Briefing

Resolution Foundation

A Polarising Crisis?

The changing shape of the UK and US labour markets from 2008 to 2012

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Introduction

When Britain and America joined other developed economies in deep recessions in 2008-09, labour markets in both countries were hit hard. Unemployment rates rose steeply, employment rates fell, and neither country has yet fully recovered. But the great recession has also reshaped both labour markets, hitting some occupations and industries harder than others. This note examines these effects, showing how the make-up of the UK and US jobs markets has been changed by the crisis. It reveals how the hit to employment has played out differently for low-, middle- and high-skilled occupations and for different industrial sectors. And for the UK it shows how real wages and employment have reacted differently across occupations, depending on the types of tasks a job involves.

The findings we present contribute to two debates about how labour markets are changing in the long- and short-term, both of which bear on the likely shape of the labour market recovery. First, they help us understand whether the crisis has accentuated or mitigated the polarisation of mature labour markets that was evident before the crisis. Long before 2008, low-skilled and high-skilled jobs were expanding their share of employment in the UK and US while middle-skilled jobs were in relative decline. There are still disputes over these findings; economists differ over their significance for labour market theory and their implications for wage inequality. And there is an important ongoing debate over the respective roles of technological change and shifting patterns of demand in driving polarisation. But understanding how the crisis affected these important changes will be key to understanding the kind of recovery we can expect.

Second, they add to a more recent debate over how the UK and US jobs markets have responded to the great recession. The UK labour market in particular has surprised economists in the way it has reacted to the downturn, with real wages falling far further than anticipated while employment has held up well. Indeed, in the UK and, to a lesser extent the US, this recession has generated less concern than usual with the overall *level* of unemployment and more with the *types* of jobs that are being created. Our findings feed into these debates, showing whether it is low-skilled or high-skilled occupations and industries that have been driving employment performance. Even if a recovery now takes hold, will we be emerging from the crisis with a different kind of labour market to the one we entered with?

The first section of the note sets out our findings for the UK, focusing on trends by occupation and then trends by industrial sector. It also describes how real wages and employment have responded to the downturn differently in different types of jobs, on the basis of an occupation's task-content. The second section of the note presents findings for the US, looking first at occupations and then at industries. The final section of the note discusses the challenges of interpreting these findings, talking through what they do and do not tell us in light of the latest academic debates in this area.

The key lessons from the analysis are that:

- **Occupational polarisation was accentuated by the 2008 crisis** in both the UK and, to a greater extent, the US. In both economies, low- and high-skilled jobs expanded their share of employment from 2008 to 2012 while middle-skilled jobs saw a relative decline. In both cases this represented a stronger performance for low-skilled jobs—relative to middle- and high-skilled jobs—than was seen in the earlier 2000s.
- Looked at by industrial sector, patterns of employment are less clear, but **in the UK and US the middle-paying third of sectors saw employment fall in absolute terms from 2008 to 2012 while low- and high-paying sectors saw employment rise.** In the UK in particular this pattern masks

standout successes in certain sectors at the top and bottom of the labour market. *Hotels and Restaurants*, the UK's lowest paying sector, grew faster than any other sector from 2008 to 2012, seeing employment rise by 17.1 per cent. Meanwhile, at the top, *Business Activities* grew 15.5 per cent from 2008 to 2012 as net employment rose by 460,000. The US saw an unambiguously strong showing from most low paying sectors, with five of the six lowest paying US sectors adding jobs from 2008 to 2012. In both countries, employment was shed from *Construction* and *Manufacturing* in the period 2008 to 2012.[1]

- **In the UK, occupations responded differently to the downturn depending on the tasks they involve.** Employment in non-routine occupations rose through 2008 to 2012 while employment in routine occupations, which are easier to automate, fell strongly. Meanwhile, real wages showed the opposite pattern; wages have fallen far more in non-routine roles than in routine roles, perhaps reflecting the fact that employers have made efforts to retain non-routine workers by squeezing their pay.

