

Blundell, Richard; Crawford, Claire; Wenchao Michelle Jin Crawford, Claire

**Working Paper**

## What can wages and employment tell us about the UK's productivity puzzle?

IFS Working Papers, No. W13/11

**Provided in Cooperation with:**

The Institute for Fiscal Studies (IFS), London

*Suggested Citation:* Blundell, Richard; Crawford, Claire; Wenchao Michelle Jin Crawford, Claire (2013) : What can wages and employment tell us about the UK's productivity puzzle?, IFS Working Papers, No. W13/11, Institute for Fiscal Studies (IFS), London, <https://doi.org/10.1920/wp.ifs.2013.1311>

This Version is available at:

<https://hdl.handle.net/10419/91506>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# What can wages and employment tell us about the UK's productivity puzzle?

IFS Working Paper W13/11

Richard Blundell  
Claire Crawford  
Wenchao Jin

The Institute for Fiscal Studies (IFS) is an independent research institute whose remit is to carry out rigorous economic research into public policy and to disseminate the findings of this research. IFS receives generous support from the Economic and Social Research Council, in particular via the ESRC Centre for the Microeconomic Analysis of Public Policy (CPP). The content of our working papers is the work of their authors and does not necessarily represent the views of IFS research staff or affiliates.

# What can wages and employment tell us about the UK's productivity puzzle?<sup>1</sup>

Richard Blundell, Claire Crawford and Wenchao Jin

## Abstract

As in many European countries, labour productivity in the UK has been stagnant since the start of the Great Recession. This paper uses individual data on employment and wages to try to understand whether real wage flexibility can help shed light on the UK's productivity puzzle. It finds, perhaps unsurprisingly, that workforce composition cannot explain the reduction in wages and hence productivity that we observe, even compared to previous recessions; instead, real wages have fallen significantly within jobs this time round. Why? One possibility we investigate is that the labour supply in the UK is higher compared to previous recessions.

**Key words:** productivity, employment, wages, recession

**JEL codes:** J01, J21

---

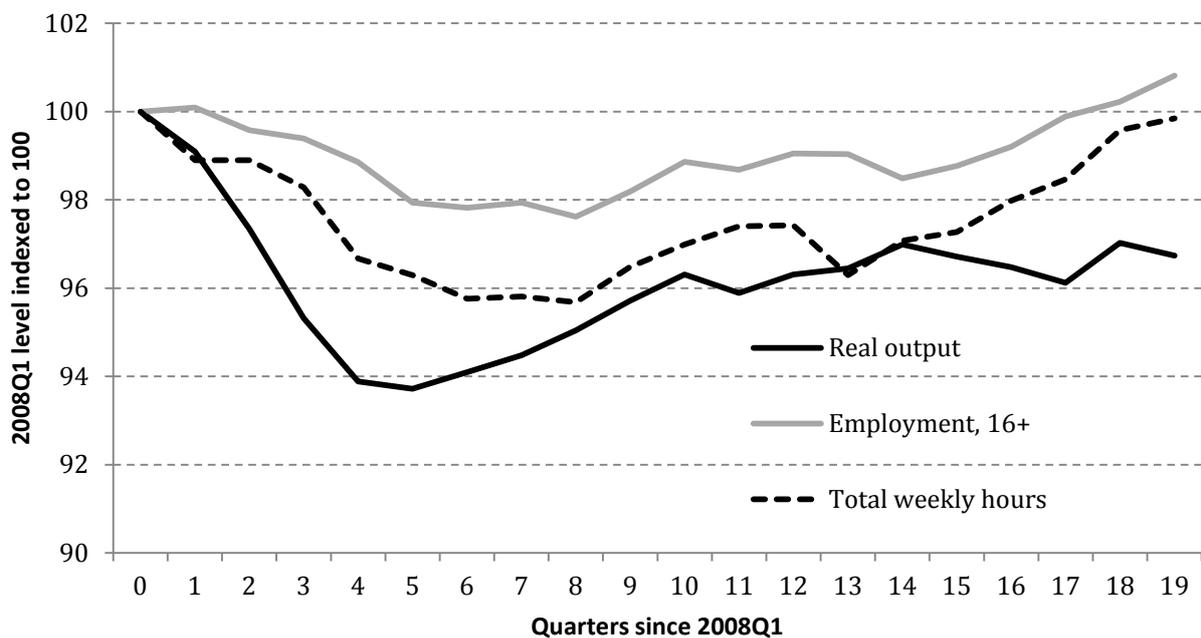
<sup>1</sup> Corresponding author: Wenchao Jin, Institute for Fiscal Studies, 7 Ridgmount Street, London, UK, WC1E 7AE. Email: wenchao\_j@ifs.org.uk.

We gratefully acknowledge funding from the Economic and Social Research Council via the Centre for the Microeconomic Analysis of Public Policy at the Institute for Fiscal Studies (grant number RES-544-28-0001). We would like to thank participants in the CEP/IFS workshops and the 2013 Royal Economic Society special session on the productivity puzzle for helpful comments and discussion, Rowena Crawford for allowing us to use the data on wealth shocks that she constructed for respondents in the English Longitudinal Study of Ageing and for providing useful comments and advice, and Jonathan Cribb for producing the counterfactual employment rates for men and women as a result of the increase in the state pension age for women. The paper is based partly on data accessed through the Secure Data Service and uses datasets which may not exactly reproduce aggregate National Statistics. The original data creators, depositors or copyright holders, the funders of the Data Collections (if different) and the UK Data Archive bear no responsibility for any analysis or interpretation in this paper. All errors remain the responsibility of the authors.

## 1. The macroeconomic context

The UK has recently experienced its deepest recession since the Second World War, with real GDP falling by over 6% (see Figure 1). At the same time, there have been substantially smaller falls in employment and hours – decreasing by just over 2% and 4% respectively – leading to falling output per worker and stagnating output per hour. These changes are very different to what happened in previous recessions in the UK in the late 1970s/early 1980s and the early 1990s. For example, Figure 2 shows that, nearly five years later, real output per hour remains 3% lower than it was at the start of the recession in 2008, while it was nearly 15% higher following the recession in the early 1990s and nearly 13% higher following the recession in the early 1980s. This has given rise to a so-called “productivity puzzle” in the UK.

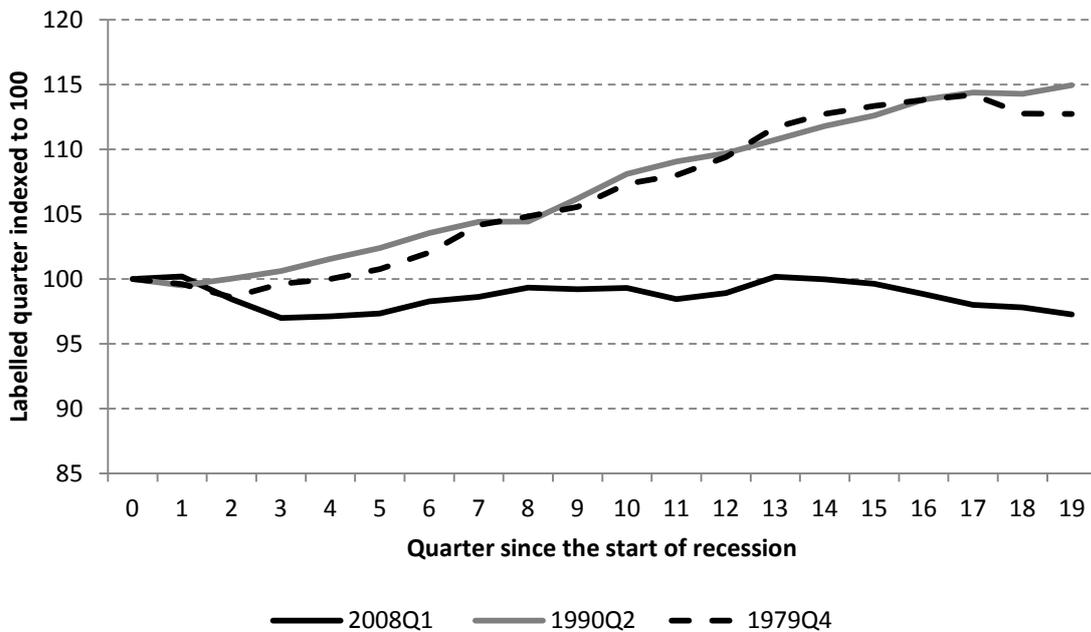
Fig. 1. *Changes to UK Output, Employment and Hours*



Source: each of the three series is normalised to 100 at 2008Q1 (quarter 0). Real output is based on ONS series ABMI, which is real GDP seasonally adjusted; employment is based on ONS series MGRZ, which is the total in employment aged 16 and over. Total weekly hours comes from ONS series YBUS.

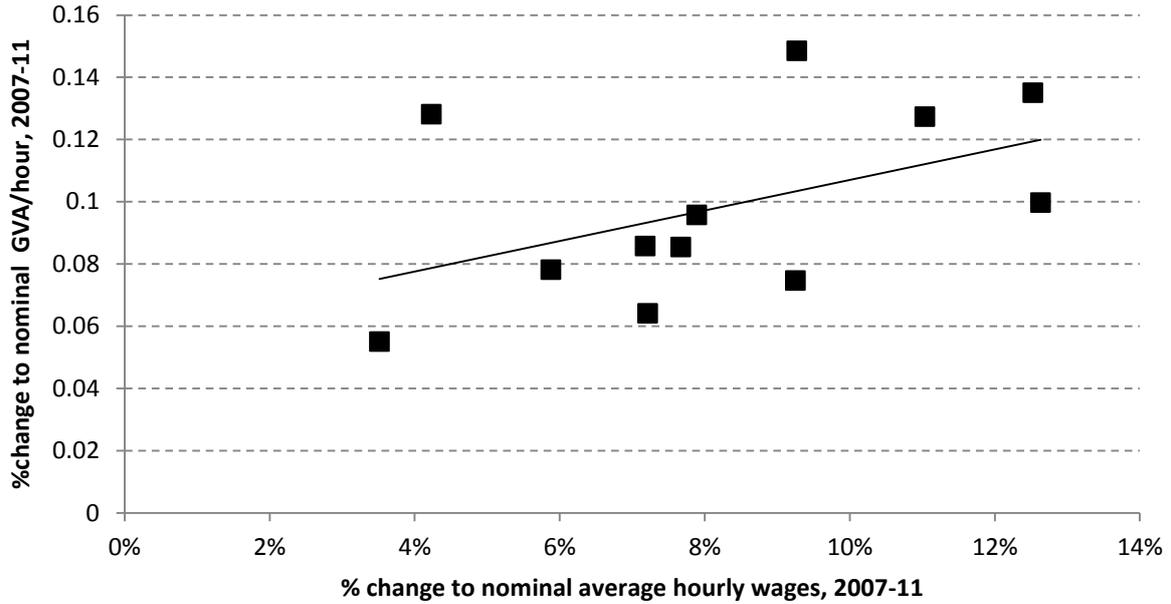
The aim of this paper is to try to shed light on this puzzle. In a competitive economy, one would expect individuals' wages to reflect their marginal productivities, thus one might anticipate changes in productivity to be correlated with changes in wages at some micro level. Figure 3 provides some supportive evidence for this at the region level during the recent recession, showing a clear positive correlation between changes to average real hourly wages and changes to gross value added per hour between 2007 and 2011. The same is also true at the industry level and Crawford et al. (2013) also provide some suggestive evidence at firm level, showing that changes in labour costs are able to explain a substantial proportion of the within-firm changes in productivity that occurred in 2008-09.

Fig. 2. *Changes to Real Output per Hour by UK Recession*



Source: each of the three series is normalised to 100 at the labelled quarter 2008Q1, 1990Q2 and 1979Q4 (quarter 0). Sources for real output and hours are the same as in Figure 1.

Fig. 3. *Changes to Productivity and Wages across UK Regions, 2007-11*



Source: % changes to wages come from authors' calculation using the Labour Force Survey by region of workplace.

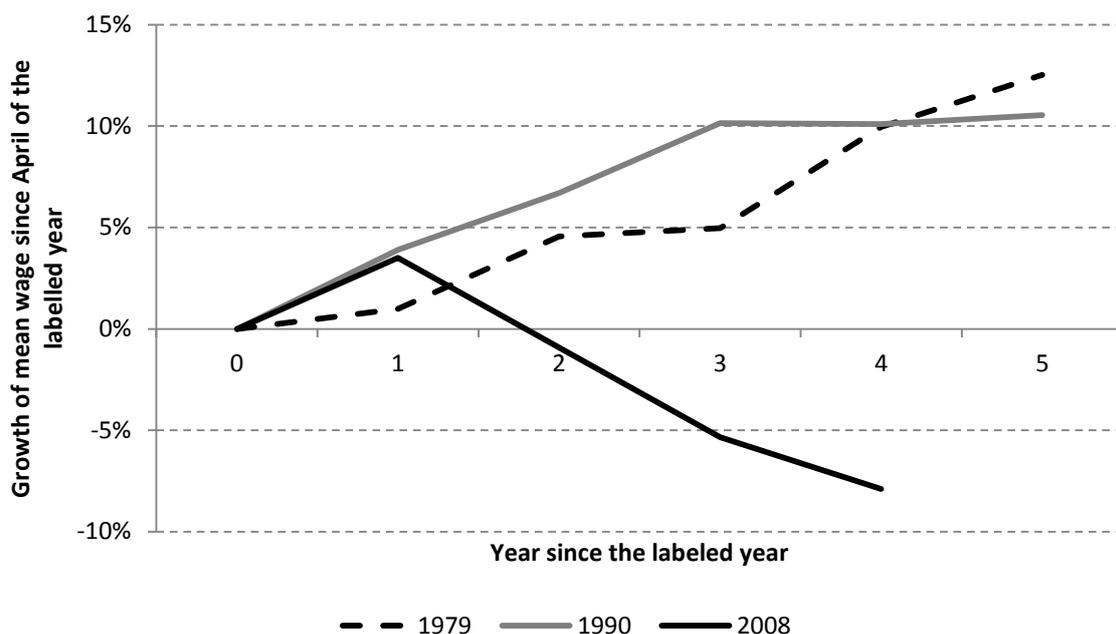
% changes to GVA/hour come from the ONS Regional Labour Productivity revisions, available at

<http://www.ons.gov.uk/ons/guide-method/method-quality/specific/economy/productivity-measures/labour-productivity/gor-revisions.xls>.

At an aggregate level, Figure 4 shows that what has happened to average real hourly wages is similar to what has happened to productivity during this recession, and dramatically different from what has happened to wages (and indeed productivity) during previous recessions. For example, in April 2011, average real hourly wages (deflated using the Retail Prices Index) were 4% lower than they were at the start of the recession in April 2008, compared to 5% higher in the early 1980s and 10% higher in the early 1990s.<sup>2</sup>

<sup>2</sup> The magnitude but not the pattern of these differences would change if we used the Consumer Prices Index (CPI) or the GDP deflator to deflate nominal wages. The corresponding figure using the GDP deflator can be found in Disney et al. (2013). The CPI is not available before the early 1990s; it has gone up by 10.9% between April 2008 and April 2011, compared to 9.55% for the RPI.

