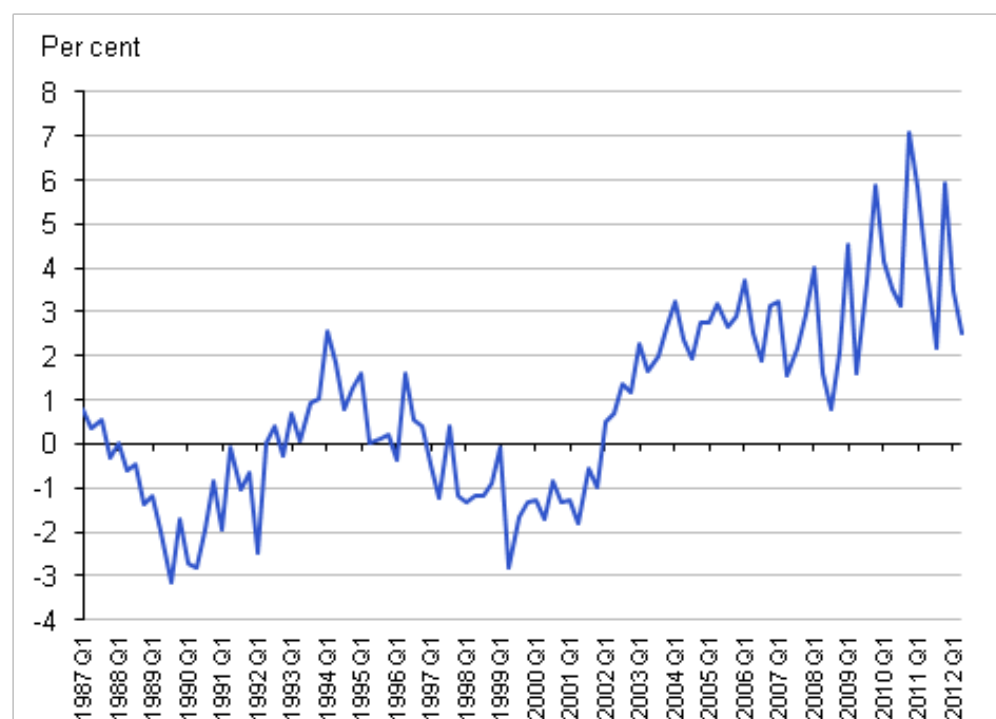
the financial sector are resolved. However if viable start-up businesses cannot become established in the current climate, then the effects will be more durable. Economic literature suggests that high rates of long-term unemployment among the young and reduced rates of investment and innovation can have long term effects on the economy's productive capacity.

4. Behaviour of companies

It has been suggested that companies have behaved differently during this economic downturn by hoarding labour to a greater extent than in the past. The rationale for such behaviour is that businesses recognise the heavy costs involved in first dismissing employees, and then in subsequently hiring new workers once the economy recovers. More importantly businesses wish to retain vital skills and knowledge which once lost are difficult and expensive to replace.

Companies will hoard labour if they have the financial means to withstand the downturn in demand without difficulty. They have been better placed in this respect than in previous recessions. Private non-financial companies have been running substantial surpluses since 2002.

Chart 9: PNFC net lending (+) or borrowing (-) as a percentage of GDP, seasonally adjusted



Source: Office for National Statistics

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The Chartered Institute of Personnel and Development (CIPD) observed in their summer [2012 Labour Market Outlook](#) that almost a third of private sector firms responding to their survey reported

that they had maintained higher staff levels than they needed to meet production levels during the previous year. Of these firms, two-thirds said that they were holding on to workers in order to maintain the level of skills within their organisations.

Despite this, it is unclear that the labour hoarding hypothesis can explain the persistence of weak productivity almost five years after the start of the crisis. Firms may seek to hold on to labour for a time in the hope that the downturn in activity proves short-lived, but the resulting drain on their finances is unlikely to be endured indefinitely.

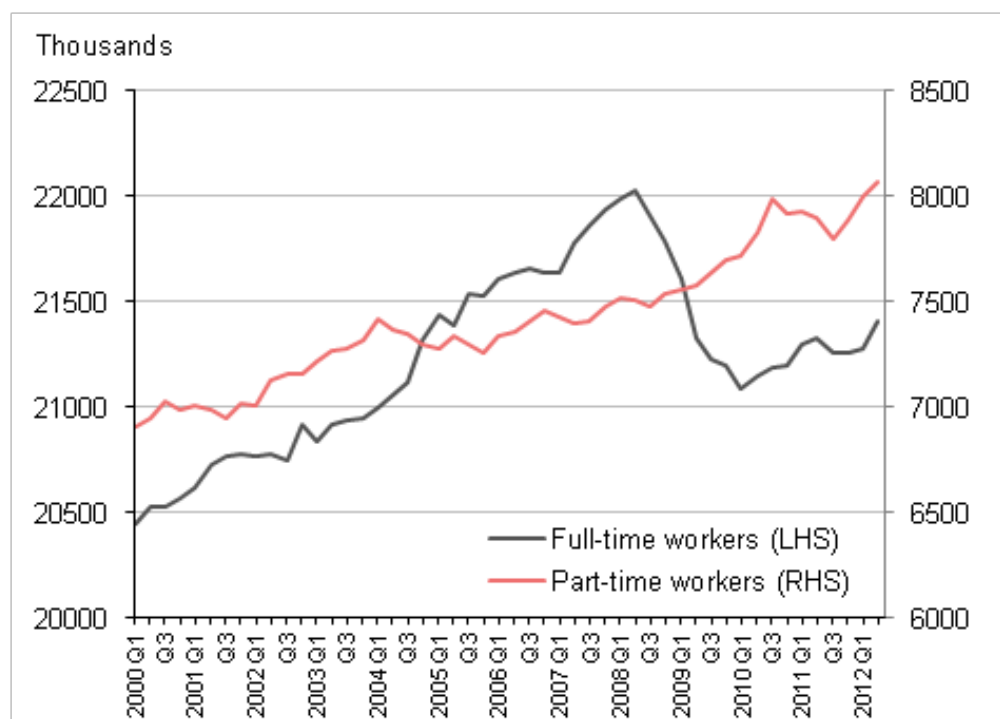
The theory that labour is being hoarded also sits uneasily with the recent strength of employment. Labour hoarding may ease the scale of the initial fall in employment, but does not seem consistent with the strong gains in employment seen over the past nine months. Even if firms have not laid off workers during the recession, or for a time afterwards, it is hard to understand why hiring of new workers should have picked up recently in the absence of a return to vigorous economic growth.