[1] In the US, this followed a path of heavy falls in manufacturing employment from 2008 into 2009 followed by a gradual recovery.

Section 1 *– The reshaping of the UK jobs market before and after 2008*

To put our findings in context, we start by setting out new analysis of polarisation in the UK labour market in the last two decades. We then zoom in to examine how the composition of employment changed in the run up to 2008 and in the post-crisis period. Our main interest in this section is how employment trends have played out by occupations across the distribution of skills, from low- to high-skilled jobs.

The findings we present in this section build on a strong academic literature. It is well-established that the UK saw occupational polarisation through the 1980s and 1990s (Goos and Manning, 2003) as low- and high-skilled jobs expanded their share of employment while middle-skilled roles saw a relative decline. This finding has since been extended to the 2000s (Oesch and Rodríguez Menés, 2010) and similar patterns have been found across European economies (Goos, Manning and Salomons, 2009). While the broad fact of polarisation is now widely accepted, recent work for the Resolution Foundation has also added complexity to these arguments, suggesting that the rise of top jobs is partially accounted for by job-title inflation (Mayhew and Holmes, 2012). More recently, there has been a lively academic debate about the causes of polarisation (Lindely and Machin, 2013) and the question of whether polarisation leads to rising wage inequality (Holmes and Mayhew, 2010). This note adds new evidence on occupational trends for the pre- and post-crisis period.

The approach we take draws on established methods, the full details of which are set out in Box 1 and Annex A. Broadly speaking, we follow the literature in using wages as a proxy for a job's skill-level, ranking occupations on a spectrum from low- to high-skilled. We use an occupation's average pay in 2002, a slightly different approach to the established literature which relies on earnings in the late 1970s or 1980s. This reflects our focus on the more recent period. We follow the method of Lindley and Machin (2013) in defining the distribution of jobs, meaning that each percentile in our charts represents one per cent of the jobs in the UK economy. We also follow their approach of reporting changes in employment relative to the average. This means that our results tell us about how the *shape* of the labour market is changing, not about the overall *level* of job creation—that is, we show how middle-skilled jobs are performing *relative to low- and high-skilled jobs*.

Box 1: Defining the distribution of occupations

To carry out the analysis in this section we construct a ranking of occupations intended to reflect their skill level. We do this by ranking occupations based on their mean hourly pay in the 2002 Labour Force Survey (and on the basis of mean wages in 1985 for our longer-term look at UK trends). We then apply the total share of employment (excluding self-employment) in each occupation in order to distribute these occupations across the percentiles shown in the x-axis in Figures 1-3. This means that each percentile shown in these figures represented 1 per cent of the labour share in 2002 (or 1985 in the case of Figure 1). The graphs are smoothed to show growth in employment shares by percentiles between specific years. Importantly, this means that they reveal broad patterns of change in the labour market and, as a flipside to this, can conceal significant variation in the performance of specific occupations.

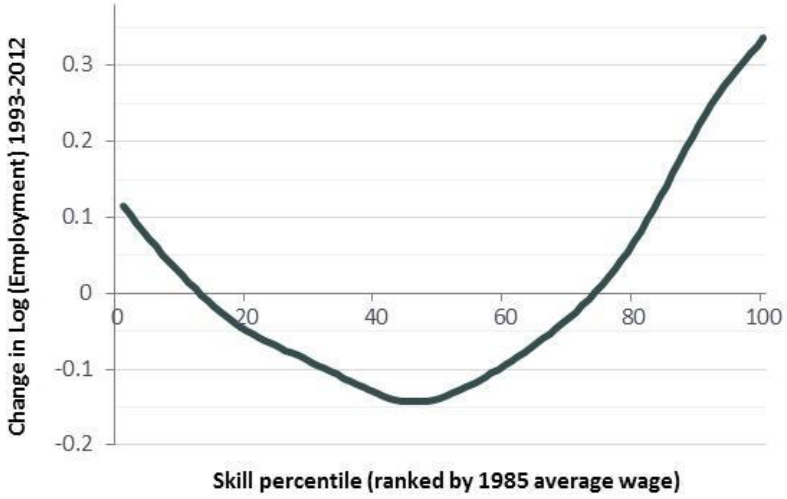
To show changes in the employment shares of different occupations we follow the approach of Lindley and Machin (2013) and scale growth relative to the average across all occupational wage percentiles. This means that a positive number shows an increased *share* in total employment while a negative number