Fig. 4. *Changes to Average Real Hourly Wages by UK Recession*



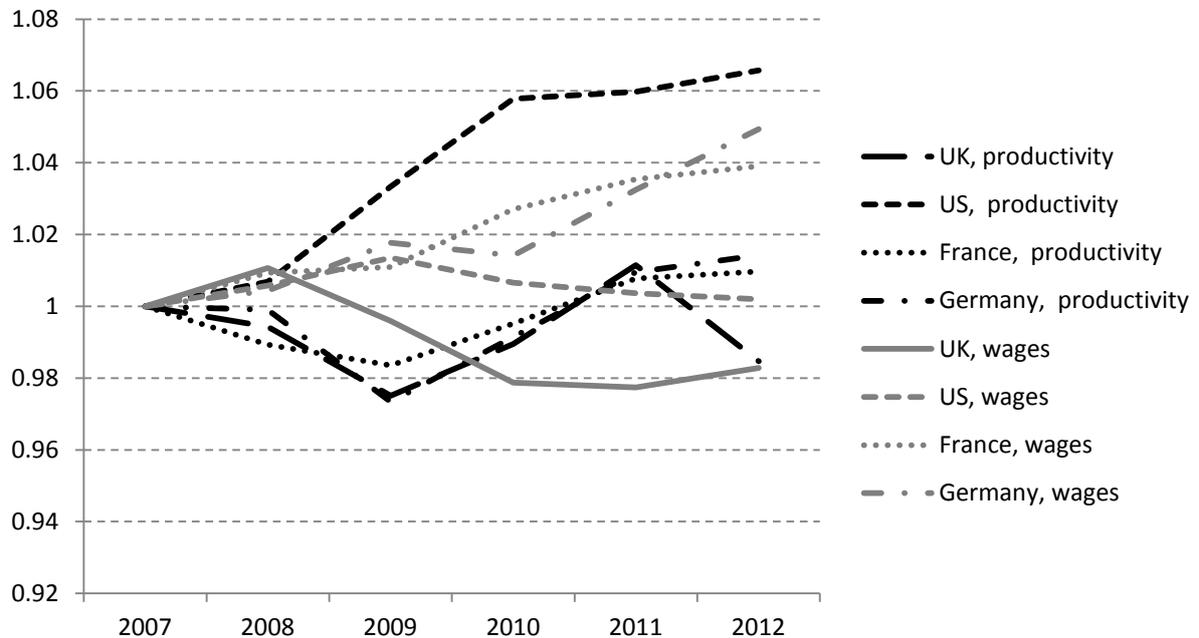
Source: New Earnings Survey Panel Dataset, excluding employees whose pay was affected by absence. The hourly wage excludes overtime. Nominal wages have been deflated using the Retail Prices Index each April.

Interestingly, however, the close relationship between what has happened to GDP per hour and what has happened to real hourly wages that we have seen in the UK has not been mirrored in other countries, even amongst those who have experienced similar flat lining of labour productivity (see Figure 5). This is consistent with the idea that productivity and wages have remained more closely linked in the UK than in other countries, e.g. the US (Pessoa & Van Reenen, 2012). For example, in Germany – where stagnating GDP per hour has been driven by increases in employment that have outstripped increases in output – wages have grown faster than productivity since the start of the recession.<sup>3</sup> The US, by contrast, saw real wage stagnation and rising labour productivity. This suggests that the factors that might help to explain the stagnation of labour productivity in the UK may not be the same as those that explain the stagnation in other countries, and suggests that

<sup>3</sup> Germany's working-age employment rate rose by almost 4 percentage points between 2007 and 2012. This is a continuation of rising employment rates before 2007, which seem to have been driven, at least in part, by the Hartz reforms, which reduced the generosity of unemployment benefits, tightened job-search conditions, and increased employer flexibility in terms of layoff rules and mini-jobs. The reforms are considered to have reduced unemployment (Krause and Uhlig 2011; Dlugosz et al., 2009).

further careful analysis of individual countries is required in order to understand what, if any, common drivers might help to explain the anaemic productivity growth that we observe.

Fig. 5. *Growth in Real GDP per Hour and Average Real Hourly Wages*



Note: real GDP per hour for all countries and nominal hourly wages for all countries except the UK come from OECDstats. Hourly wages are for the private sector only. Average hourly wages for the UK are calculated from the Labour Force Survey for private-sector workers. All hourly wages are deflated by GDP deflators from OECDstats.

In this paper, we maintain our focus on the UK, building on the growing literature attempting to explain the UK's productivity puzzle (e.g. Grice 2012; Hughes & Saleheen, 2012; Patterson, 2012; Goodridge *et al.*, 2013; Pessoa and Van Reenen, 2013) by focusing on wages rather than productivity as the outcome of interest, and examining three potential explanations for why wages (and hence productivity) have fallen so much during this recession compared to previous recessions in the UK.

One obvious possibility is that effective labour supply is substantially greater during this recession than in the past: the labour supply curve has shifted to the right. We know that the population of working age has increased substantially over the last 30 years – from 35.4 million in 1981 to 40.5

million in 2011<sup>4</sup> – a substantial proportion of which is due to net migration.<sup>5</sup> This would mean that there are more individuals willing to work at any given wage and thus that there is likely to be greater competition for jobs. This might mean that workers have lower reservation wages than in the past and that they attach more weight to staying in work (because their expected time to find another job is longer than in the past) than on securing higher wages.

Section 2 provides some suggestive evidence that labour supply has indeed been more robust in this recession than in previous recessions, particularly amongst older workers (those aged 55-74). These patterns are consistent with recent changes to welfare policy in the UK, such as the increasing number of welfare-to-work programmes available to jobseekers, the more stringent job search conditions attached to benefits claimed by the unemployed, those with disabilities and lone parents, and, more recently, the increase in the state pension age for women. Another potential explanation for higher observed labour supply in this recession compared to previous recessions might be that individuals have experienced substantial wealth shocks (or shocks to expectations of their future income) as a result of the financial crisis that mean they decide to work for longer. Section 2 provides only limited support for this hypothesis using a sample of older people in England, but other studies (e.g. Crossley *et al.*, 2013; Disney & Gathergood, 2013) find stronger evidence.

To the extent that labour supply was higher amongst individuals with lower productivity, firms may be able to employ more of these low-productive, low-paid workers, or substitute them for more-expensive workers or capital. Thus, one potential cause of both low productivity and low wages at the aggregate level might be a reduction in the average quality of labour. While we do not observe

---

<sup>4</sup> Source: <http://www.neighbourhood.statistics.gov.uk/HTMLDocs/dvc1/UKPyramid.html>.

<sup>5</sup> For example, between 2001 and 2011, just over half of the increase in total population in England and Wales could be attributed to net migration. Source: authors' calculations based on <http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2002-to-mid-2010-revised-national-sty-components-of-population-change.html>. There is, however, relatively little evidence that higher immigration has led to a reduction in wages amongst the native born population (e.g. Dustmann *et al.* 2005; Manacorda *et al.*, 2012) and some suggestion that the effect on average wages might even have been positive (e.g. Dustmann *et al.*, 2013).

the quality or productivity of workers directly, we can examine this composition hypothesis by looking at the individual characteristics of the workforce over time.

Section 3 investigates how the composition of the UK workforce changed during this recession compared to previous recessions. We would usually expect the composition of the workforce to shift towards more productive workers during a recession, as a reduction in aggregate demand would typically lead firms to lay off their least productive workers first. This is exactly what we see during this recession too: based on the characteristics we observe, compositional changes should have increased productivity and average wages since 2008, and the magnitude of these changes appears to be as productivity-enhancing, if not more so, than in previous recessions. There is thus strong evidence against the composition or quality-of-labour hypothesis as a potential explanation for the reduction in wages and hence productivity that has occurred during the recent recession in the UK.

This suggests that much of the change in wages must have occurred as a result of decreases in the returns to particular characteristics and thus that we would expect wages to have fallen significantly amongst individuals who remained in the labour market. This is not particularly surprising, given that this group vastly outweighs those who enter or leave the labour market from year-to-year in the UK. Changes in the composition of the workforce may play a bigger role in countries which have had higher labour turnover or more layoffs since the recession, such as the US. In Section 4, we will show that, amongst workers who stayed in the same job between 2010 and 2011, one third experienced nominal wage freezes or cuts (12% experienced freezes and 21% experienced cuts) and 70% experienced real wage cuts (when wages are deflated using the Retail Prices Index). Moreover, these experiences were felt across the wage distribution and amongst workers with different observable characteristics (e.g. amongst both high and low educated). So the real question is: why have wages for existing workers been able to fall so much in this recession compared to previous recessions?

Part of the explanation is that labour supply has been substantially higher – and hence competition for jobs significantly greater – in this recession than in previous recessions, as discussed above. This

is consistent with the findings of Gregg *et al.* (2013), who show that wages have become more responsive to local unemployment rates since the early 2000s. Another likely factor is that the labour market is now substantially more flexible than it was in the 1980s or 1990s. There has been a dramatic decline in trade union membership over the last 30 years, which has reduced the proportion of employees covered by collective bargaining. This appears to have made it easier for employers to hold constant or reduce insiders' wages: nominal wage freezes were more prevalent in jobs without collective agreements and average wages have fallen least amongst those covered by collective agreements at the national or industry level. A third possibility is that employers are capturing a higher proportion of economic rents now than in earlier periods.

A final piece in the puzzle – discussed extensively in Pessoa & Van Reenen (2013) – is that the reduction in productivity might be driven by a reduction in the capital-labour ratio as a result of an increase in the cost of capital (particularly for small and medium sized firms) or the continuing misallocation of capital to less efficient firms or projects. There has certainly been a sharp reduction in business investment over the course of the recent recession, which has been significantly larger than in previous recessions (Benito *et al.*, 2010) and amongst small and medium-sized firms (Crawford *et al.*, 2013). While Crawford *et al.* (2013) provide some evidence that the reduction in investment can explain only a small proportion of the within-firm changes in productivity in 2008-09, it is plausible that reductions in productivity resulting from a fall in the capital-labour ratio also contributed to reductions in real wages and hence labour costs, which Crawford *et al.* (2013) find to be the primary driver of productivity falls.

This paper now proceeds as follows: Section 2 presents evidence on changes to labour supply (and their determinants) over the short- and longer-term. Section 3 considers the extent to which changes to the composition of the workforce might explain the fall in real wages that we observe. Section 4 documents and discusses potential explanations for the substantial proportion of nominal wage freezes and cuts that have occurred within jobs. Section 5 concludes.

## 2. How has Labour Supply in the UK Changed Over Time?

This section uses a range of individual-level micro-data to examine whether labour supply has been higher or more resilient in the recent recession in the UK compared to previous recessions. Appendix A offers a brief description of the key data sources used in this analysis.

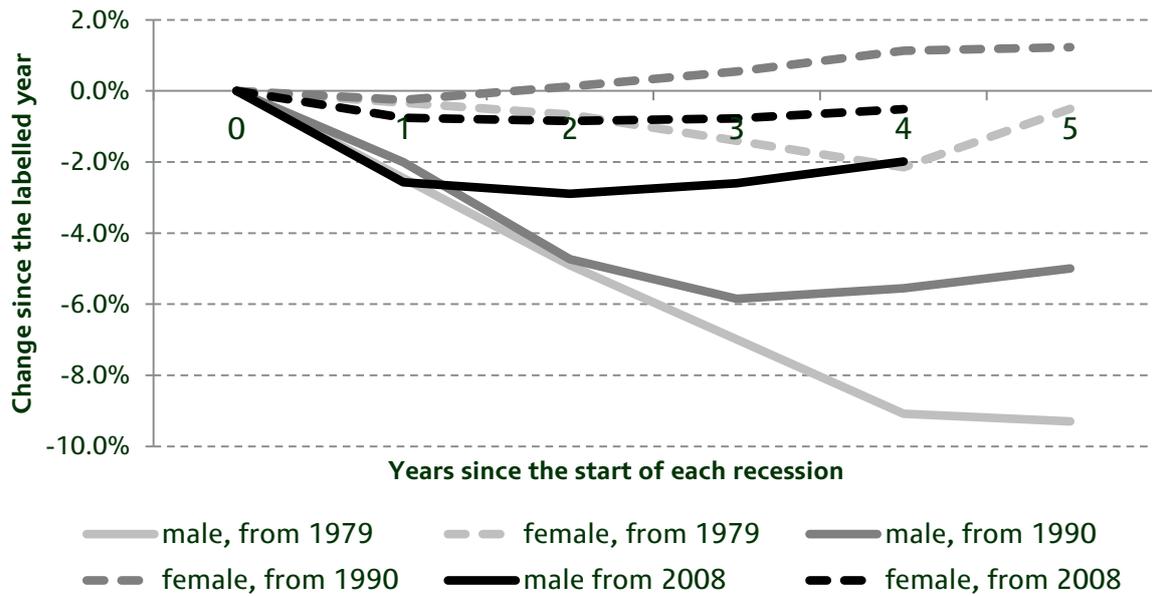
We start by comparing employment rates across recessions by gender, age group and highest educational qualification. We also document what has happened in terms of self-employment. We then move on to examine the drivers of increases in labour supply for particular demographic or socio-economic groups, including older people (those aged 55 and over) and lone mothers.

### 2.1. *The Big picture: Employment Rates*

Figure 6 looks at what happened to the proportion of the working-age majority (those aged 23-64) in work during and after the recessions starting in 1979, 1990 and 2008, separately for males and females. This recession saw a smaller fall in the proportion of men in work than in previous recessions, with 3% fewer men in work two years after the start of the recession, compared to 6% after three years in the 1990s and nearly 10% after five years in the 1980s. This pattern arises both from a smaller increase in the proportion of men that are unemployed than in previous recessions and no change (rather than an increase) in the inactivity rate.

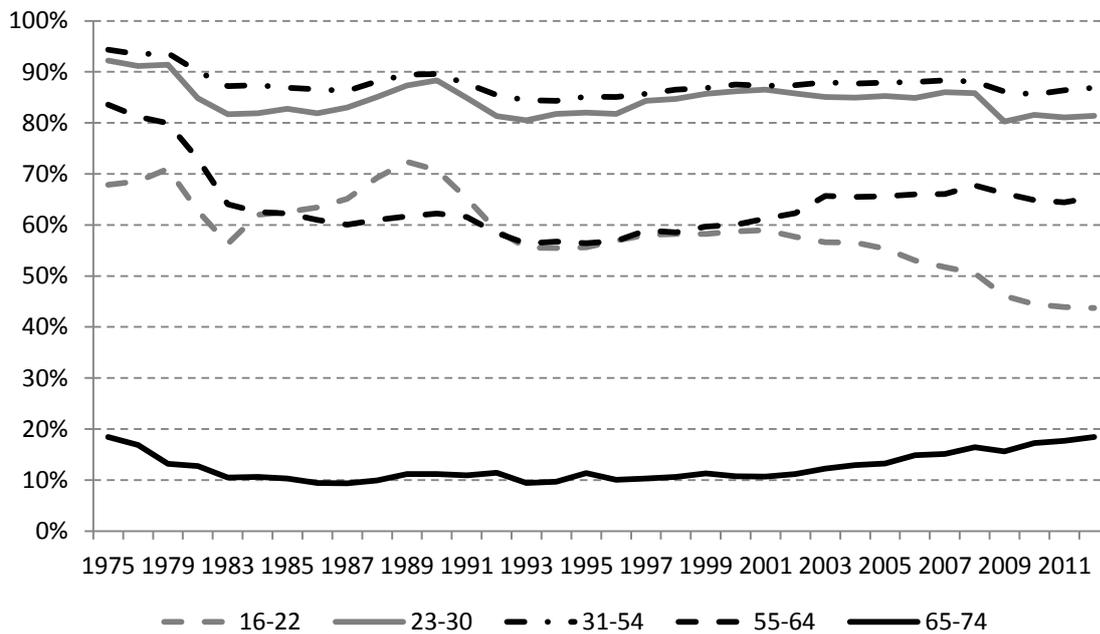
In contrast to men, the pattern in terms of the proportion of women in work (and participating in the labour market) does not differ dramatically across recessions, although the proportion of women that are unemployed has been slightly higher in this recession than in previous recessions. This picture does not change if we account for the increasing labour market participation of women over time by taking a linear or quadratic trend out of the employment time series.