5. Flexibility of labour markets

A common hypothesis is that the UK labour market has become more flexible in the period of almost two decades since the last recession. This has allowed part of the adjustment to the fall in output to take the form of changes in hours and earnings as well as cuts in employment.

The numbers of people working part time have risen by almost 10 per cent since 2007, taking the share of total employment up from 25 per cent to more than 27 per cent. As a result of this shift in working patterns, total hours worked have fallen by more than employment. Total hours are currently around 1 per cent lower than the peak level at the start of 2008, while the number in employment has now returned to that level.

Chart 10: Full-time and part-time employment, seasonally adjusted

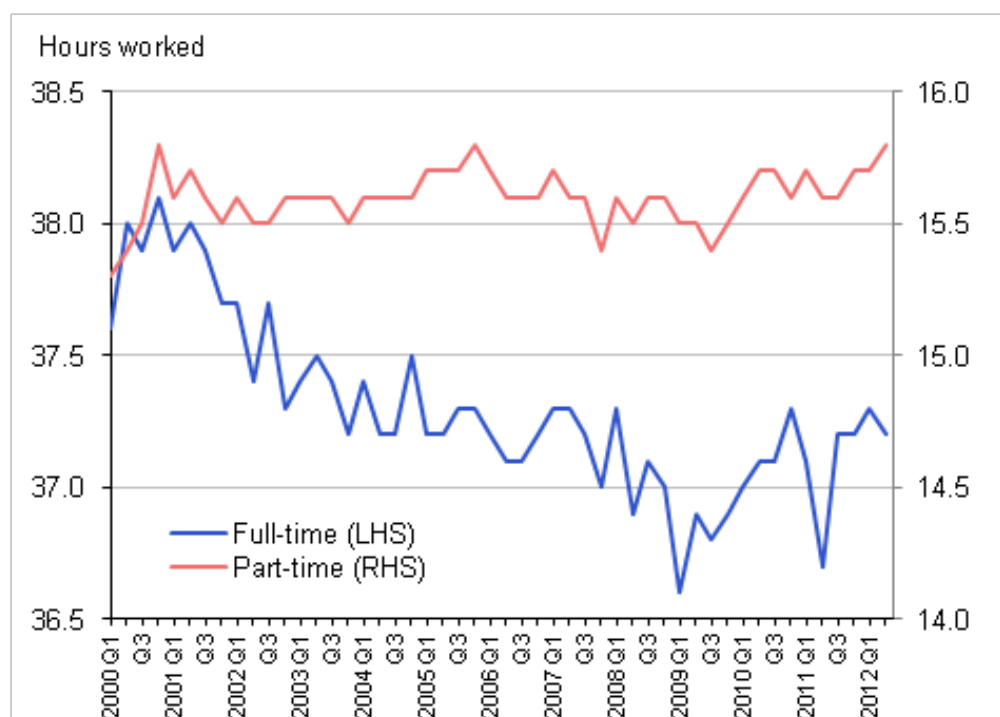


Source: Office for National Statistics

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Chart 11: Full-time and part-time average actual weekly hours worked, seasonally adjusted



Source: Office for National Statistics

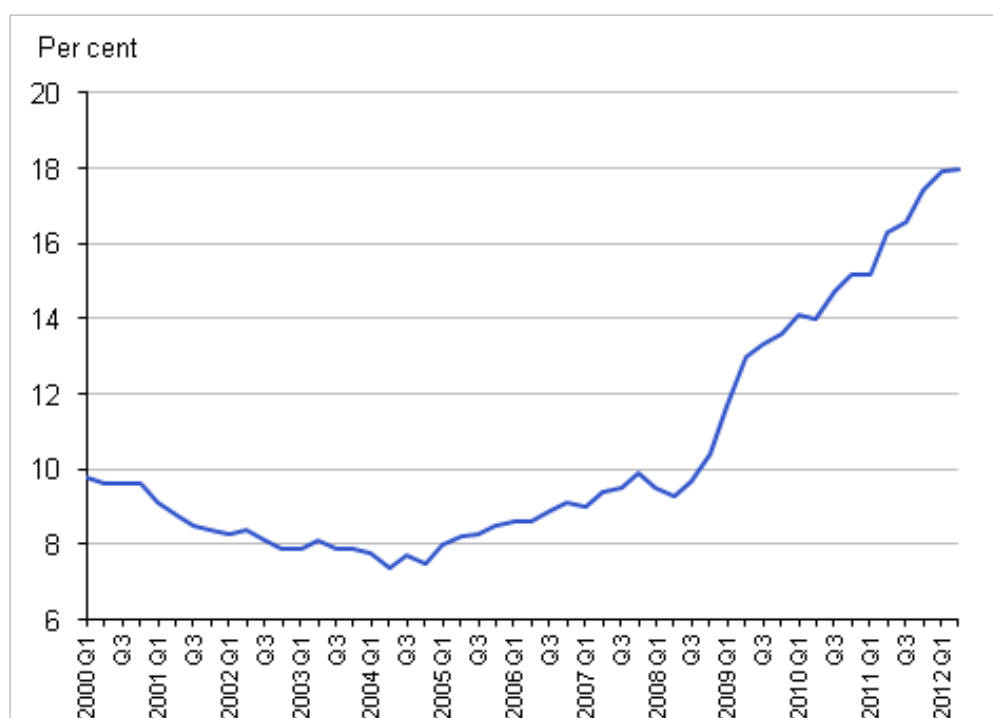
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However not all of the part-time working is voluntary. Indeed the increase in part-time workers since the start of 2008 is exceeded by the rising number of such workers who say that they cannot find a full-time job. The share of part-time workers in this position has risen from less than 10 per cent in 2008 to nearly 18 per cent in the latest period, although the rising trend may have stabilised during the first half of 2012.