implies a fall, and that the overall average growth is zero. The fact that we are focusing on relative changes in employment shares, rather than the overall numbers of jobs, is important to how we interpret the results. While middle-skill jobs are declining as a share of employment because they are expanding less quickly than low- and high-skilled jobs, they may still be growing in absolute terms.

Fuller details of our data sources and methodology are set out in Annex A.

Figure 1 sets the context by showing new analysis of how the shape of the UK labour market changed from 1993 to 2012. Because we are looking over a longer time period, here we define occupations on the basis of their average wage in 1985. The results confirm that the UK labour market has polarised in the last two decades, replicating findings in the established literature (Goos and Manning, 2003). High-skilled occupations have dramatically expanded their share of the UK labour market in the last two decades while middle-skilled occupations have experienced a relative decline. Low-skilled jobs in roughly the bottom fifth of the wage distribution have also increased their share of employment over time. This result is particularly important because it runs against traditional labour market theory which had anticipated that jobs in developed economies would become higher-skilled over time.

Figure 1: The changing shape of the UK labour market in the last two decades
Change in Log (Employment) across the skill-distribution of UK occupations, 1993-2012



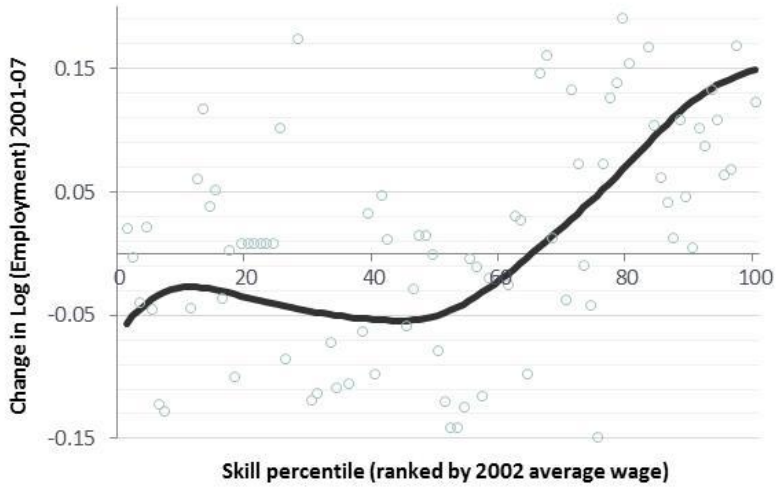
Notes: Skill percentiles are defined on the basis of mean wage in 1985. Each percentile relates to 1 per cent of employment in 1985. Graph shows smoothed growth in employment shares by percentile scaled relative to the average across all occupational wage percentiles—that is, a positive number shows an increased share in total employment while a negative number implies a fall. See Box 1 and Annex A for full methodology.
Source: Resolution Foundation and Centre for Economic Performance analysis, Labour Force Survey

So how did this long-term trend of polarisation play out in the more recent period? Figure 2 shows how the shape of the UK labour market changed from 2001 to 2007. It is important to note that these results are not directly comparable to those in Figure 1 because we now define occupations on the basis of their average pay in 2002 to get a more accurate sense of the distribution of jobs in this period.

A broadly similar ranking can be seen between low-skilled, middle-skilled and high-skilled occupations, but with some important differences. High-skilled jobs—specifically around the top 30 per cent of jobs—expanded their share of employment over time while jobs from around the 70th percentile down fell as a share of overall employment. In contrast to the earlier period, lower skilled occupations did not expand

their share of employment. The lowest 20 per cent of jobs held their share of employment roughly constant. These results are echoed in findings presented below for the US labour market in the 2000s. They suggest that occupational polarisation was somewhat less pronounced in the UK in the 2000s than in earlier decades, particularly in the bottom quarter of the labour market.