Fig. 6. *Changes to the Employment Rates of 23-64 Year Olds by Recession*



Source: Labour Force Survey. No data point for 1980 or 1982. Quarter 2 is used for years since 1992.

Fig. 7. *Male Employment Rates by Broad Age Group*



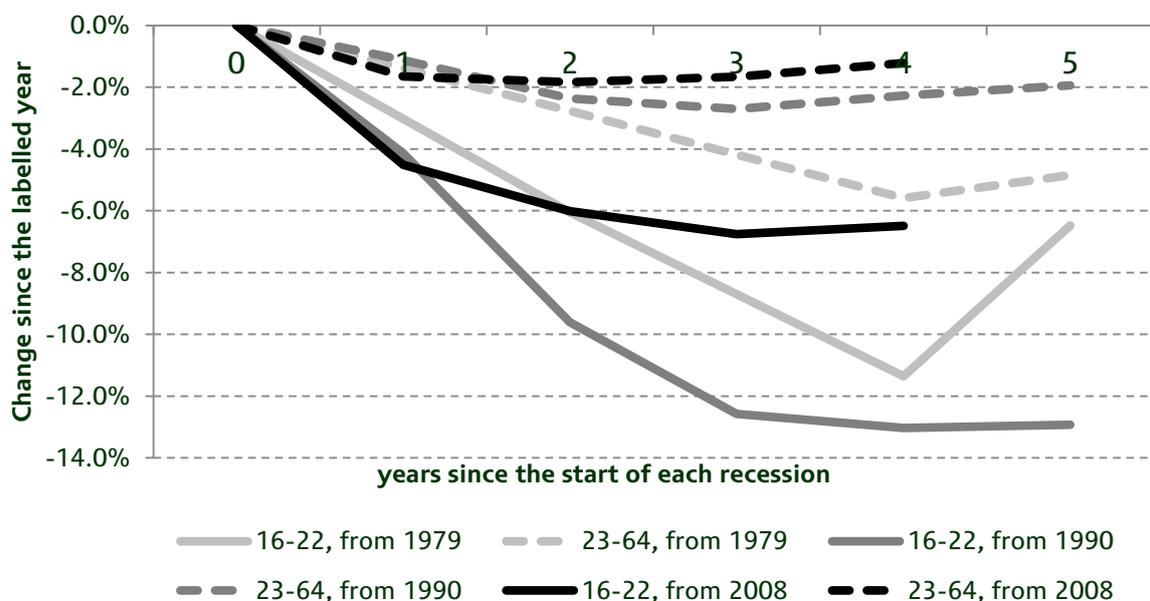
Source: Labour Force Survey. No data point for 1980 or 1982. Quarter 2 is used for years since 1992.

Figure 7 analyses the changes in male employment rates in more detail, by showing how different age groups have been affected over time. It is clear that most groups have experienced smaller declines in employment in this recession compared to previous recessions, but that this difference is

particularly striking for those aged 55-64, especially compared to the recession of the early 1980s. The more robust participation rates amongst older men are also evident for those above state pension age, with the employment rates of 65-74 year old men continuing to rise over time.

Figure 7 also shows that the employment rates of young people tend to be hardest hit during a recession, and Figure 8 brings this into sharp relief by comparing the employment rates of those aged 16-22 and 23-64 through the first five years during and after the recessions starting in 1979, 1990 and 2008. It emphasises that young people’s employment rates do indeed fall substantially more than those of prime age workers, but that, in line with the overall picture, the employment rates of young people have fallen less in this recession compared to previous recessions: for example, four years after the start of most recent recession, just over 6% less young people are in work, compared to 11% less after the 1980s recession and 13% less than after the 1990s recession. This may be partially (but not entirely) explained by higher education participation rates amongst young people in this recession than in previous recessions, particularly amongst 16-17 year olds.

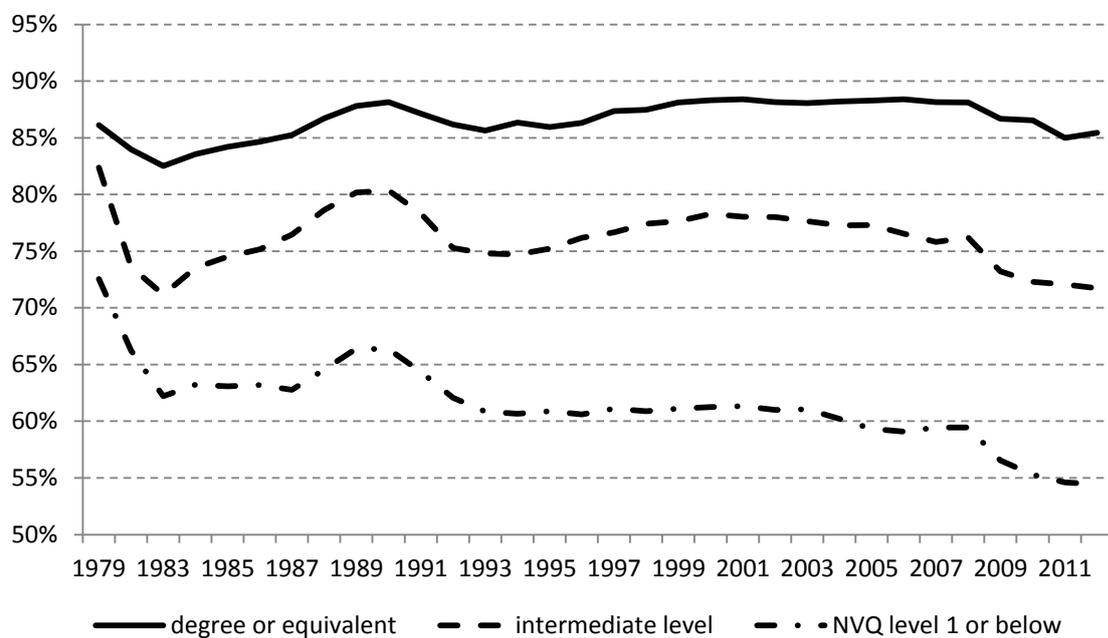
Fig. 8. *Employment Rate of Those Aged 16-22 versus 23-64 by Recession*



Source: Labour Force Survey. No data point for 1980 or 1982. Quarter 2 is used for years since 1992.

Finally, Figure 9 shows that, as is typical during a recession, employment rates fell by more amongst lower-skilled individuals than amongst higher-skilled individuals. The employment rate of those with less than 5 GCSEs at grades A\*-C or equivalent (the benchmark typically required for young people to continue beyond compulsory schooling in the UK) fell by 5 percentage points between 2008 and 2012 (from 59% to 54%), having never recovered following the 1990s recession. This compares to a reduction of 4 percentage points amongst those with intermediate qualifications and 2 percentage points amongst those with a university degree or equivalent.

Fig. 9. *Employment Rates by Level of Highest Qualification*



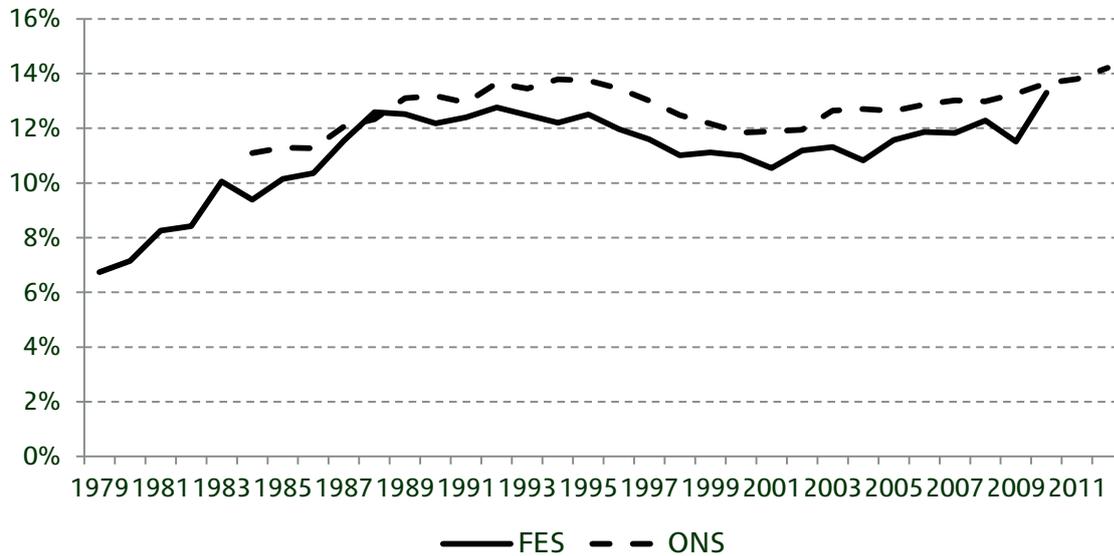
Source: Labour Force Survey. No data point for 1980 or 1982. Quarter 2 is used for years since 1992. Sample restricted to 16-59 year olds, as the questions about qualifications were not applicable to those aged 60 and above in some years.

## 2.2. The Self-Employed

It has been hypothesised that one reason why the proportion of individuals in work has not fallen further during the most recent recession in the UK is because there has been an increase in the proportion of self-employed workers with very low incomes, who may be regarded as the “hidden unemployed”. It is certainly the case that a substantial proportion of workers are self-employed:

Figure 10 shows that this figure is at an historical high (of 14% in 2012 according to the ONS figures and 13% in 2010 according to the Family Expenditure Survey).

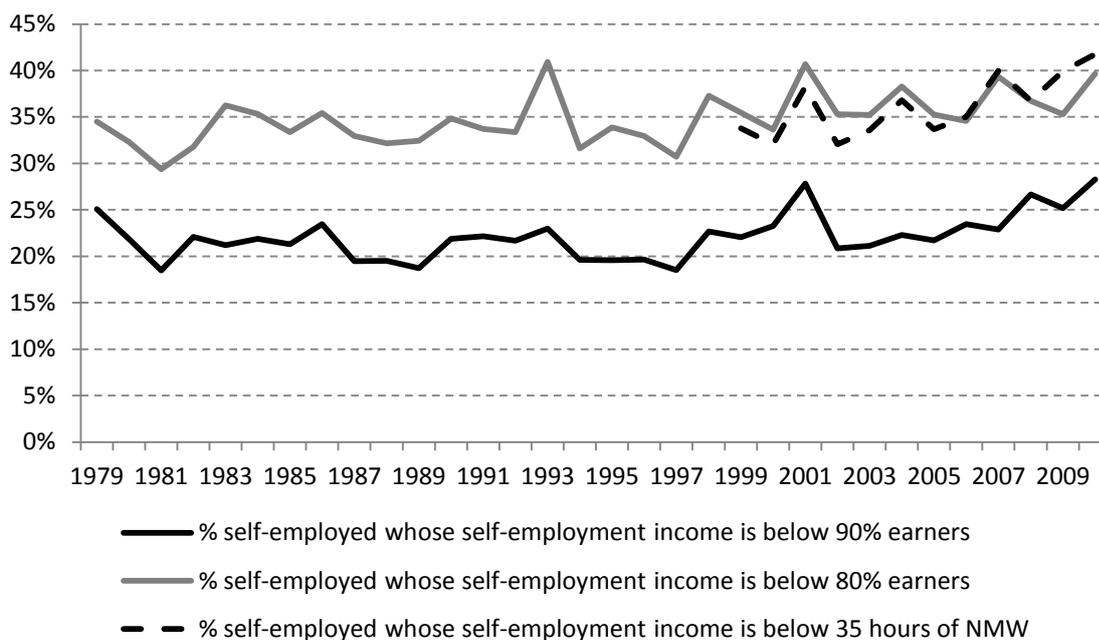
Fig. 10. *Proportion of Workers who are Self-Employed*



Source: the FES trend presents figures from the Family Expenditure Survey, 1979-2010; the ONS trend comes from annual ONS statistics on the number of self-employed (series MGRQ) and the total number in work (series MGRZ).

Figure 11 also shows that there has been an increase in the proportion of self-employed workers who earn less than employees at the lower end of the earnings distribution (on various measures) since 2008. Thus, while the pro-cyclicality of self-employment earnings is to be expected, an increase in the proportion of low-paid self-employed workers – particularly at a time when average real hourly wages are falling – provides some suggestion that an increasing proportion of self-employed workers would be better off as employees and thus that at least part of the reason why they are self-employed may be because they cannot find appropriate employment. It is not clear that this is happening to a greater extent now than in previous recessions though.

Fig. 11. *Proportions of Self-Employed Individuals with Low Self-Employment Income*

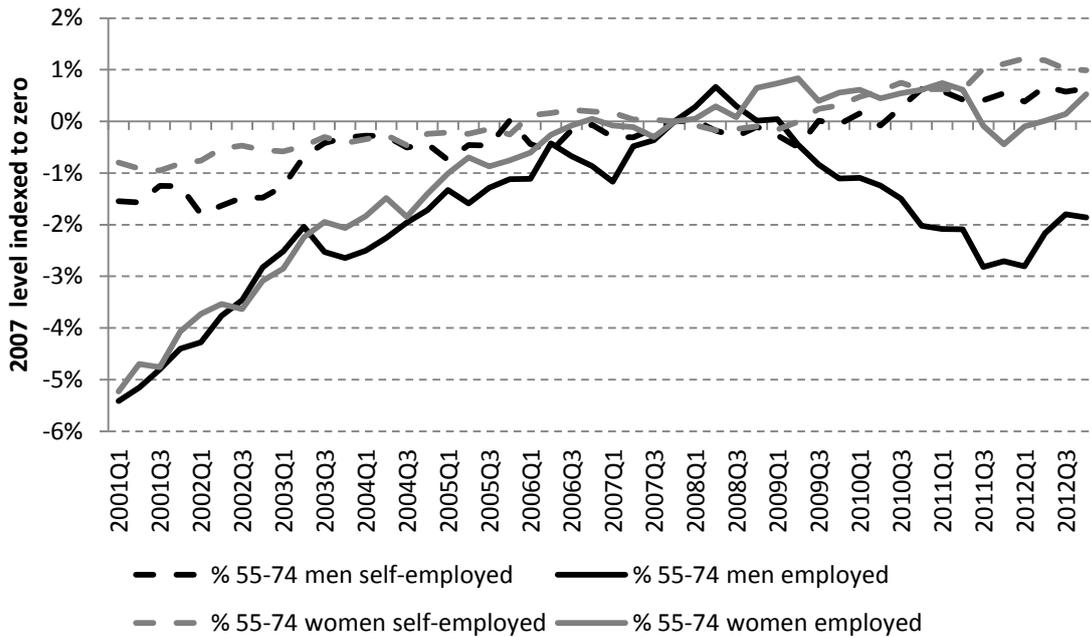


Source: authors' calculation using the Family Expenditure Survey. The first two thresholds are the 10<sup>th</sup> percentile and the 20<sup>th</sup> percentile of the non-zero distribution of gross earnings in the year. The 10<sup>th</sup> percentile of non-zero earnings was around £116 per week in 2010.