Chart 12: Percentage of part-time workers who could not find a full-time job, seasonally adjusted



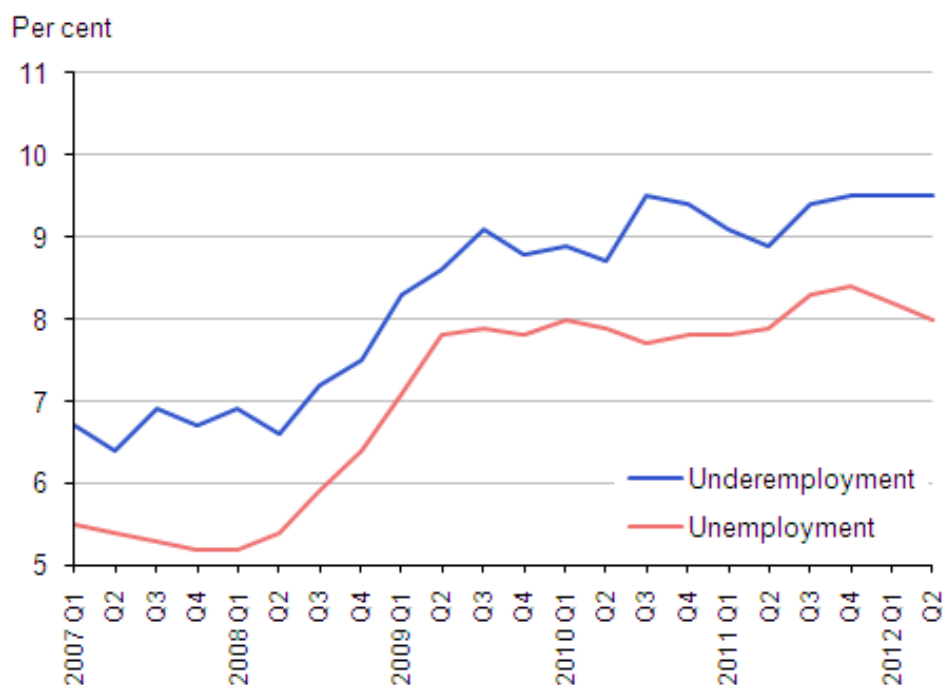
Source: Office for National Statistics

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Part of the impact of the recession on the labour market has therefore taken the form of “underemployment” in addition to those who are unemployed. Underemployment may be time-related, where individuals are working shorter hours than they want, or it can take the form of people being over-qualified for the jobs they are doing.

Chart 13: Unemployment and time related underemployment rates, seasonally adjusted

Source: Office for National Statistics

Notes:

1. Underemployment rate is calculated as the total number of underemployed people divided by the total economically active population.

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The number of under-employed workers has increased since the economic downturn, increasing by 980,000 (47 per cent) between 2008 and 2012. The underemployment rate, the percentage of people in employment who are underemployed, also increased during this period from 7 per cent to 10 per cent. Before this period the rate of underemployment was fairly steady around 6.5 per cent.

A higher percentage of those who are underemployed work part-time rather than full-time with workers in younger age groups, for example 16-24, and those in the distribution, hotels & restaurants industry, being more likely to be underemployed, partly because part-time working is more prevalent among these groups.

In terms of occupation, the level of underemployment has risen most sharply in low skilled jobs. For instance, 23 per cent of workers in “elementary occupations” regard themselves as under-employed by time, almost double the share in 2006. Similarly 20 per cent of those employed in sales and customer service occupations are under-employed. The rates of underemployment are much lower for more skilled occupations.

A similar picture emerges by qualification, with the highest rates of underemployment among those with relatively low qualification levels, especially those without degrees or other higher education qualifications.

Another growing form of flexible working is the rising number of individuals in temporary jobs. These are relatively few in number – just over 1.6 million in the latest period, having risen from 1.4 million at the start of the recession. The share of total employees in temporary jobs has risen from 5.4 per cent to 6.5 per cent in the last four years.

Chart 14: Temporary workers as a percentage of all employees, seasonally adjusted



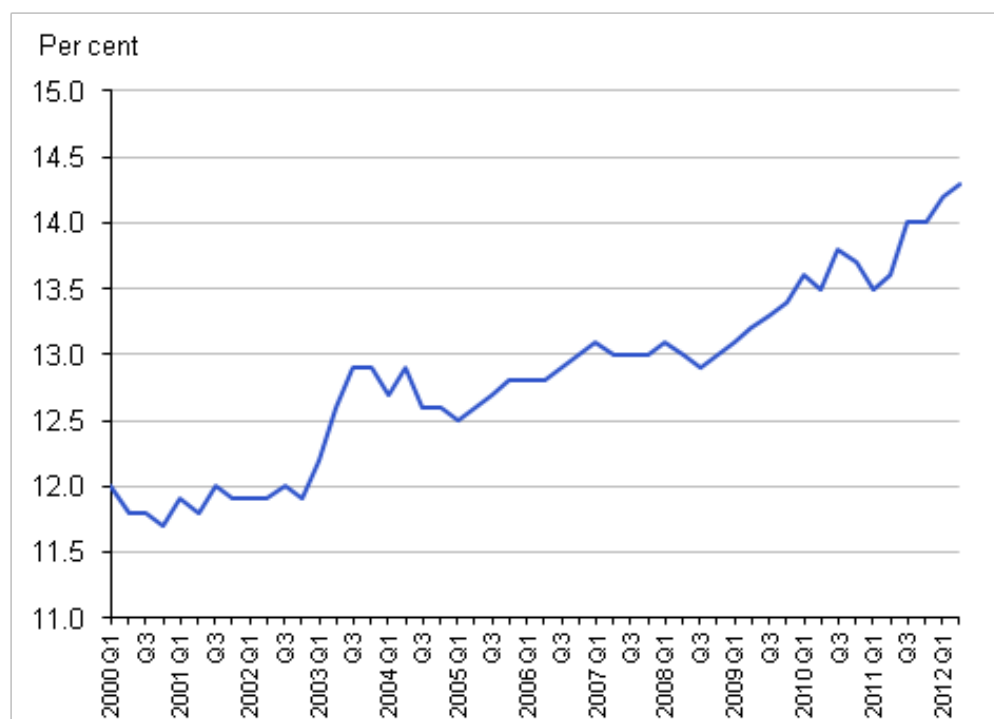
Source: Office for National Statistics

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As with part-time workers, the share of those with temporary jobs who cannot find a permanent job has risen from 25 per cent in early 2008 to more than 40 per cent in the May to July period this year.