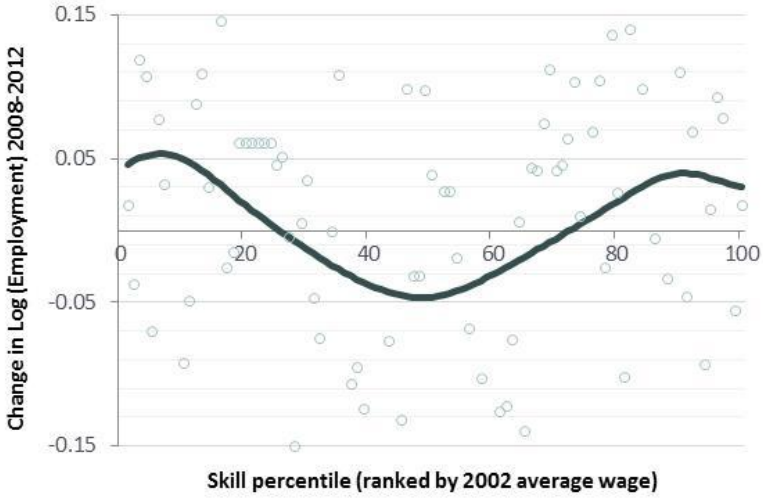
Figure 2: The changing shape of the UK labour market before the crisis
Change in Log (Employment) across the skill-distribution of UK occupations, 2001-2007



Notes: Skill percentiles are defined on the basis of mean wage in 2002. See Box 1 and Annex A for full methodology.
Source: Resolution Foundation and Centre for Economic Performance analysis, Labour Force Survey

Figure 3 for the first time shows how this pattern changed after 2008. The results are again measured on the basis of average pay in occupations in 2002 and so are directly comparable with the results in Figure 2. Again, they show how employment shares changed across occupations from 2008 to 2012. The findings show that polarisation has been more pronounced in the UK since 2008 than in the pre-recession period. In particular, low-skilled occupations in this period actually outperformed occupations across the spectrum, with the bottom quarter of jobs expanding their share of overall employment. At the top end of the jobs market, high-skilled jobs grew their share of employment at a relatively slower rate than in the pre-recession period but still expanded overall. Meanwhile, middle skilled jobs from around the 25th to the 75th percentile saw their share of employment continue to decline relative to other occupations.

Figure 3: The changing shape of the UK labour market after the crisis
Change in Log (Employment) across the skill-distribution of UK occupations, 2008-2012



Notes: Skill percentiles are defined on the basis of mean wage in 2002. See Box 1 and Annex A for full methodology.
Source: Resolution Foundation and Centre for Economic Performance analysis, Labour Force Survey