### 2.3. The Older Generation

We saw in Figure 7 that the proportion of 55-74 year old men in work had been broadly flat or even increasing over the course of the recent recession. Figure 12 shows how this is broken up into employment and self-employment for men, and presents the same breakdown for women in this age group as well. It shows that the overall picture for men is driven by a fall in the proportion in employment (of similar magnitude to that for prime age men) and a rise in the proportion that are self-employed. The proportion of 55-74 year old women in self-employment has also risen since 2007, and there has been a less marked decline (and even a small overall increase) in the proportion in employment over the same period.

Fig. 12. *Employment and Self-Employment Rates of 55-74 year olds*



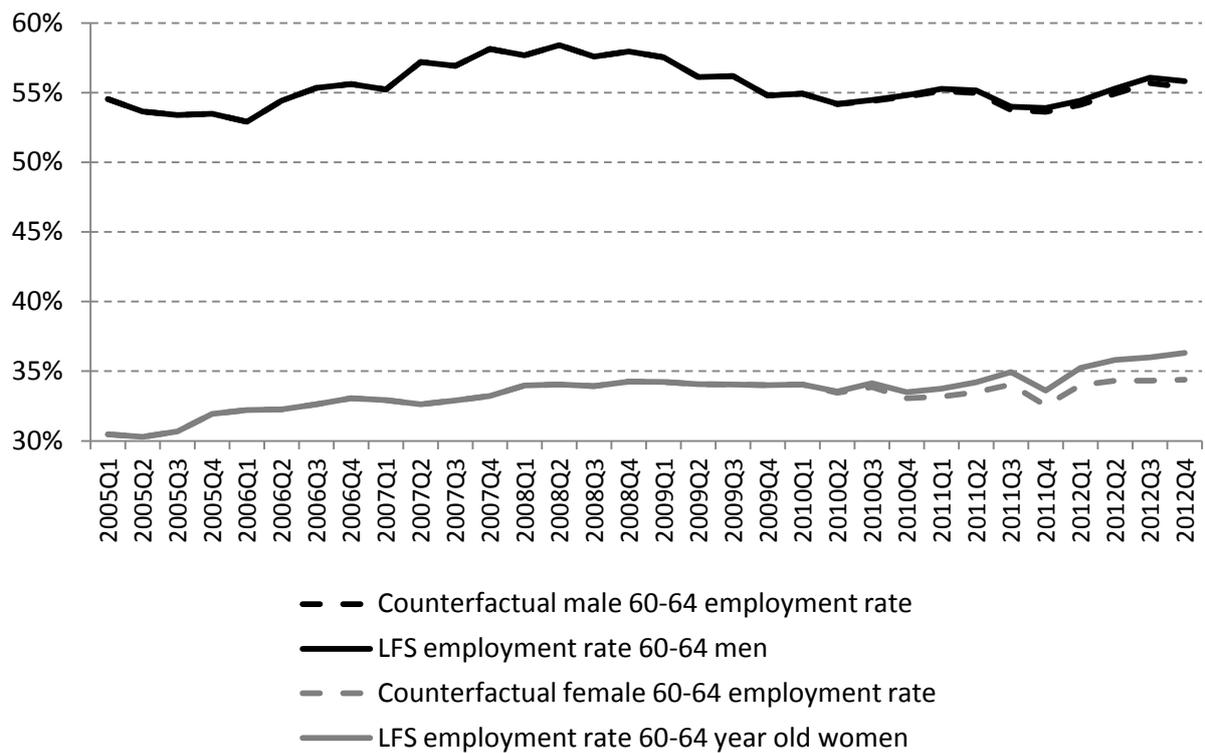
Source: authors' calculations using quarterly Labour Force Survey.

Some of the increase in labour market participation among older people can potentially be explained by the increase in the state pension age for women from 60 towards 65, beginning in the second quarter of 2010. Figure 13 uses estimates of the impact of the policy from Cribb *et al.* (2013) to calculate counterfactual employment rates for men and women – i.e. what we would have expected their employment rates to look like in the absence of the policy – and compares this to the actual employment rates observed. It shows that the raising of the state pension age accounts for almost the entire rise in employment rates among 60-64-year-old women since 2010, and a smaller proportion of the rise in male employment rates as well, as the partners of some affected women seem to delay their retirement as well.

Overall, however, the raising of the state pension age for women can explain only a small proportion of the aggregate rise in labour supply among older people. As we saw in Figure 12, employment and self-employment rates, particularly for women, held up reasonably well throughout the recession, even before the policy was introduced in 2010 (although this could potentially be at least partially explained by anticipation effects). More importantly, employment rates among women who are

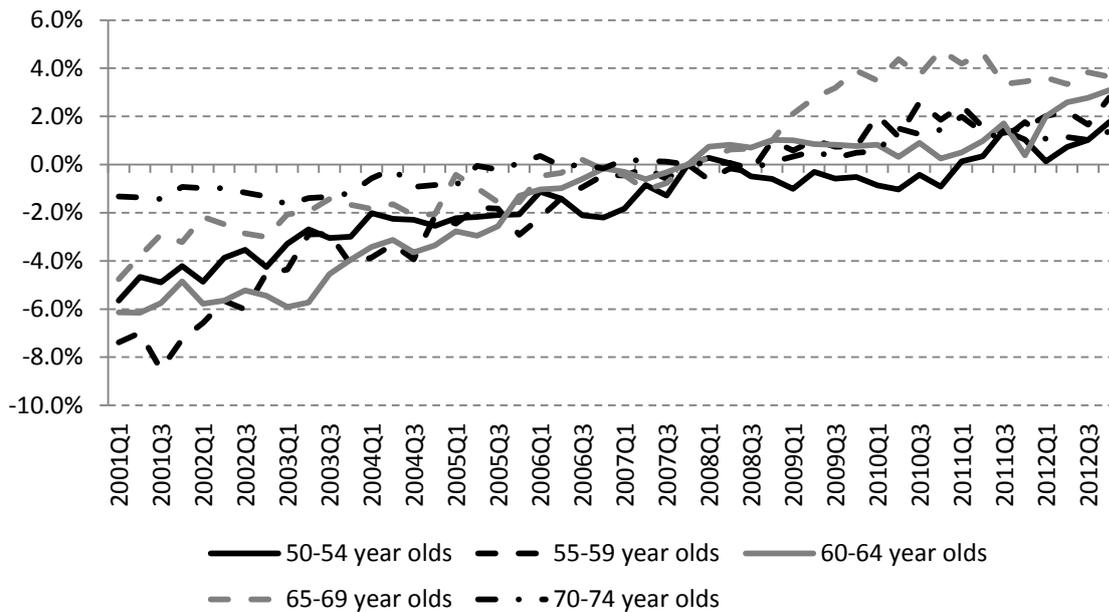
already above state pension age – and are thus unaffected by this policy – have also risen since 2008. Figure 14 shows that this increase has been particularly strong among 65-69 year olds.

Fig. 13. *Employment Rates of 60-64 Year Old Men and Women, with and without the State Pension Age Increase*



Source: quarterly Labour Force Survey combined with estimates of the impact of the policy from Cribb et al. (2013).

Fig. 14. *Changes to Employment Rates among Older Women Relative to 2007Q4*



Source: Quarterly Labour Force Survey. "In work" includes both employment and self-employment.

Another plausible explanation for the increasing employment rates among older people may be that they are supplying more labour in response to unexpected wealth shocks (and/or lower expectations of future income from assets) as a result of the financial crisis. Banks *et al.* (2012) estimate the effect of the financial crisis on the finances of those aged 50 plus using the English Longitudinal Study of Ageing (ELSA). They document the magnitude of changes to observed housing and financial wealth between the Wave 3 and 4 interviews (which took place in May 2006-August 2007 and June 2008-July 2009) and also attempt to simulate the magnitude of shocks to housing and risky financial assets that respondents might have experienced between the height of the boom (May 2007) and the depth of the recession (March 2009), as well as between the Wave 3 and Wave 4 interviews.<sup>6</sup> Housing wealth shocks were simulated on the basis of self-reported house value in Wave 3 and regional house price indices, whereas shocks to risky financial assets were estimated on the basis of holdings of risky financial assets and defined contribution pensions in 2006-07 and two stock market (FTSE) indices.

<sup>6</sup> These two periods overlap to a large extent. For most respondents, the Wave 3 interviews took place a few months before May 2007 and the Wave 4 interviews took place a few months before March 2009.

Crawford (2013) looked at the impact of these different measures of wealth shocks on retirement intentions. We build on her analysis to look at the labour supply of older individuals. We focus on the simulated peak-to-trough shocks calculated by Banks *et al.* (2012), as they have the advantage of measuring the change in assets over a fixed period of time for all individuals and are likely to capture the largest change that households might have experienced as a result of the financial crisis; the downside is that they rely only on differences in initial asset holdings, plus regional variation in house prices and national variation in stock market indices to generate variation in the magnitude of the shocks experienced by different households. As a robustness check, we therefore use the Wave 3 to Wave 4 simulations as well, which have the advantage of introducing additional variation on the basis of differences in the timing of the interviews, at the expense of moving away from changes observed over fixed periods which may not fully capture the change in assets experienced over the course of the recession.

We focus on individuals aged 55-74 and document the relationship between simulated peak-to-trough changes to housing and financial wealth, and subsequent labour supply. Specifically, we investigate whether variation in the magnitude of changes to wealth (relative to initial asset holdings) can help to explain differences in employment status in 2010-11 (Wave 5), conditional on employment status in 2006-07 (Wave 3) and a range of other individual characteristics.

Table 1 reports the results from a series of regressions run using a linear probability model. Estimates from a Probit regression model (not reported here) show a similar pattern to those obtained from a linear probability model. In each regression the outcome is whether an individual is in paid work (including self-employment) in 2010-11, and the key covariates of interest are dummy variables indicating the quintile of the distribution of relative changes to financial wealth (first three columns) or housing wealth (second three columns) into which the individual falls. In each case, the analysis is run separately for men and women, and the omitted category is those who experience (or

are simulated to experience) the smallest negative wealth shocks as a proportion of their total wealth.

**Table 1** *Effect of Simulated Changes to Housing and Financial Wealth on Employment Status*

	Simulated change to financial wealth: May 2007 to March 2009			Simulated change to housing wealth: May 2007 to March 2009		
	% change	Effect of change on employment in 2010-11		% change	Effect of change on employment in 2010-11	
		Men	Women		Men	Women
Bottom quintile: most negative change	-10.5%	0.033 (0.025)	-0.060*** (0.021)	-10.5%	0.142*** (0.050)	0.090** (0.0398)
2 <sup>nd</sup> quintile	-3.5%	0.032 (0.023)	-0.010 (0.021)	-7.4%	0.124*** (0.046)	0.080** (0.0386)
3 <sup>rd</sup> quintile	-1.1%	0.016 (0.024)	-0.021 (0.020)	-5.7%	0.133*** (0.044)	0.051 (0.039)
4 <sup>th</sup> quintile	0.0%	(omitted)	(omitted)	-4.0%	0.0605 (0.045)	0.054 (0.039)
Top quintile: least negative change (reference category)	0.0%	(omitted)	(omitted)	-0.5%	(omitted)	(omitted)
Observations	4,286	1,947	2,339	4,205	1,911	2,294
R-squared		0.52	0.51		0.52	0.51

Notes: “% shock” shows simulated shock as a proportion of initial total wealth, averaged within the quintile as defined by the proportional shock. Regressions are run separately by gender. Controls include whether the person was in work, looking for work, or inactive in 2006-07, quarter of interview in 2006-07 and 2010-11, dummies for 5-year-age-band in 2010-11, and individual characteristics measured in 2006-07: highest qualification, marital status, whether the person reports a long-term illness, a work-limiting illness, a temporary illness, whether the person owns their home outright or with a mortgage, or whether they rent, household size, whether has children

and whether they think they can rely on the children. The sample for looking at housing wealth is smaller than that for financial wealth because some people have moved across regions between wave 3 and wave 4. It's not clear which regional house price trend would affect them, so they are excluded from analysis of housing wealth changes. Robust standard errors are reported in brackets. \*\*\* indicates significance at the 1% level, \*\* at the 5% level and \* at the 10% level.

Table 1 shows that there was considerable variation in the magnitude of changes to financial and housing wealth that we might have expected ELSA cohort members to face on the basis of regional or national trends, given their initial wealth. For example, from peak-to-trough (May 2007 to March 2009), amongst the fifth of the sample who were hardest hit, the simulated financial wealth shock amounted to a fall of 10.5%, on average, while two fifths of the sample experienced no change in financial wealth. The relevant range in terms of housing wealth shocks was from -10.5% amongst the 20% worst affected to -0.5% amongst the 20% least affected.

Despite the relatively large simulated changes to financial wealth between 2007 and 2009, however, we find no evidence that these changes affect the likelihood of being in work two years later. By contrast, the estimated effects of simulated housing wealth changes are significant for both genders. For example, relative to men who were amongst the 20% of the sample whose housing wealth decreased least as a share of initial total wealth, men in the 20% of the sample who lost most were 14.2% significantly more likely to be in work in 2010-11, compared to 12.4% more likely for the next 20% and 13% more likely for the middle quintile. The estimated effects are smaller for women, but still significant amongst the hardest hit 40%. It seems intuitive that older people may be more inclined to work for longer if their house loses value and if housing accounts for a larger share of their total wealth. This is consistent with the findings of Disney and Gathergood (2013), who used data from the British Household Panel Survey between 1991 and 2009 and found a large impact of housing wealth on labour supply, especially amongst younger workers and older men.

Our estimates imply a sizeable labour supply elasticity with regard to housing wealth of more than -1 for men and just below -1 for women. If people had been expecting no nominal change to their

housing wealth (on average), then these estimates would translate into an aggregate employment effect of negative housing wealth shocks of around 5% on 55-74 year olds.<sup>7</sup> However, it seems likely that people would have expected house prices to appreciate in nominal terms, in which case 5% would underestimate the resultant positive employment effects.

The estimated relationship between housing wealth and labour supply is not robust to variation in the measures used to capture changes in wealth, however. We repeated the analysis using two alternative measures of wealth changes, the results of which are reported in Appendix Tables B1-B2. The first alternative measure is the simulated wealth shock between Wave 3 and Wave 4. The second alternative measure is actual changes to wealth between Wave 3 and Wave 4. The estimated relationship between changes in housing wealth and labour supply using these measures point to near-zero (or even negative) effects of housing wealth changes on employment.

The contrast between our main estimates and those based on Wave 3 to Wave 4 simulated housing wealth shocks is particularly surprising, given that the only difference between the two measures is the time period. One possibility is that our main measure relies too heavily on regional variation in house prices which could be highly correlated with differential employment opportunities across regions. This seems unlikely, however, as the regions with the most resilient house prices (e.g. London) are also the ones which saw more of an increase in employment over this period. We thus remain cautious about the strength of the relationship between housing wealth shocks and employment among older people.