Self-employment has also grown strongly during and since the recession. The number of self-employed workers has risen by around 10 per cent over the past four years, and now accounts for 14.3 per cent of total employment, up from around 13.0 per cent in 2008.

Chart 15: Self employment as a share of total employment, seasonally adjusted

Source: Office for National Statistics

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The number of self-employed workers initially fell between 2008 and 2009, during the onset of the economic recession, before increasing each year between 2009 and 2012. The majority of the increase, 219,000, occurred over the last year between 2011 and 2012. Of these, 10 industries account for almost 200,000 of the increase, shown in the table 4.

Table 4: Top 10 increases in the number of self-employed workers over the last year by industry (SIC 2007)

			Thousands
SIC	Industry	Increase	
43	Specialised construction activities	40	
81	Services to buildings and landscape	34	
47	Retail trade, except vehicles	21	
70	Head offices; management consultancy	19	
93	Sports, amusement, recreation	17	
74	Other prof, scientific and technical	17	
69	Legal and accounting activities	15	
56	Food and beverage service activities	14	
62	Computer programming and consultancy	11	
85	Education	10	
Combined increase		198	

Table source: Office for National Statistics

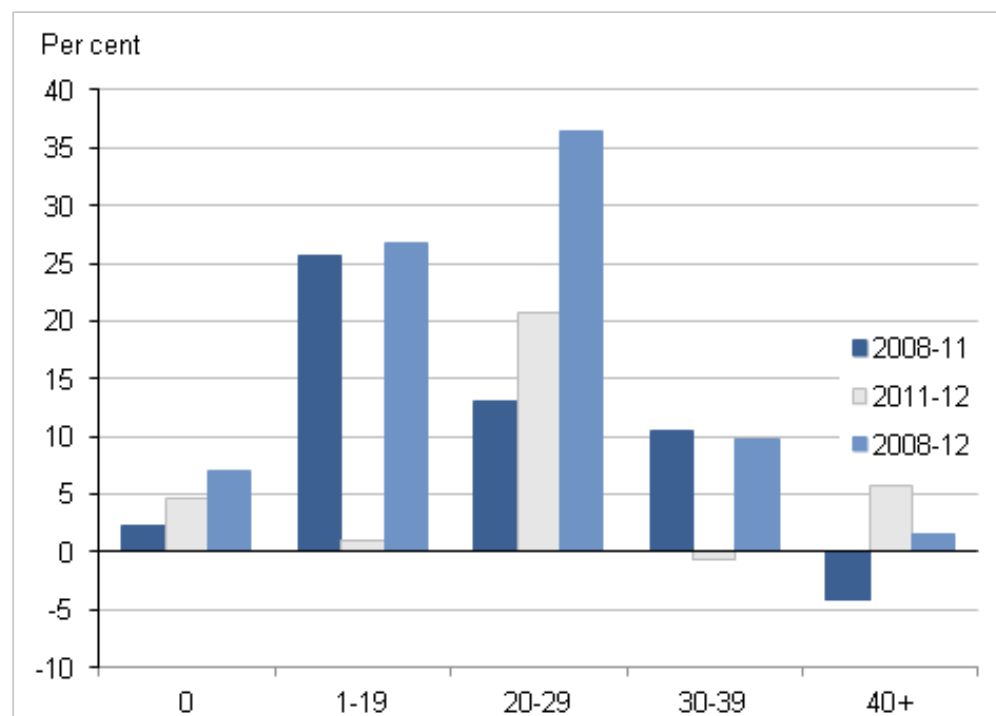
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It is possible that some of the growth in self employment has been generated by individuals who, having lost their jobs, have then set themselves up with their own businesses.

Figures from the Labour Force Survey indicate that more than half the extra self-employed people over the last four years are working less than 30 hours a week. However between 2008 and 2011 the majority of the increase in self-employed was among those working 1-19 hours per week. In contrast, of the 219,000 increase in self-employed over the last year, 101,000 (almost 50 per cent) worked 40 or more hours per week.

Chart 16: Percentage increase in the number of self-employed workers by average actual weekly hours worked between April-June 2008 and April-June 2012



Source: Office for National Statistics

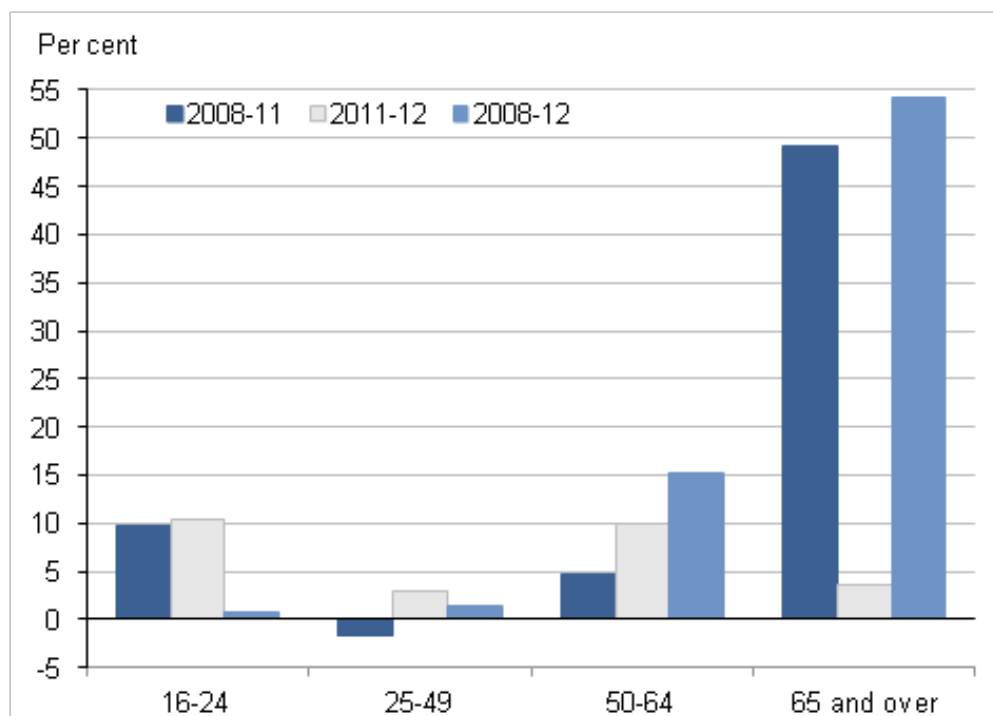
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Of the 367,000 rise in self-employment since 2008, just over four in every five were aged 50 and over, accounting for 306,000 of the increase. Between 2008 and 2011 the majority of the increase, 110,000 (74 per cent), was for those in the 65 or over age group whereas between 2011 and 2012 the majority of the increase, 127,000 (58 per cent), was for those in the 50-64 age group.