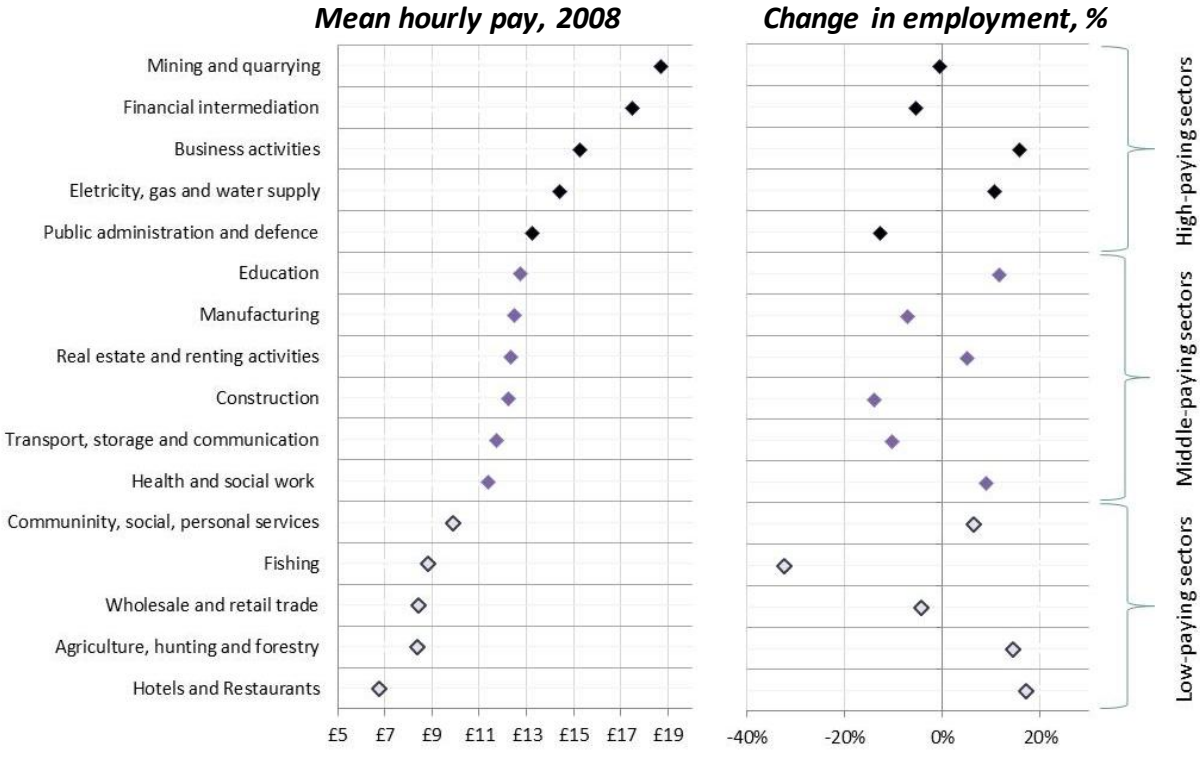
Employment change by industrial sector

The analysis presented so far has focused on how employment has changed in different occupations on the basis of skill-levels. The findings therefore tell us about changes in the types of tasks performed in the UK labour market. For example, is the UK workforce carrying out more low-skilled or more high-skilled tasks over time? In addition to this question, it is also important to understand how employment is playing out across industrial sectors (for example retail or finance). Rather than telling us about tasks, which vary widely within industrial sectors, this tells us more about the impact of industrial dynamics on employment. For example, how is the balance of employment in the UK labour market being changed by trends in the UK's international competitiveness and trends in labour productivity in different industries?

Figure 4 starts by showing new findings for the percentage growth in employment in each of the UK's major industrial sectors from 2008 to 2012. Rather than looking at changes in the share of employment, as we did in the previous section, here we shift focus to look at changes in net employment in absolute terms. Sectors are ranked by their mean wage in 2008 to highlight any relationship between patterns in employment and pay, with high-paying sectors shown at the top and low-paying sectors shown at the bottom. It is important to note that these results focus on the percentage growth in net employment in different sectors and so do not take into account the size of sectors, which we go on to do in Figure 5.

The results show that the fastest growing industrial sector in the UK from 2008 to 2012 was also the lowest paying sector: *Hotels and Restaurants*. In this sector, which in 2008 had an average wage of just £6.78 an hour, net employment increased by 17.1 per cent in just four years. In all, net employment rose by 220,000 in *Hotels and Restaurants* from 2008 to 2012. The sectors of *Agriculture, Hunting and Forestry* (also a very low-paying sector) and *Business Activities* (a very high-paying sector) also grew strongly while *Construction* and *Fishing* saw the biggest contraction in employment, shrinking by 14.1 per cent and 32.4 per cent respectively.