#### *2.4. Welfare Recipients*

A number of changes have been made to the welfare system in the UK in recent years in order to try to encourage various groups of claimants to start or return to work. These reforms have generally been of two types: the first set of reforms has tried to strengthen the work incentives of various

---

<sup>7</sup> The average fall in housing wealth between May 2007 and March 2009 experienced by 55-74-year-olds in ELSA was 5.3%.

groups; for example, the Working Families Tax Credit was introduced in 1999 and has subsequently been reformed multiple times, most recently transforming into the new Universal Credit programme. The second set of reforms has tried to impose greater conditionality on benefit claimants who are out of work for various reasons. For example, a series of active-labour-market measures targeted at the unemployed and known as the “New Deal” began in the late 1990s. Similarly, the benefit available to individuals who are too sick or disabled to work was reformed in 2008 in order to introduce stricter work capability tests, plus job search requirements as a condition of continuing receipt for those who are deemed capable of returning to work.<sup>8</sup>

Changes have also been made to the benefits that can be claimed by out-of-work lone parents, a group whose labour supply is often found to be particularly sensitive to welfare policies.<sup>9</sup> Before November 2008, most lone parents who were not in work could claim a benefit for those on low incomes with no job search conditions attached (Income Support). In order to encourage lone parents to work, however, it is no longer possible to claim Income Support if their youngest child is above a certain age limit. This means that out-of-work lone parents with older children must instead claim Jobseeker’s Allowance (JSA), which is a benefit of equivalent value, but that has strict job search conditions attached. The age limit for youngest child was set at 12 in November 2008 for all new claimants of Income Support, and was lowered to 10 in October 2009, seven in October 2010 and five in October 2011. For lone parents who were already claiming Income Support, the changes were phased in over a year from the date of policy change for new claimants.

Figure 15 plots the change in labour market participation rates of lone mothers since the policy change for the four groups of interest (split according to age of youngest child), after taking out

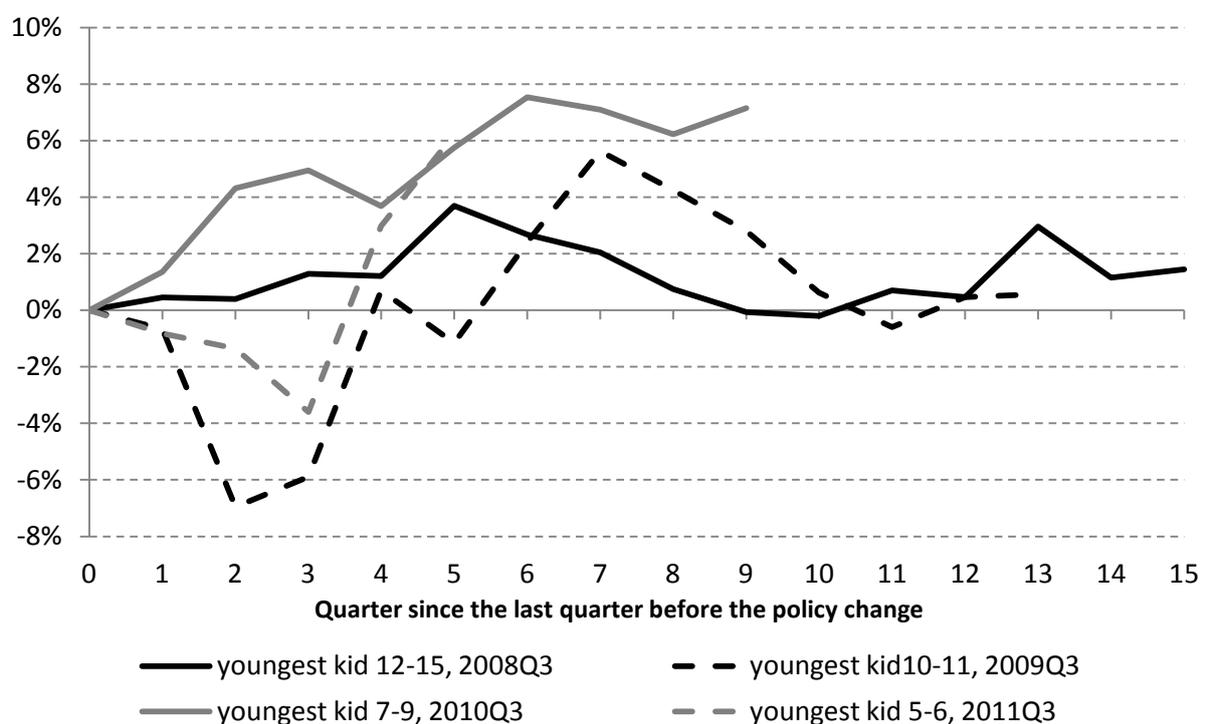
---

<sup>8</sup> These changes were heralded by the switch from Incapacity Benefit to Employment Support Allowance for new claimants in 2008. For further details of the old and new benefit regimes, see Browne & Hood (2013).

<sup>9</sup> For example, they are often the group found to be most responsive to childcare subsidies (e.g. Cascio, 2009; Fitzpatrick, 2012) as well as the in-work support offered via tax credits (e.g. Blundell et al., 2000, 2008; Brewer, 2001; Blundell & Hoynes, 2004; Brewer et al., 2006).

seasonal effects and a linear time trend.<sup>10</sup> Figure 16 does the same for employment rates. Both participation and employment rates appear to have increased strongly (by around 8-9%) amongst lone mothers whose youngest child is aged 7-9 since the policy change occurred for this group. There are relatively smaller changes for other groups, but in most cases participation rates are higher than employment rates. More formally, Avram *et al.* (2013) evaluated the impact of this policy on affected lone parents using a difference-in-differences framework. They found that it increased employment rates by around 7 percentage points three months after the policy started to bite and by 8-10 percentage points nine months later. They also found larger effects on participation, as measured by the number of lone parents estimated to have moved from Income Support to Jobseekers' Allowance, although it is not possible to tell to what extent these new JSA claimants were actively seeking work.

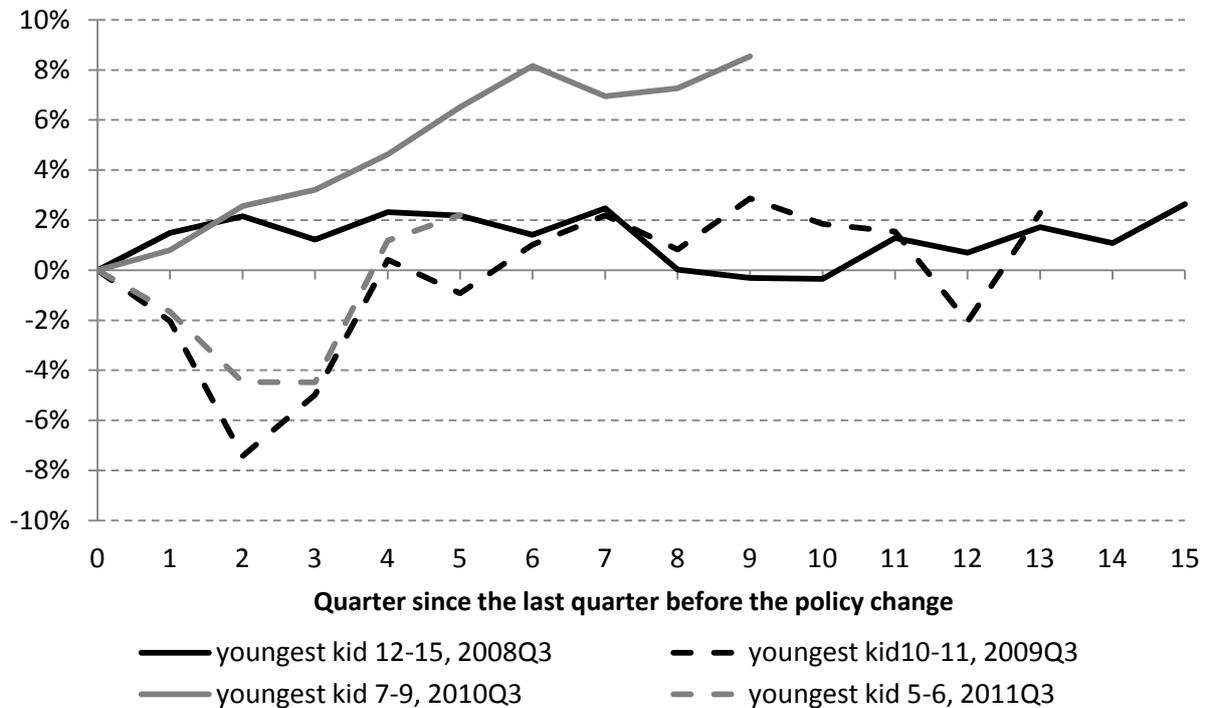
Fig. 15. *Lone Mothers' Participation Rates since the Policy Change by Age of Youngest Child*



<sup>10</sup> For each group, we regress a binary outcome (e.g. employment) on three quarterly dummies and year between 2001Q1 and 2012Q4. The figure shows changes to residuals since the labelled quarter.

Source: Quarterly Labour Force Survey. Sample restricted to lone mothers aged between 20 and 54. The labour market participation rates are de-trended as we regress participation rates on three quarterly dummies and year between 2001Q1 and 2012Q4 and plotting changes to the residuals.

Fig. 16. *Lone Mothers' Employment Rates since the Policy Change by Age of Youngest Child*



Source: Quarterly Labour Force Survey. Sample restricted to lone mothers aged between 20 and 54. The employment rates are de-trended as we regress participation rates on three quarterly dummies and year between 2001Q1 and 2012Q4 and plotting changes to the residuals.

### 3. Can Changes to the Composition of the Workforce Help Explain Falls in Productivity?

Section 2 provided some descriptive evidence that effective labour supply has been greater (i.e. the labour supply curve has shifted to the right) in this recession than in previous recessions, particularly amongst older people and certain types of welfare recipients, such as lone parents. If such individuals were found to have relatively lower productivity, on average, than the existing workforce, then it is possible that the average productivity of the workforce could be lower in this recession than in previous recessions as a result of the higher supply of low productivity types. The key question here is not whether the workforce has shifted to less productive types during the

recent recession – in general, the workforce becomes more productive, on average, during a recession, as firms are likely to sack their least productive workers first – but whether the composition change has been more adverse (or less positive) than in previous recessions. If this were to have been the case, then this composition (or aggregate quality of labour) hypothesis might provide a potential explanation for why labour productivity fell by more in this recession than in previous recessions.

Assuming that individual wages proxy individual productivity, we can quantify how much of the aggregate change in wages (and hence productivity) can be explained by changes to the composition of the workforce (as measured by observed individual characteristics,  $\mathbf{X}$ , such as age and occupation) and how much is due to changes to the parameter values associated with (or “returns” to) particular characteristics (e.g. education). To do so, we run separate wage equations at the start and end of the period of interest and then carry out a simple Oaxaca decomposition, as per equation 1:

$$\widehat{Y}_1 - \widehat{Y}_0 = \widehat{\beta}_1(\mathbf{X}_1 - \mathbf{X}_0) + (\widehat{\beta}_1 - \widehat{\beta}_0)\mathbf{X}_0 \quad (1)$$

To investigate the extent to which the higher supply of less productive workers might help to explain the fall in productivity during the recent recession, we run wage equations in 2007 and 2012 using data from the Labour Force Survey (LFS), which contains a reasonably rich set of individual characteristics, including gender, age, education, family composition, nationality, region, industry, occupation and tenure. Figure 17 presents the results of this analysis, and compares the results for 2007 to 2012 with those over two recent boom periods: 1997-2002 and 2002-2007.

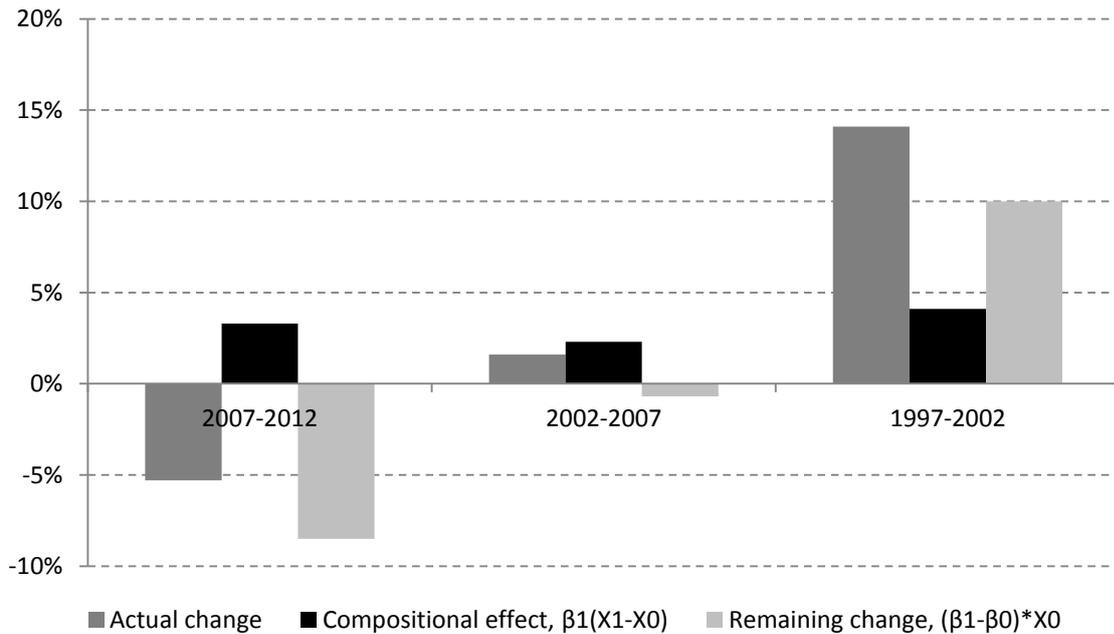
Figure 17 shows that between 2007 and 2012, mean log wages fell by 5.3% in real terms (i.e. the aggregate change was -5.3%). Of this, +3.3% could be explained by compositional changes: in other words, on the basis of changes to the characteristics of individuals in the workforce and the jobs that they do, we would have expected wages to increase by 3.3%, all other things being equal.<sup>11</sup> This is

---

<sup>11</sup> One might expect the compositional effect to be more positive during recessions if lower-skilled lower-paid workers are laid off first or hiring at the junior level stops, but this does not seem to be the case here, as the

exactly what we would expect to happen during a recession, and means that none of the aggregate wage fall can be explained by changes to the composition of the workforce on the basis of characteristics that we observe and hence must instead all be due to changes to the parameter values associated with (or returns to) particular characteristics instead.

Fig. 17. *Decomposing Changes in Real Log Hourly Wages*



Notes: observations missing any individual characteristics are dropped from the analysis. Regressions are weighted by the income weight in LFS. Age bands are 16-17, 18-24, 25-34, 35-44, 45-54, 55-64, 65+. There are three categories of highest qualification: degree and equivalent, secondary (e.g. A levels, A\*-C GCSEs), and elementary/none. There are 6 categories for number of kids, from 0 to 5+. Age of youngest child has 18 dummies. Nationality is controlled by a binary indicator of whether the individual has UK nationality. Occupation has 9 groups according to SOC. Industry is at SIC 1992 section level.