Chart 17: Percentage increase in the number of self-employed workers by age group between April-June 2008 and April-June 2012



Source: Office for National Statistics

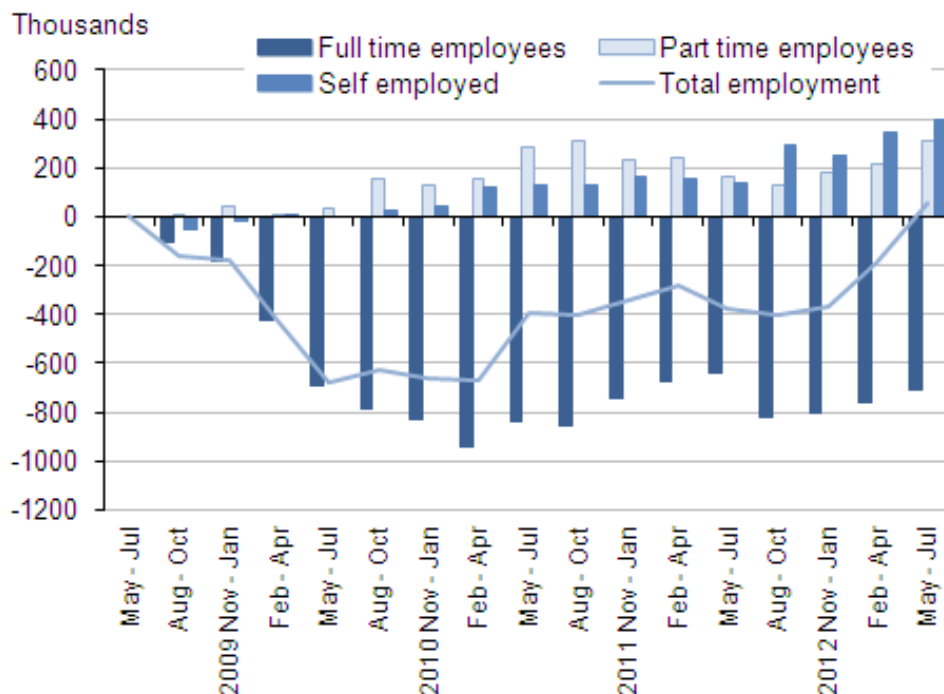
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As a result of these trends in part-time and self-employment - chart 18 shows that total employment has now re-attained its pre-recession peak level of 29.5 million. However the number of full-time employees is still 700 thousand (3.7 per cent) lower – similar in scale to the shortfall in GDP.

Chart 18: Cumulative changes in full-time and part-time employees and total employment since 2008 Q1, seasonally adjusted



Source: Office for National Statistics

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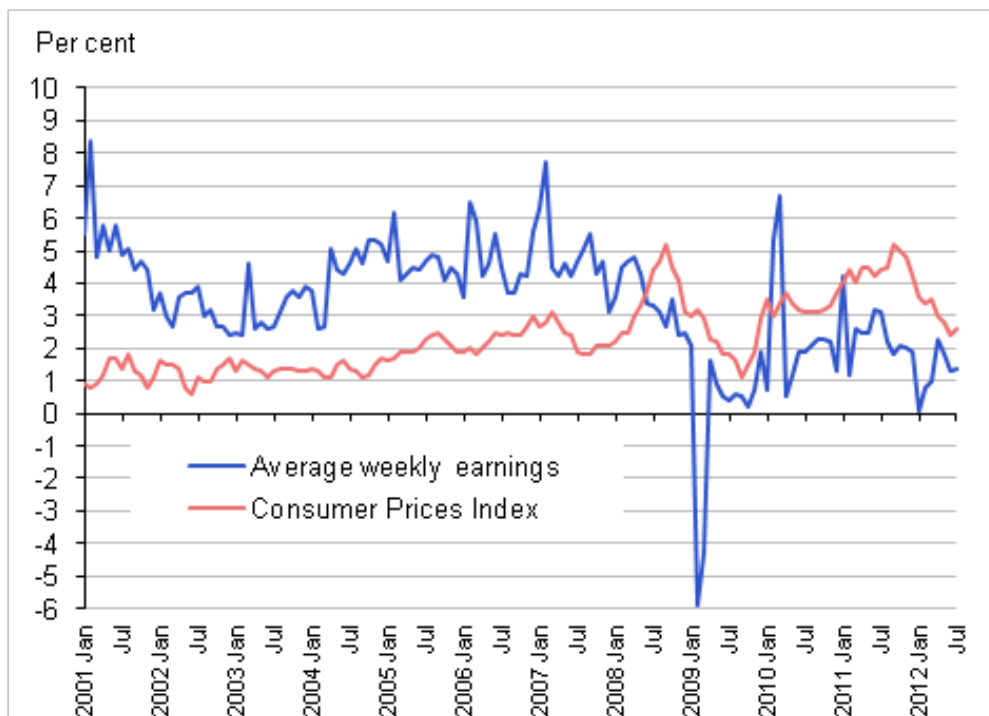
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Response of earnings

Faced with a weakening employment outlook, employees have been willing to accept lower pay rises – or in some cases cuts in pay - than in previous economic downturns. As a result earnings growth has slowed from rates seen prior to the recession. Earnings grew by around 4 per cent a year on average during the years up to 2007. By the end of 2009, this had dropped to just 1 per cent, and has since picked up only slightly. Latest figures show annual earnings growing by 1.9 per cent in the three months to July 2012.