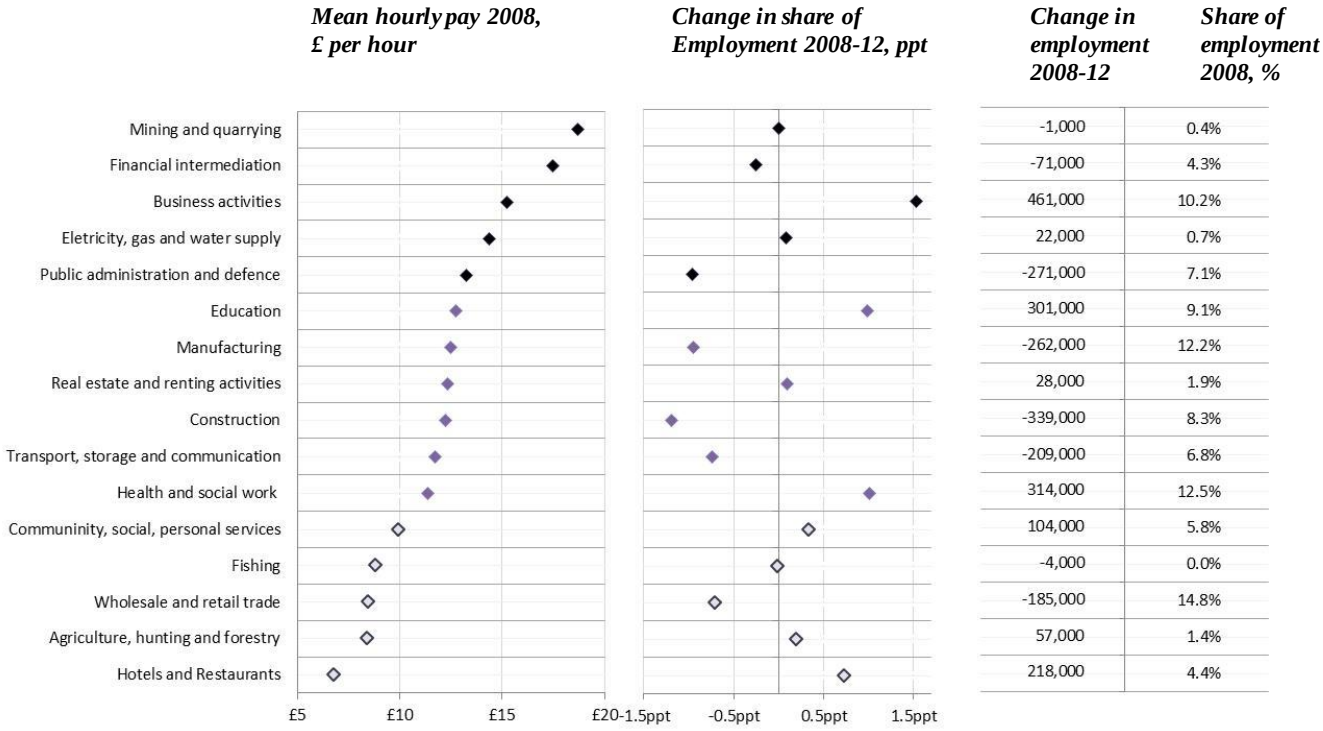
Figure 4: The winners and losers among UK industries after the crisis
Growth in net employment by industrial sector, 2008 to 2012



Notes: Changes relate to net employment by industry.
Source: Resolution Foundation and Centre for Economic Performance analysis, Labour Force Survey

How have these changes rebalanced the industrial make-up of the UK jobs market? To answer this question we need to take the relative size of different sectors into account. While a sector like *Fishing* experienced a large fall in employment from 2008 to 2012, the decline of such a small sector had little impact on the overall composition of the UK labour market. Figure 5 therefore shows the same list of sectors that was shown in Figure 4, again ranked by hourly pay, but this time showing the percentage point change in each sector's share of overall employment from 2008 to 2012. To the right of the chart we also show the total increase or decrease in employment in each sector over the same four year period as well as the sector's share of total employment in 2008.