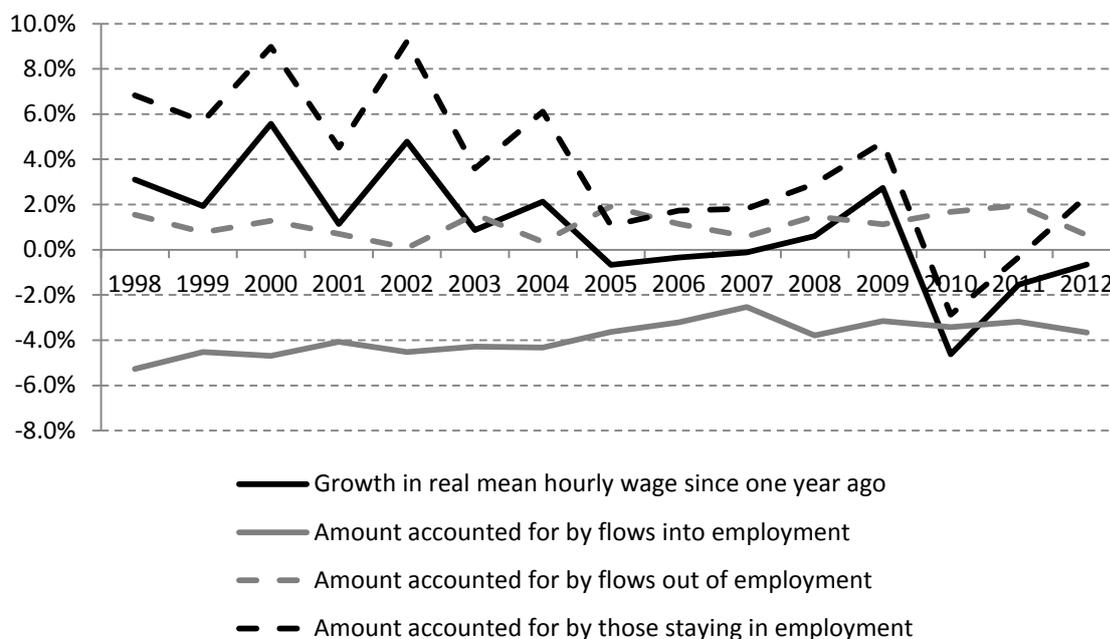
Another way of saying this is that the vast majority of the change in wages must have occurred amongst those who stay in work across periods, rather than because of flows into or out of work. Given that those who remain in work from one year to the next make up about 80% of the workforce in any given year, this is perhaps not surprising, and is exactly what we see in Figure 18,

---

contribution made by changes to the composition of the workforce is approximately similar in 2007-2012 as it was on average over the preceding decade.

which plots year-on-year percentage changes in average real hourly wages and decomposes this into the amount accounted for by flows into employment, the amount accounted for by flows out of employment and the amount accounted for by those who stay in employment.<sup>12</sup>

Fig. 18. *Decomposition of Aggregate Year-on-year Real Hourly Wage Growth by Flows*



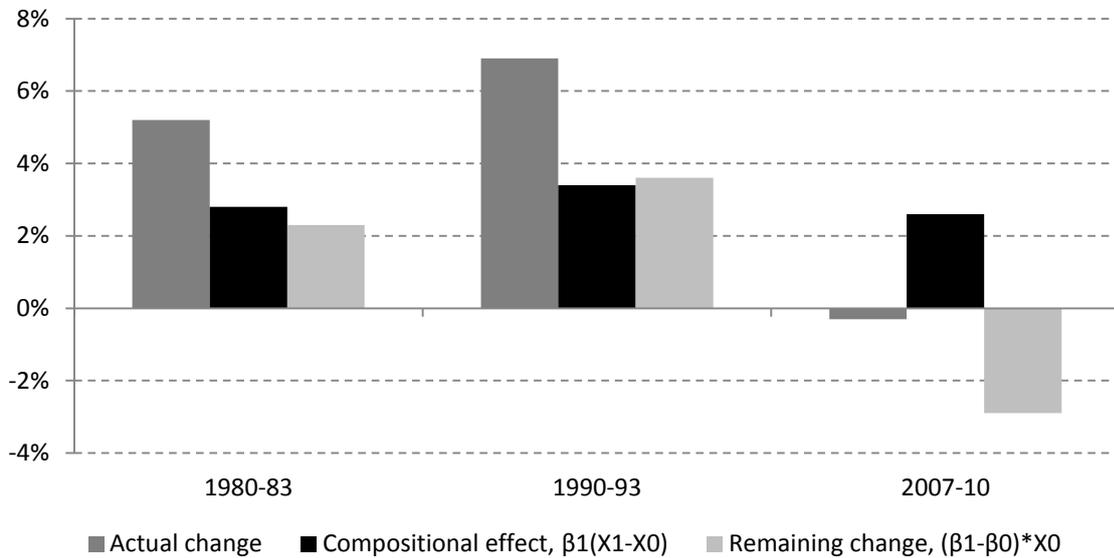
Source: Labour Force Survey. Wages are deflated using the RPI and are scaled to be consistent with quarterly cross-sectional figures; however, we would get a qualitatively similar picture if we did not apply such scaling.

For this to help us understand why the labour market performance of this recession has been so different to previous recessions, we would expect the picture presented by these decompositions to vary by recession. To examine whether this is the case, we run a series of Oaxaca decompositions for each of the recessionary periods of interest (1980-83, 1990-93 and 2007-10) using data from the Family Expenditure Survey, the results of which are shown in Figure 19. We use data from the Family Expenditure Survey (FES) because wages are not collected this far back in LFS. The FES contains

<sup>12</sup> Mechanically, this can be calculated as:  $\text{meanwage}_t - \text{meanwage}_{t-1} = n_3/(n_3+n_2)*(w_{3t}-w_{2t}) + n_1/(n_1+n_2)*(w_{2_{t-1}}-w_{1_{t-1}}) + (w_{2t}-w_{2_{t-1}})$ . Where  $n_1$  is the number of people in work at time  $t-1$  but out of work at time  $t$ ,  $n_2$  is the number of people in work at both time  $t-1$  and time  $t$ , and  $n_3$  is the number of people who are not in work in  $t-1$  but are at time  $t$ ;  $w_1$ ,  $w_2$ ,  $w_3$  represent average wages of the groups at specified time points.

similar individual characteristics to the LFS, but fewer job characteristics. At the time of writing, the latest year for which FES data is available is 2010.

Fig. 19. *Decomposing Changes in Real Log Hourly Wages, by Recession Period*



Source: Family Expenditure Survey. Age, number of children and age of youngest child are accounted for in the same way as described in Figure 17. Age when ceased education is controlled for by dummies for individual years between 15 and 25.

Figure 19 shows that the compositional effect in this recession is estimated to be less positive than in previous ones, suggesting that a small part of the explanation for lower real wages (and hence productivity) in this recession compared to previous recessions may be the fact that the lowest productivity workers are exiting the labour market to a lesser extent than in previous recessions. This difference is, however, very small relative to the difference in actual wage growth in each period. What is strikingly different about this recession compared to previous ones is that the parameters associated with (or returns to) individual characteristics have fallen dramatically in this recession, while they remained strong and positive in previous recessions. In other words, changes in the composition of the workforce make only a very small contribution to the explanation of why real wages continued growing in the recessions of the early 1980s and 1990s but stagnated in the

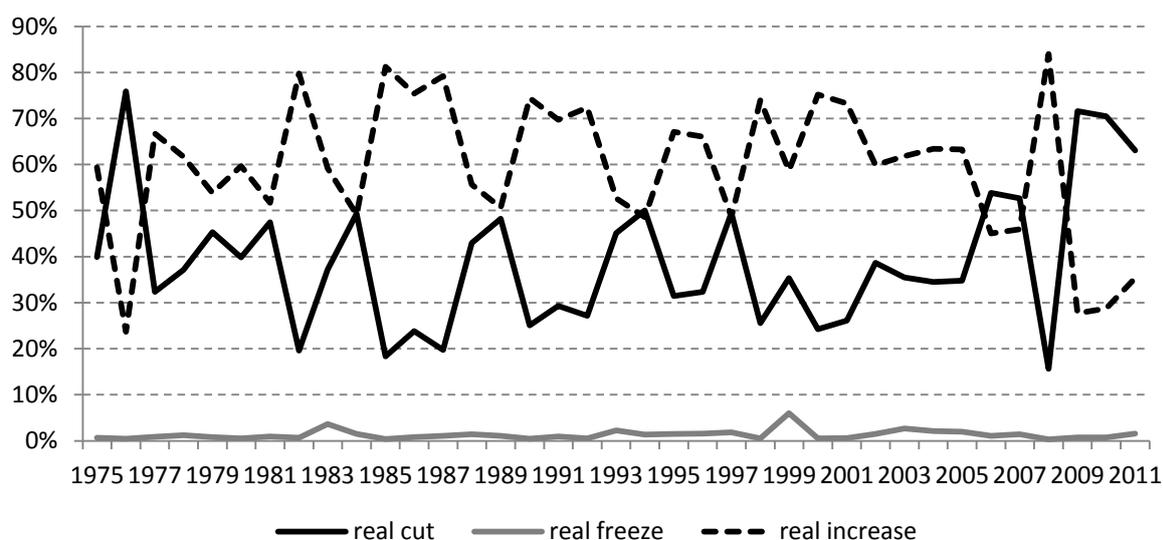
current downturn; instead we must try to explain why wages have fallen so dramatically amongst existing workers in this recession.

#### 4. What has happened to nominal and real wages during the recent recession?

This section documents in more detail what has happened to nominal and real wages over the course of the recent recession and how this differs from previous recessions. It also attempts to provide some potential explanations for the differences that we observe.

The first thing to note is that the reduction in average real hourly wages amongst existing workers documented in the previous section is not just being driven by individuals being made redundant and having to take lower paid jobs: there is also strong evidence of substantial nominal and real wage reductions occurring *within jobs*. Figures 20 and 21 focus on individuals who are in the same job as one year ago (which covers around 80% of workers throughout the period) and document the proportions of individuals whose hourly pay was cut, frozen or raised compared to a year ago in real terms (calculated using the Retail Prices Index) (Figure 20) and nominal terms (Figure 21).

Fig. 20. *Percentage of Stayers whose Real Wages were Cut, Frozen or Raised*

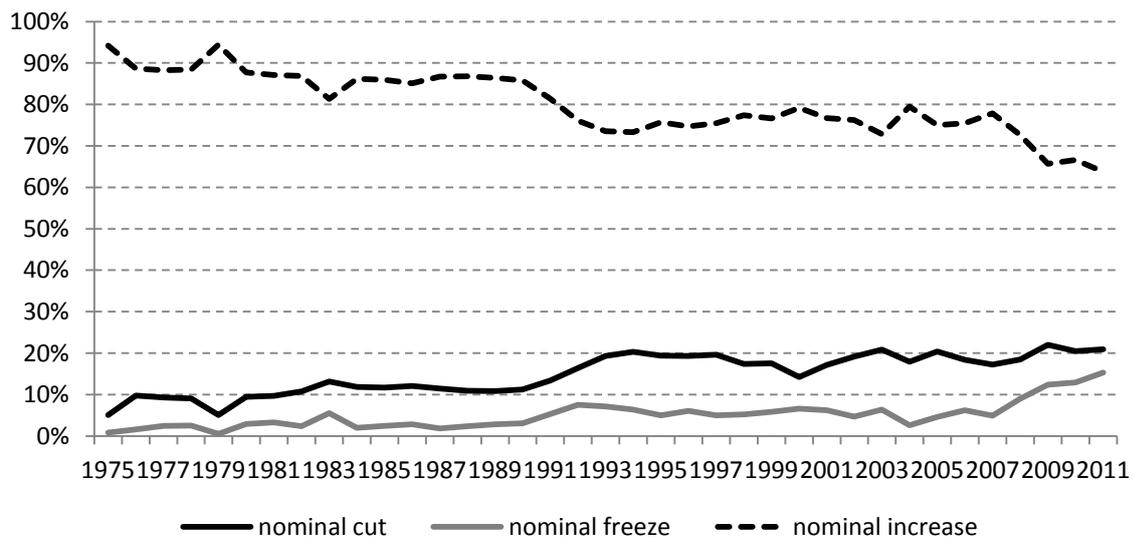


Note: Sample restricted to individuals being in the same main job in the coming year. The labelled year refers to the base year. We have excluded observations whose gender, industry, occupation or work area has changed despite claiming to be in the same job.

Source: New Earnings Survey Panel Dataset 1975-2012. Freeze defined as  $|\%change| < 0.1\%$ .

Figure 20 shows that between 2010 and 2011, 70% of employees who stayed in the same job faced real wage cuts, while Figure 21 shows that a third of those workers faced nominal wage freezes or cuts (12% experienced freezes and 21% experienced cuts). The last time that such a high proportion of workers faced real wage cuts was between 1976 and 1977, when inflation exceeded 15%, while the proportions of nominal wage freezes and cuts are the highest since the series began in the mid 1970s. Those percentages of real cuts would have been lower if we had used another deflator (such as the Consumer Prices Index or the GDP deflator), but the broad pattern would have remained the same.

Fig. 21. *Percentage of Stayers whose Nominal Wages were Cut, Frozen or Raised*



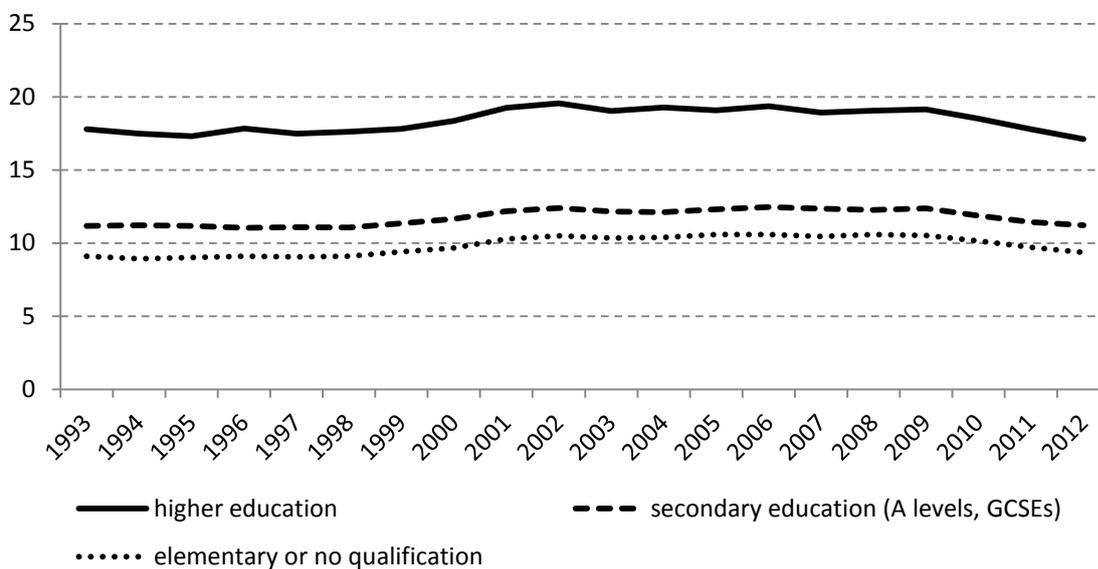
Note: Same as Figure 20.

Source: New Earnings Survey Panel Dataset 1975-2012. Freeze defined as  $|\%change| < 0.1\%$ .

Moreover, these changes have occurred amongst a range of different types of workers (e.g. by gender, age, occupation, industry and firm size) and across the wage distribution. For example, Figure 22 shows that average hourly wages have fallen by about 10% in real terms between 2009 and 2012 for those with higher education as well as for those with low or no qualifications. Similarly,

Figure 23 shows that average real hourly wages have fallen by more amongst individuals at the top of the distribution than amongst individuals in the middle and at the bottom of the distribution in this recession, while in previous recessions wages continued to grow for individuals at the top of the distribution. One important reason may be the falling employment share of financial industries (a high-earning sector hit particularly hard in this recession in the UK)<sup>13</sup> and the slowdown of wage growth amongst those remaining in that sector. Stagnation (rather than reductions) in wages at the bottom of the distribution may be at least partly attributable to the floor introduced by the minimum wage in 1999, which has been shown to have helped reduce earnings inequality in the UK (see, for example, Dolton *et al.*, 2012). Figures B1 and B2 in Appendix B also replicate Figures 20 and 21 for different quintiles of the wage distribution, finding a similar pattern. As a result, earnings inequality has stagnated or even fallen slightly during the recent recession, while it continued to increase during previous recessions.