This has produced a sustained period of falling real earnings when measured against the rate of consumer price inflation. Unusually, earnings have been rising more slowly than prices for almost the entire period since 2009, amounting to a cumulative cut in real earnings of 3.5-4 per cent. This is the first time real earnings growth has been under such sustained pressure since the mid-1970s.

Chart 19: Growth in average weekly earnings (total pay) and Consumer Price Index, month on same month a year ago, seasonally adjusted



Source: Office for National Statistics

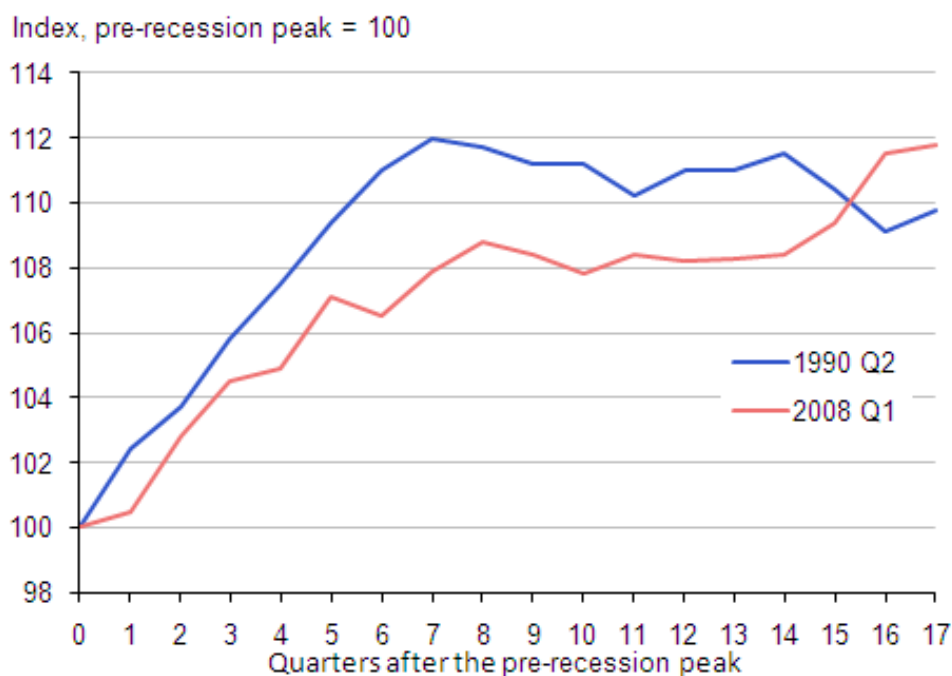
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For firms, this has brought the opportunity to retain labour, and the associated knowledge and skills, at a lower cost than would have been possible during previous economic downturns.

Despite the weakness in productivity, unit labour costs appear to have been kept under control. The low rate of earnings growth has limited the rise in whole economy unit labour costs to rates similar to those in the early 1990s recession.

Chart 20: Trends in unit labour costs, seasonally adjusted

Source: Office for National Statistics

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6. Measurement error in GDP estimates

The divergent movements in output and employment during the last few years have brought the instinctive reaction in some quarters that the official statistics - either GDP or labour market figures or both - must be wrong.

The nature of statistical estimates means that the possibility of measurement error cannot be ruled out. However the methodological rigour imposed by the ONS statistical value chain means that substantial errors are unlikely in most circumstances.

Concerns about measurement error are most often directed at GDP figures because they can be revised significantly after initial publication. These revisions are made in order to take on new information as it is received, and in some cases to accommodate improvements to methodology or coverage.

ONS published an [article](#) in May 2012 setting out how different vintages of GDP are compiled and how information from multiple and independent sources for the different approaches is 'balanced' to produce coherent national accounts.

That article further discussed the reasons for and timing of revisions to enable users to assess the quality of current GDP estimates with reference to past revisions performance. At that time, and indeed even now, the full extent of revisions performance for the period 2008 and later is not known. A further [article](#) is published today that presents an up to date analysis of revisions since 1961. It concludes that:

- The preliminary estimate of GDP continues to be 'unbiased' and the average revision continues to be not significant.
- There is some emerging evidence that revisions since 2005 are a little greater, perhaps reflecting the difficulty in monitoring economic growth through a downturn and the question of whether assumptions and methods that applied during a period of relatively stable growth in the period 1992 to 2007 are still applicable in the more volatile period since 2008.

To illustrate how GDP revisions might explain the productivity puzzle, revisions to annual growth of +/- 0.3 per cent on average to the years since 2009 are at the upper bound of the size of revisions that might be expected based on previous experience. Even if the 'worst case scenario' were to materialise, it would only lead to a 1 percentage point increase in GDP over the last three years, and would not explain much of the gap between output and employment.

As part of the ONS commitment to be the place where people come first for trusted statistics, ONS continuously reviews and improves data sources, methods and systems. It also assists users in their understanding of the quality of the statistics, their fitness for purpose and their relevance. The work currently being undertaken to improve the measurement of GDP will be highlighted in an article to be published later in October.

Relationship between GDP and business opinion surveys

Some commentators have claimed that the ONS' estimates of GDP growth do not match the picture of the economy being given by other indicators, such as the business opinion surveys produced by a number of organisations.

Today ONS publishes an [article](#) updating and refining previous analysis of the relationship between official GDP figures and the results of the Purchasing Managers' Indices (PMI) published on a monthly basis by Markit/CIPS.

This article finds that direct comparisons are not possible for a number of methodological and output reasons. But after standardising both ONS and PMI data and adjusting ONS data to fit the PMI coverage as closely as possible, the overall story is of relative coherence. In manufacturing, services, and on a whole economy level, the two datasets broadly agree with one another, with isolated and rare instances of significant divergence.

Where there are significant divergences, there is usually an exceptional economic event that accounts for it, as opposed to a systemic driver. The exceptions to this are the services sector surveys, which appear to react slightly differently to shocks, although usually not to a significant extent.