Figure 5: The shifting industrial make-up of UK employment after the crisis
Change in share of UK employment, 2008 to 2012



Notes: Changes relate to net employment by industry.
Source: Resolution Foundation and Centre for Economic Performance analysis, Labour Force Survey

The results set out in Figure 5 tell an interesting story about how the composition of the UK labour market has changed in the aftermath of the 2008 crisis:

- **In lower paying parts of the UK economy** some sectors are growing while others have seen a decline. As we have seen, employment in *Hotels and Restaurants* increased by 218,000 from 2008 to 2012 and the sector's share of employment expanded by 0.7 percentage points from 4.4 to 5.1 per cent. These jobs were in the lowest paying sector in the UK economy, although it is important to remember that there is significant variation in pay within sectors. The *Health and Social Work* sector similarly expanded by 314,000 and by 1.0 percentage point as a share of overall employment from 12.5 to 13.5 per cent—a significant jump in just four years. *Retail* by contrast has seen a decline, with employment falling by 185,000 from 2008 to 2012 and the sector's share of overall employment falling by 0.7 percentage points from 14.8 to 14.1 per cent.
- **In higher paying parts of the UK economy,** *Financial Intermediation* shrank slightly as a share of overall employment, seeing employment fall by 71,000 overall. The *Business Activities* sector by contrast has been the outstanding success story of the last four years, continuing its long-running expansion, increasing net employment by 461,000, more than any other sector in this period, and

growing as a share of overall employment from 10.2 to 11.7 per cent. *Business Activities* was the third highest paid of any sector in 2008, paying an average of £15.26 an hour in 2008.

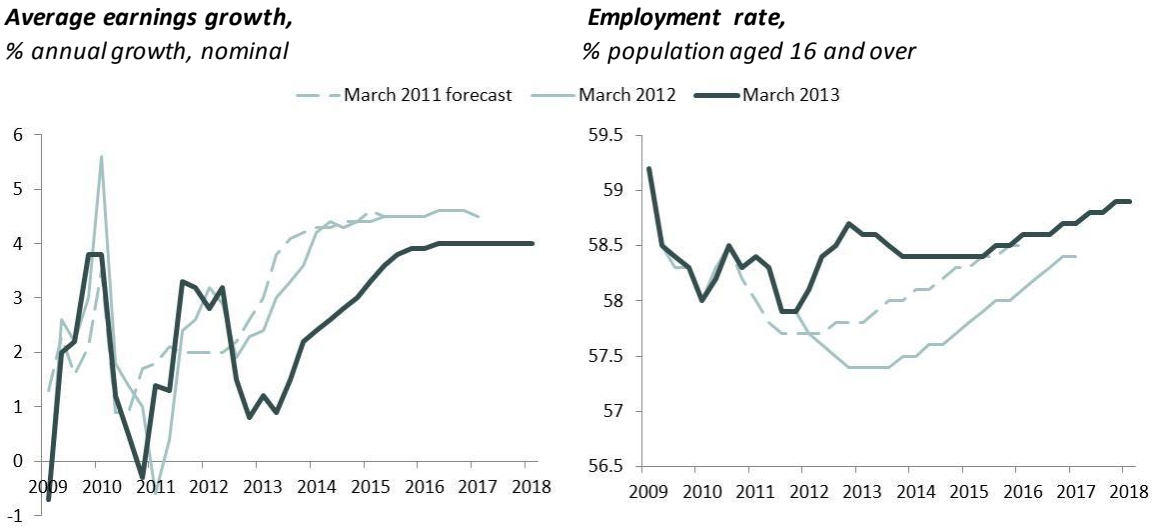
- **There were some clear impacts from the collapse in demand** as *Manufacturing* accelerated its long-term decline, seeing a fall in employment of 262,000 in this period while *Construction* slumped more than any other sector in terms of its share of employment, likely reflecting a cyclical impact of the downturn. Construction's share of employment fell by 1.2 percentage points from 2008 to 2012 as the number of jobs in the sector declined by 339,000.
- **Within sectors dominated by public expenditure**, there were stark differences in job losses and gains in different sectors. This is likely to reflect a combination of rising public spending from 2008 to 2010 and subsequent public spending settlements: employment in *Public Administration and Defence* fell by 271,000 and by 1.0 percentage point as a share of overall UK employment. Meanwhile *Education* expanded (by 301,000) and, as we saw above, *Health and Social Work* also expanded rapidly, seeing an increase in employment of 314,000.