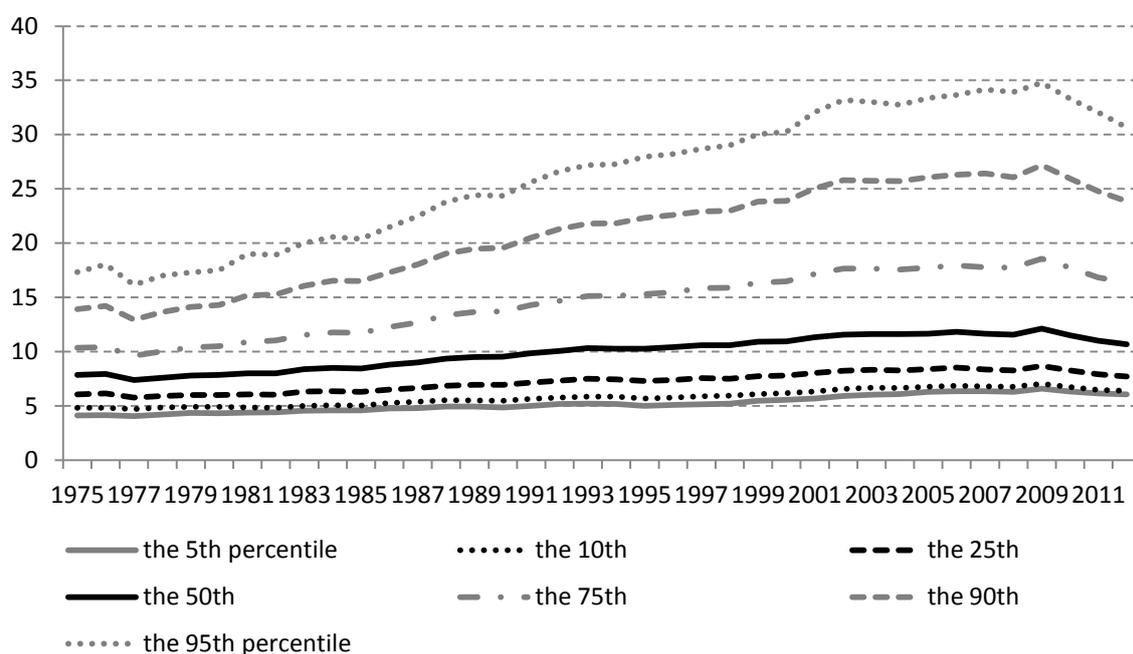
Fig. 22. *Average Real Hourly Wage by Highest Qualifications Achieved*



Note: The sample is 16-59 year olds in the Labour Force Survey. Wages are deflated by the RPI and in 2012 prices.

<sup>13</sup> “Financial and insurance activities” accounted for 3.9% of total employment in 2013Q2, compared to 4.4% in 2007Q2. Source: ONS table EMP13 “All in employment by industry sector”.

Fig. 23. *The Distribution of Real Hourly Wages*



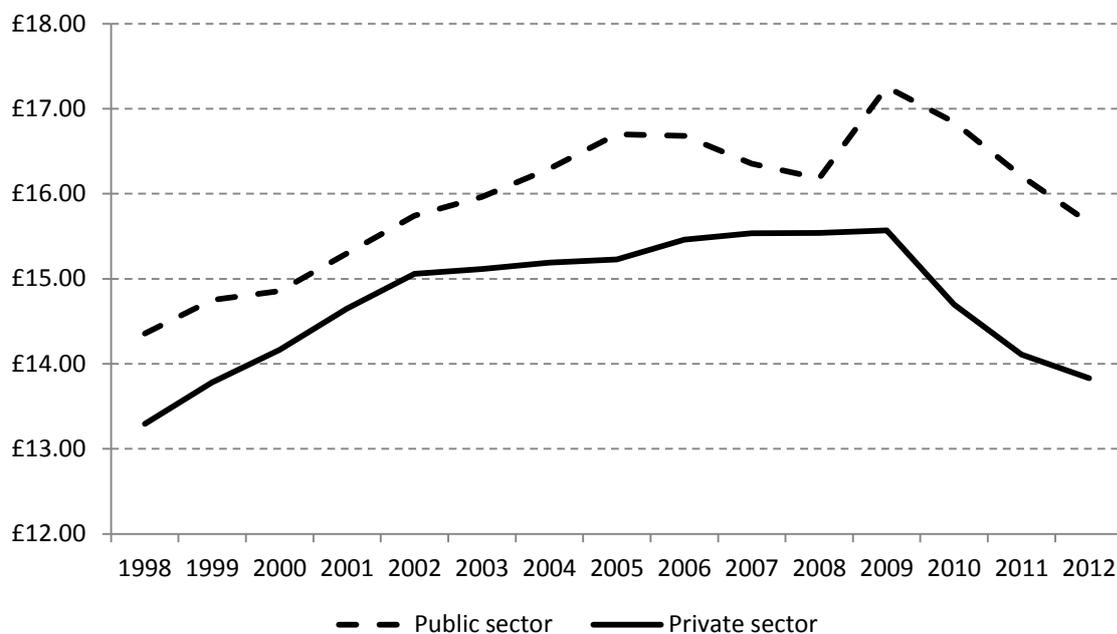
Source: New Earnings Survey Panel Dataset, excluding employees whose pay was affected by absence, those with non-positive hours or earnings, and overtime. Nominal wages have been inflated to April 2012 prices using the RPI.

It is also interesting to note that despite widespread discussion and acknowledgement of public sector pay restraint, Figure 24 shows that average real hourly wages (amongst workers who stay in the same job) have actually fallen faster in the private sector than in the public sector over the last few years, such that the public-private sector wage gap has increased substantially over this period.

Why are workers so much more likely to have experienced nominal wage freezes or cuts during this recession compared to previous recession? One hypothesis that we are able to test (at least to some extent) is that it is because the labour market is now substantially more flexible than it was in the 1980s or 1990s. There has been a dramatic decline in trade union membership over the last 30 years, from a peak of around 13 million members (37% of the working age population) in the early

1980s to around 7.5 million (19%) in 2008.<sup>14</sup> This decline has been accompanied by a reduction in the proportion of employees covered by collective bargaining, which appears to have made it easier for employers to hold constant or reduce insiders' wages.

Fig. 24 *Average Real Hourly Wages in the Public versus Private Sector*

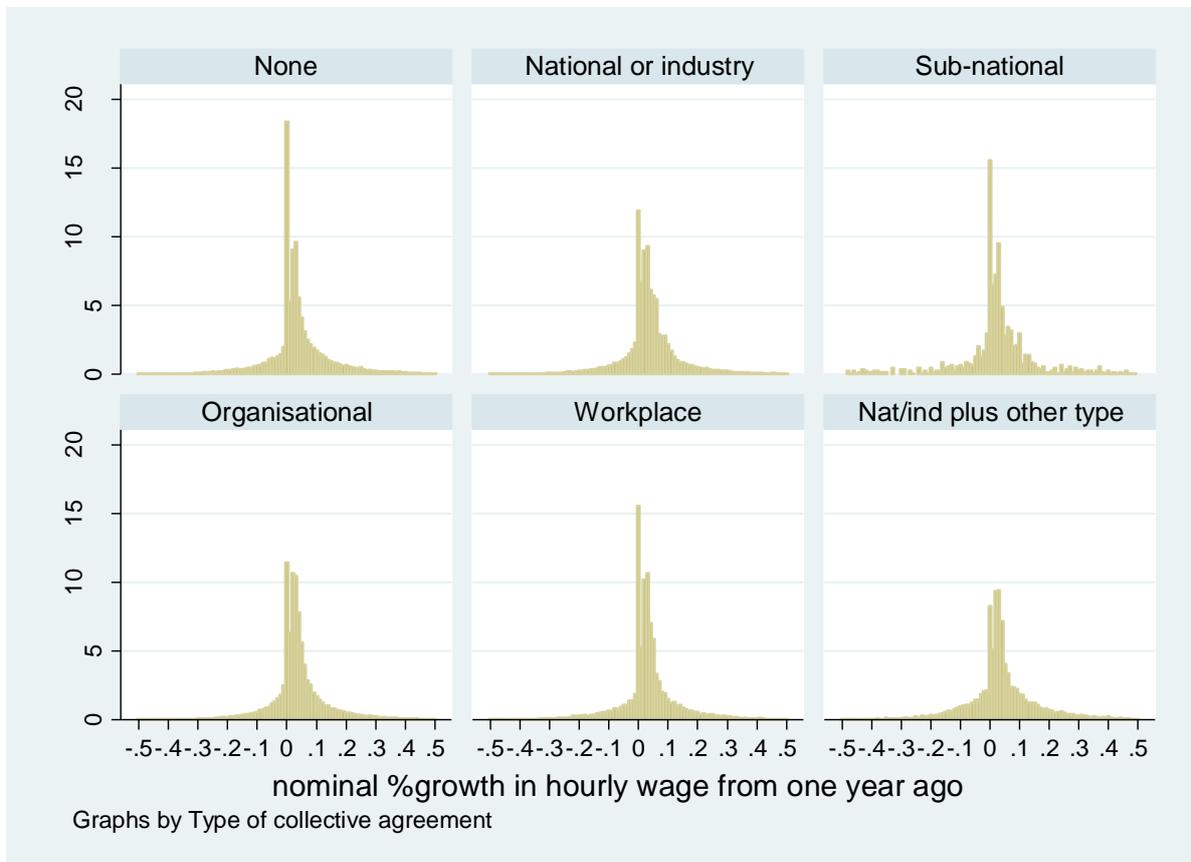


Note: same sample restriction and exclusions as Figure 20. Source: Annual Survey of Hours and Earnings 2005-2012 (unweighted). Main job (i.e. job that gives the highest weekly earnings) only. Wages are in April 2012 prices.

Figure 25 shows that year-on-year nominal wage freezes over the period 2008 to 2012 were more prevalent in jobs without collective agreements, and that where pay awards were agreed at the national, industry or organisational level, proportionally more workers experienced small positive nominal wage growth.

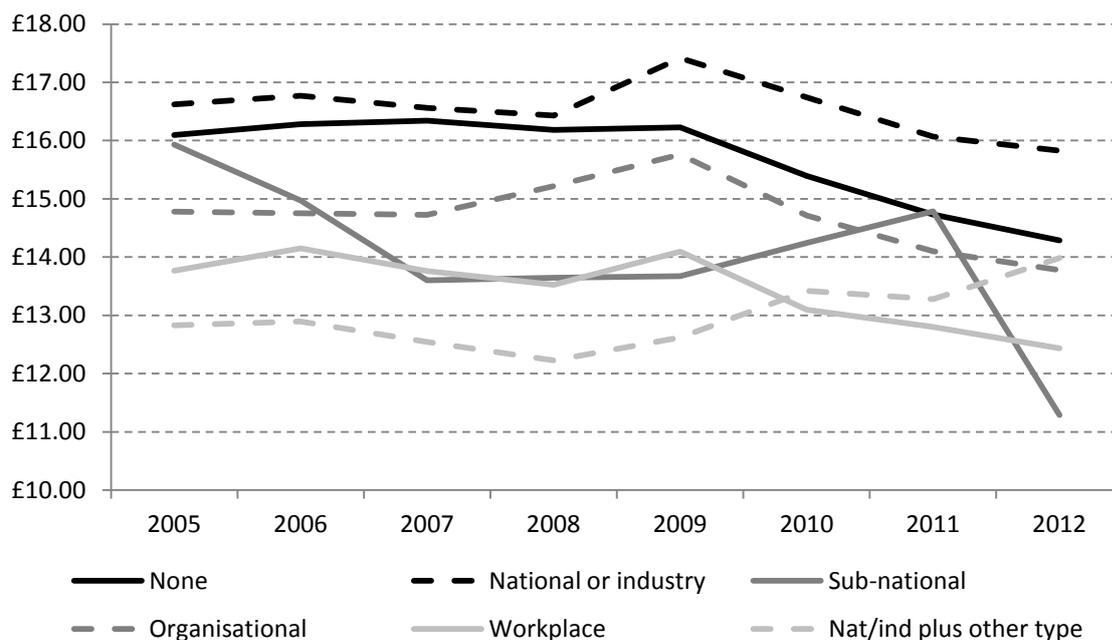
<sup>14</sup> Source: authors' calculations using Achur (2011) for trade union membership and <http://www.neighbourhood.statistics.gov.uk/HTMLDocs/dvc1/UKPyramid.html> for working age population.

Fig. 25 Distribution of Year-on-year Nominal Hourly Wage Growth by Type of Collective Agreement, 2008-12



Source: Annual Survey of Hours and Earnings. For any employees with more than one job, we only look at the main job as defined by gross weekly earnings excluding overtime. The sample is also restricted to employees being in the same main job as the preceding year. Each of the six distributions pool together observations from 2008 to 2012.

Fig. 26. Average Real Hourly Wages by Type of Collective Agreement



Source: Annual Survey of Hours and Earnings 2005-2012(unweighted). Sample restricted to individuals being in the same main job as the preceding year. Main job (i.e. job that gives the highest weekly earnings) only. Wages are in April 2012 prices. Each data point is based on thousands of observations except the series "sub-national", which has 180-420 observations per year.

Similarly, Figure 26 shows that average real wages have fallen least amongst those covered by collective agreements at the national or industry level. Taken together, these patterns suggest that the decline in collective bargaining which has accompanied rapidly falling trade union membership may have contributed to wage stagnation during the recent recession and hence may help to explain why wages have fallen further in this recession than in the past. This may also help to explain the differences between public and private sector pay shown in Figure 21. However, it is clear that average real wages in 2012 were no higher than in 2005 even for workers protected by national or industry-level collective bargaining. In other words, while the decline in collective bargaining was a contributing factor, it is far from the main cause of the aggregate wage falls since 2009.

## 5. Conclusions and policy implications

This paper has used individual data on employment and wages to try to shed light on the UK's productivity puzzle. Overall, we have shown that the supply of workers in this recession is higher than in previous recessions: the labour supply curve has shifted to the right. However, despite the increase in supply occurring amongst groups towards the lower end of the jobs market, there is strong evidence against the composition or quality-of-labour hypothesis as a potential explanation for the reduction in wages and hence productivity that we observe. By contrast, we find significant real wage reductions amongst individuals who have stayed in the same job year-on-year, with around one third of workers experiencing nominal wage freezes or cuts between 2010 and 2011 and 70% experiencing real wage cuts (on the basis of the Retail Prices Index). So the real question is: why have wages for existing workers been able to fall so much in this recession compared to previous recessions?

Part of the explanation is the higher labour supply that we have observed in this recession. We provide some evidence that a combination of policy changes and reductions in the value of household wealth may have contributed to this. This means that there are more individuals willing to work at any given wage and thus that there is likely to be greater competition for jobs. As a consequence workers are likely to have lower reservation wages than in the past and seem to attach more weight to staying in work (because their expected time to find another job is longer than in the past) than on securing higher wages, and are thus willing to accept lower wages in exchange for holding onto their job. This is consistent with the findings of Gregg *et al.* (2013), who show that wages have become more responsive to local unemployment rates since the early 2000s.

Another likely factor is that the labour market is now substantially more flexible than it was in the 1980s or 1990s. There has been a dramatic decline in trade union membership over the last 30 years, which appears to have made it easier for employers to reduce insiders' wages: nominal wage freezes were more prevalent in jobs without collective agreements and average wages have fallen least amongst those covered by collective agreements at the national or industry level. The fact that

similar reductions in trade union membership have occurred in other countries with very different responses to the recent recession (e.g. the US), however, means that this cannot be the whole story.