Relationship between GDP and tax receipts

It has been suggested that the figures for tax revenues in recent months offer evidence that ONS' GDP estimates are under-stating the strength of economic activity in the UK. This section compares movements in the growth in tax receipts with that of GDP in nominal terms, that is without adjusting for the impact of inflation. This is because tax receipts are based on cash movements in income and expenditure, regardless whether they are created by changes in the volume of activity or by inflation.

It is difficult to be confident in drawing conclusions about activity levels from studying tax revenues for a number of reasons, including the difficulty in adjusting for changes in tax rates or allowances, and the lags in the collection of taxes.

In the sections below, we consider movements in receipts of value added tax (VAT), Pay As You Earn (PAYE) income tax, and National Insurance contributions (NICs), as well as total government current receipts.

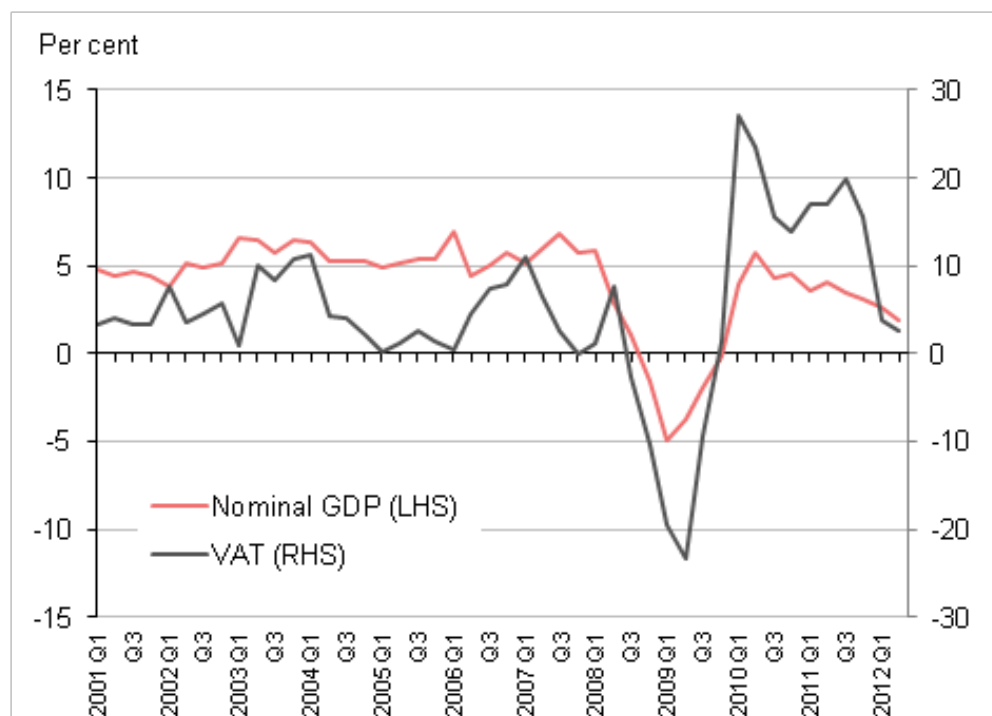
It is difficult to draw strong conclusions about the relationship between VAT receipts and GDP, especially as the link was broken between 2008 and 2011 by changes in the rate of VAT during this period. The VAT rate was temporarily cut from 17.5 per cent to 15 per cent in December 2008, reverting to 17.5 per cent in January 2010. There was then a further increase to 20 per cent in January 2011.

Given the lags in payment of VAT, it is too soon after the VAT changes to be robust in claiming that the recent path of VAT receipts is consistent with official estimates of GDP growth, or the converse. However the graph does not appear to call into question the behaviour of nominal GDP growth, with the two series in chart 22 converging once again in early 2012 – the first period when year-on-year growth rates changes are not distorted by changes to the VAT rate.

The comparisons are not exact, because VAT is levied on only parts of household consumption, and not on the whole of GDP. But a similar picture emerges from the comparison of VAT receipts with nominal household spending growth.

In addition there may have been a substitution effect with households switching expenditure between discretionary and non-discretionary items (some of which, such as food, are not liable to VAT) in response to changes in the rate of VAT.

Chart 21: VAT receipts and nominal GDP growth, quarter on quarter a year ago, not seasonally adjusted



Source: Office for National Statistics

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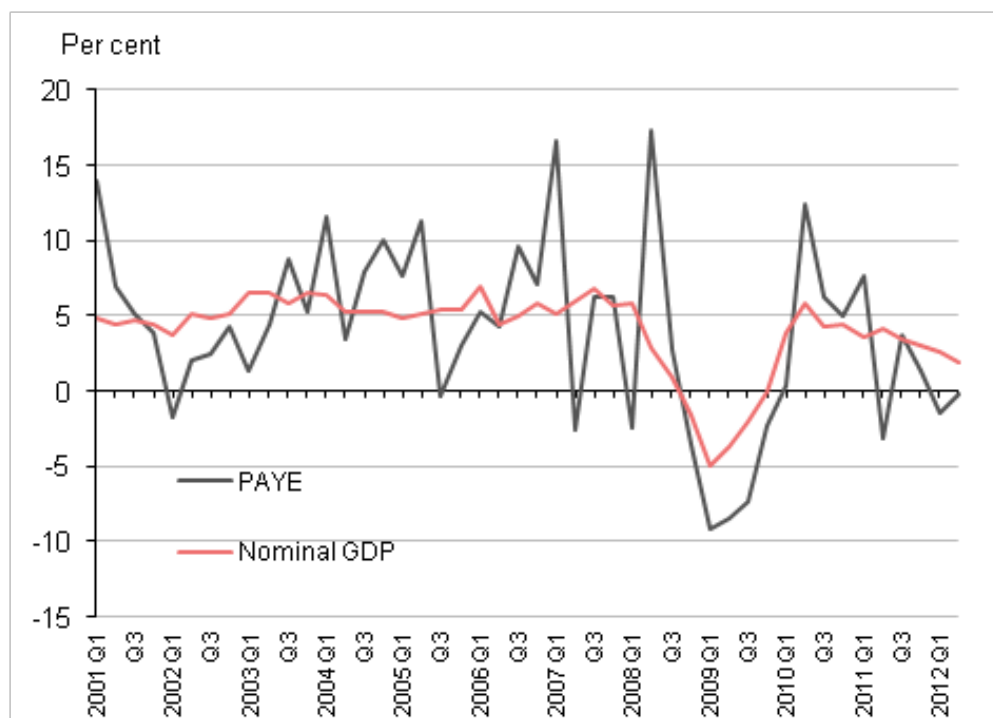
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Note that the VAT figures shown here are derived from HMRC accruals data, which differ from those published in the monthly public sector finances statistics as the latter include imputed figures for VAT payments by central government and local authorities.

The pattern of PAYE income tax receipts shows a fairly close relationship with nominal GDP growth (chart 23), as do movements in national insurance contributions (chart 24), although the latter are more volatile.

Chart 22: PAYE receipts and nominal GDP growth, quarter on same quarter a year ago, not seasonally adjusted



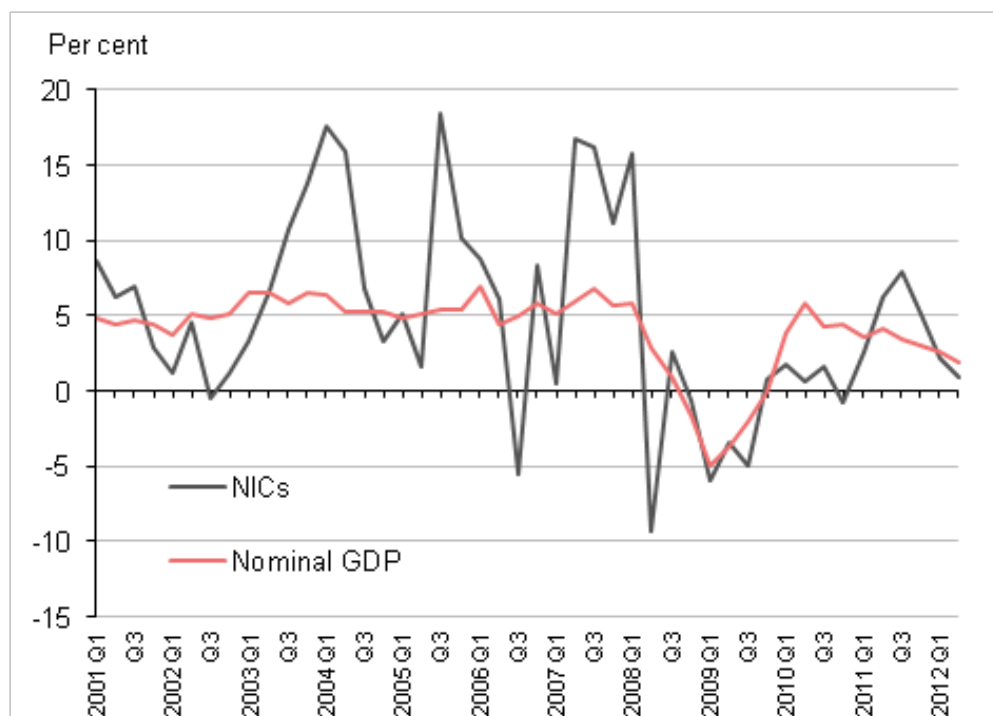
Source: Office for National Statistics

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Chart 23: National Insurance Contributions (NICs) and nominal GDP growth, quarter on same quarter a year ago, not seasonally adjusted



Source: Office for National Statistics

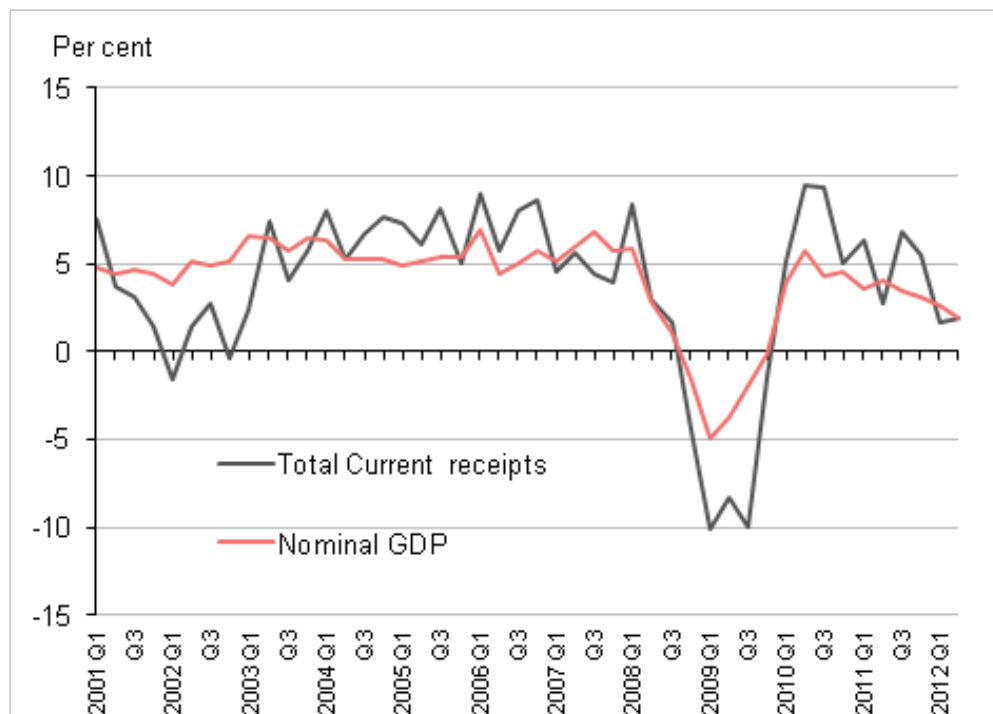
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Changes in total central government current receipts from all sources are also fairly closely related to GDP growth over time, although here too the relationship since 2008 is distorted by changes to the rate of VAT.

Chart 24: Total current receipts and nominal GDP growth, quarter on same quarter a year ago, not seasonally adjusted



Source: Office for National Statistics

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This analysis does not offer conclusive evidence about the relationship between tax revenues and GDP growth. However neither does it point to a clear inconsistency between recent estimates of nominal GDP growth and the behaviour of tax receipts.

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