A final piece in the puzzle – discussed extensively in Van Reenen (2013) – is that the reduction in productivity might be driven by a reduction in the capital-labour ratio as a result of an increase in the cost of capital (particularly for small and medium sized firms) or the continuing misallocation of capital to less efficient firms or projects. There has certainly been a sharp reduction in business investment over the course of the recent recession, which has been significantly larger than in previous recessions (Benito *et al.*, 2010) and amongst small and medium-sized firms (Crawford *et al.*, 2013). While Crawford *et al.* (2013) provide some evidence that the reduction in investment can explain only a small proportion of the within-firm changes in productivity in 2008-09, it is plausible that reductions in productivity resulting from a fall in the capital-labour ratio also contributed to reductions in real wages and hence labour costs, which Crawford *et al.* (2013) find to be the primary driver of productivity falls.

Thus, while it is impossible to tell the extent to which lower productivity is being driven by lower wages or lower wages are being driven by lower productivity, obtaining new insights into the drivers of the significant reductions in wages that we observe amongst those who remain in the same job year-on-year would seem to be at the heart of understanding the UK's productivity puzzle.

## **Appendix A. Data sources used**

The **English Longitudinal Study of Ageing (ELSA)** is a longitudinal dataset of a representative sample of 50-year-olds and above in England. It contains a huge amount of information on wealth, health, pension schemes, employment, and other economic and social circumstances. ELSA began in 2002-03. This study uses linked ELSA 2006-7 (Wave3) and 2010-11 (Wave 5), and has a sample of more than 7,000 respondents.

The **Family Expenditure Survey (FES)** is a repeated cross-sectional survey focusing on expenditures and incomes of households in the UK. In 2001 the FES was merged with the National Food Survey (NFS) to create the Expenditure and Food Survey (EFS). At the individual level, the FES/EFS contains employment status, hours, incomes from different sources and some demographic information. There are 5,000-9,000 adult respondents every year.

The **Labour Force Survey (LFS)** is a survey of employment circumstances of households in the UK. It started as a bi-annual survey in 1975, becoming annual from 1983 to 1991 and quarterly since 1992 Q2. The survey contains detailed information on individual characteristics such as education, ethnicity, and household composition. Since the LFS became quarterly, each respondent is interviewed at five consecutive quarters and in each wave one-fifth of the households in the sample are replaced. The LFS contains around 100,000 individuals per quarter. Wages are surveyed in the first and the fifth interviews only, and from 1992 only.

The **New Earnings Survey Panel Dataset (NESPD)** is a large panel dataset of earnings of individuals in the UK. Broadly speaking, the sample frame contains all working individuals whose National Insurance number ends in a particular pair of digits, so the same individuals can be linked over time. The survey forms are sent to their employers and ask detailed questions about hours, wages and pensions arrangements. There is little information on individual characteristics. The NESPD combines

the New Earnings Survey (1975-2003) with the Annual Survey of Hours and Earnings (ASHE, 2004-2011). The sample size is around 150,000 every year.

## Appendix B. Additional tables and figures

Table B1 *Effect of Simulated and Actual Changes to Financial Wealth on Employment Status*

	Simulated change: Wave 3 to Wave 4			Actual change: Wave 3 to Wave 4		
	% change	Effect of change on employment in wave 5		% change	Effect of change on employment in wave 5	
		Men	Women		Men	Women
Bottom quintile: most negative change	-4.8%	0.003 (0.035)	-0.042 (0.035)	-13.4%	0.015 (0.024)	-0.003 (0.023)
2 <sup>nd</sup> quintile	-0.9%	-0.028 (0.034)	-0.030 (0.033)	-1.4%	0.005 (0.024)	0.007 (0.023)
3 <sup>rd</sup> quintile	-0.2%	-0.006 (0.033)	-0.006 (0.033)	0.0%	-0.048* (0.027)	0.043* (0.023)
4 <sup>th</sup> quintile	0.0%	-0.036 (0.035)	0.018 (0.032)	0.9%	-0.010 (0.028)	0.028 (0.025)
Top quintile: least negative change (reference category)	0.6%	(omitted)	(omitted)	23.2%	(omitted)	(omitted)
Observations	4,286	1,947	2,339	4,286	1,947	2,339
R-squared		0.52	0.51		0.52	0.51

See Notes to Table 1.

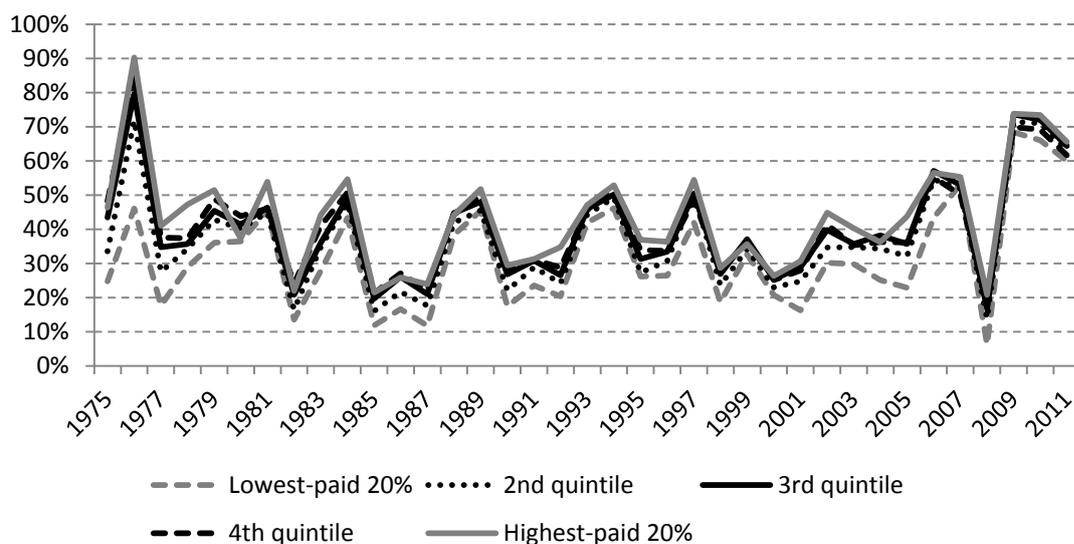
Table B2 *Effect of Simulated and Actual Changes to Housing Wealth on Employment Status*

Simulated change: Wave 3 to Wave 4			Actual change: Wave 3 to Wave 4	
% change	Effect of change on employment in wave 5		% change	Effect of change on employment in wave 5

		Men	Women		Men	Women
Bottom quintile: most negative change	-5.7%	-0.012 (0.0344)	0.007 (0.030)	-20.4%	-0.005 (0.027)	0.004 (0.023)
2 <sup>nd</sup> quintile	-2.8%	-0.008 (0.030)	-0.0003 (0.027)	-3.5%	-0.020 (0.026)	-0.008 (0.023)
3 <sup>rd</sup> quintile	-0.3%	-0.054* (0.031)	0.024 (0.028)	0.0%	-0.039 (0.028)	-0.007 (0.024)
4 <sup>th</sup> quintile	0.6%	-0.073*** (0.028)	-0.029 (0.025)	2.3%	-0.045 (0.029)	-0.028 (0.027)
Top quintile: least negative change (reference category)	3.1%	(omitted)	(omitted)	17.6%	(omitted)	(omitted)
Observations	4,205	1,911	2,294	4,205	1,911	2,294
R-squared		0.52	0.512		0.519	0.512

See Notes to Table 1.

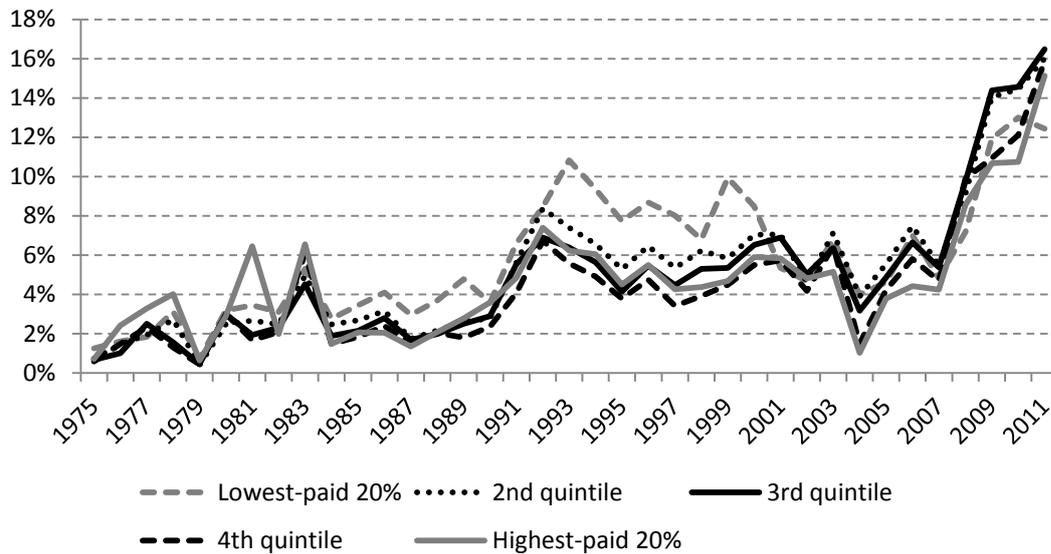
Fig. B1. %Stayers Facing Real Wage Cut in the Coming Year by Current Wage Quintile



Note: same as Figure 20

Source: New Earnings Survey Panel Dataset 1975-2012. There are 20,000-30,000 observations underlying each data point.

Fig. B2. %Stayers Facing Nominal Wage Freeze in the Coming Year by Current Wage Quintile



Note: same as Figure 21

Source: New Earnings Survey Panel Dataset 1975-2012. There are 20,000-30,000 observations underlying each data point.

### Authors' affiliations

Richard Blundell – University College London and Institute for Fiscal Studies

Claire Crawford – Warwick University and Institute for Fiscal Studies

Wenchao Jin – Institute for Fiscal Studies

Submitted: 29 April 2013

Accepted: 26 October 2013

### References

- Achur, J. (2011). 'Trade Union Membership 2010', A National Statistics Publication from the Department for Business, Innovation and Skills.
- Avram, S., Brewer, M. and Salvatori, A. (2013). 'Lone Parent Obligations: an impact assessment', DWP Research Report No 845
- Banks, J., Crawford, R., Crossley, T. and Emmerson, C. (2012). 'The effect of the financial crisis on older households in England', IFS Working Paper W12/09.
- Benito, A., Neiss, K., Price, S. and Rachel, L. (2010), The impact of the financial crisis on supply, *Bank of England Quarterly Bulletin*, Vol. 50, pp. 104–14.
- Blundell, R., Brewer, M. and Francesconi, M. (2008). 'Job changes and hours changes: understanding the path of labor supply adjustment', *Journal of Labor Economics*, Vol. 26, pp. 421-453.
- Blundell, R., Duncan, A., McCrae, J. and Meghir, C. (2000). 'The Labour Market Impact of the Working Families' Tax Credit', *Fiscal Studies*, Vol. 21, pp. 75-103.
- Blundell, R. and H. Hoynes (2004). 'Has 'In-Work' Benefit Reform Helped the Labor Market?', in Card, D., R. Blundell and R. Freeman (eds.), *Seeking a Premier Economy: The Economic Effects of British Economic Reforms, 1980-2000*, University of Chicago Press.
- Brewer, M. (2001). 'Comparing In-work Benefits and the Reward to Work for Low-Income Families with Children in the US and UK', *Fiscal Studies*, Vol. 22, pp. 41-77.
- Brewer, M., Duncan, A., Shepard, A. and Suárez, M. (2006). 'Did Working Families' Tax Credit Work? The Impact of In-Work Support on Labour Supply in Great Britain', *Labour Economics*, Vol. 13, pp. 699-720.
- Browne, J. and Hood, A. (2012). 'A Survey of the UK Benefit System', IFS Briefing Note 13.

Cascio, E. (2009). 'Public preschool and Maternal Labour Supply: Evidence from the Introduction of Kindergarten into American Public Schools', *Journal of Human Resources*, Vol. 44, pp. 140-170.

Crawford, C., Jin, W. and Simpson, H. (2013). 'Firms' productivity, investment and training: what happened during the recession and how was it affected by the national minimum wage?', Report to the Low Pay Commission 2013.

Crawford, R. (2013). 'The effect of the financial crisis on the retirement plans of older workers in England': Elsevier, *Economics Letters*, August 2013

Cribb, J., Emmerson, C. and Tetlow, G. (2013). 'Incentives, shocks or signals: labour supply effects of increasing the female state pension age in the UK', IFS Working Paper W13/03.

Crossley, T., Low, H. and O'Dea, C. (2013). 'Household Consumption Through Recent Recessions', *Fiscal Studies*, Vol. 34, pp. 203–229.

Disney, R. and Gathergood, J. (2013) 'House Prices, Wealth Effects and Labour Supply, School of Economics', University of Nottingham, Discussion Paper 13/02.

Disney, R., Jin, W. and Miller, H. (2013), 'The productivity puzzles' in (C. Emmerson, P. Johnson and H. Miller, eds ) *The IFS Green Budget 2013*.

Dolton, P., C. Rosazza Bondibene and J. Wadsworth (2012), Employment, inequality and the UK national minimum wage over the medium-term, *Oxford Bulletin of Economics and Statistics*, Vol. 74, pp. 78-106.

Dustmann, C., Fabbri, F. and Preston, I. (2005). 'The Impact of Immigration on the British Labour Market', *The Economic Journal* , Vol. 115, pp. F324-F341.

Dustmann, C., Frattini, T. and Preston, I. (2013). 'The Effect of Immigration along the Distribution of Wages', *Review of Economic Studies*, Vol. 80, pp. 145-173.

Fitzpatrick, M. (2012). 'Revising our thinking about the relationship between maternal labor supply and preschool', *Journal of Human Resources*, Vol. 47, pp. 583-612.

Goodridge, P., Haskel, J. and Wallis, G. (2013). 'Can intangible investment explain the UK productivity puzzle?' Centre for Research into Business Activity Working Paper.

Gregg, P., Machin, S. and Saldago, M. (2013). 'Real Wages and Unemployment in the Big Squeeze', mimeo.

Grice, J. (2012). 'The Productivity Conundrum: Interpreting the Recent Behaviour of the Economy', [Office for National Statistics](#).

Hughes, A. and Saleheen, J. (2012). 'UK labour productivity since the onset of the crisis – an international and historical perspective', Bank of England Quarterly Bulletin, 2012Q2.

Manacorda, M., Manning, A. and Wadsworth, J. (2012). 'The impact of immigration on the structure of wages: theory and evidence from Britain', *Journal of the European Economic Association*, Vol. 10, pp. 120-151.

Patterson, P. (2012). 'The Productivity Conundrum: Explanations and Preliminary Analysis', [Office for National Statistics](#).

Pessoa, J. and Van Reenen, J. (2012). 'Decoupling of Wage Growth and Productivity Growth: Myth and Reality', Report to the Resolution Foundation Commission on Living Standards.

Pessoa, J. and Van Reenen, J. (2013). 'The UK productivity and jobs mystery: does the answer lie in labour market flexibility?', mimeo.

Van Reenen, J. (2003). 'Active Labour Market Policies and the British New Deal for the Young Unemployed in Context', NBER Working Paper No. 9576, March 2003