Having taken into account the size of sectors, we see a slightly more pronounced relationship between low pay and employment in the years from 2008 to 2012, echoing the occupational polarisation shown above. Overall, employment increased by 190,000 in the lowest-skilled third of the UK economy (on the basis of average pay in 2008) from 2008 to 2012 while in the middle-skilled third of sectors employment fell by 169,000. In the highest-skilled third of sectors employment rose by 139,000 in the same period. As can be seen clearly in Figure 5, however, this relationship is weak, hiding significant variation between sectors in each category. There is also, of course, significant variation in pay *within* sectors—the Hotel and Restaurant industry, although low paying, nonetheless contains high paying occupations. For this reason, employment growth in a low paying industry may not necessary mean growth in low paying jobs.

Understanding the squeeze on real wages and employment in the context of polarisation

We finish this section by turning briefly to the relationship between real wages and employment in the downturn, exploring how this has played out in different occupations. Patterns of wage growth and employment have been the focus of much recent debate in the UK because of surprising outturns in the labour market since 2008. Real wages have dramatically underperformed expectations in the early years of the downturn while employment has over-performed. Figure 6 shows quite how significantly forecasts have been changed in this period, having been revised in different directions since March 2011.

Figure 6: Forecast revisions for wages and employment, Office for Budget Responsibility



Source: Resolution Foundation analysis, Office for Budget Responsibility supplementary economy tables, March 2011, March 2012 and March 2013 economic outlook

In light of these trends, it is useful to explore how real wage and employment growth has played out in different types of occupations since 2008. Here we look at whether these trends have played out differently for routine occupations compared to non-routine occupations. We take this approach because one of the key explanations for occupational polarisation in the academic literature is that routine jobs are now bearing the brunt of automation and so are drying up over time. These jobs — from skilled manufacturing to administration — are focused broadly in the middle of the wage distribution while non-routine jobs are over-represented in the low-paid and high-paid parts of the labour market. As a result, low- and high-paid non-routine jobs are absorbing a growing share of employment in mature economies.

If this theory holds, we might expect it to be reflected in the way employers have responded to the downturn. Specifically, we might expect employers to have worked harder to retain staff in non-routine roles during the downturn, for example by squeezing their real wages. Meanwhile, we might expect employers to have been more willing to let employees go from more routine occupations, accelerating the longer-term decline of these types of jobs.

To answer this question, we classify jobs in the UK labour market on the basis of their task-content (see Annex B for full methodology). We then score jobs on the basis of their 'routineness' — that is, on the basis of whether they involve routine tasks that could easily be automated, or non-routine tasks that are harder to automate. For simplicity we group jobs into three categories: 'routine' jobs that have a high routine-intensity, jobs with a 'middle routine-intensity'; and 'non-routine jobs' with a low routine-intensity. We then show how real wages and employment have changed in each case since 2008.

Figure 7 shows the results, outlining how employment and real wages have changed in these categories of jobs from 2007 to 2012. Table 1 shows more detailed findings. As anticipated, routine jobs have suffered a bigger hit to employment while non-routine jobs have seen stronger employment growth. Indeed non-routine roles have actually expanded in absolute terms throughout the downturn. Interestingly, real wages show the opposite trend, with non-routine jobs having seen a bigger squeeze on pay than routine jobs. This may be because employers have squeezed the pay of non-routine workers in an effort to minimise employment losses. In the case of routine workers, there may also be changes in composition at work, as lower paid routine workers lose their jobs, leaving a relatively better paid population in work.

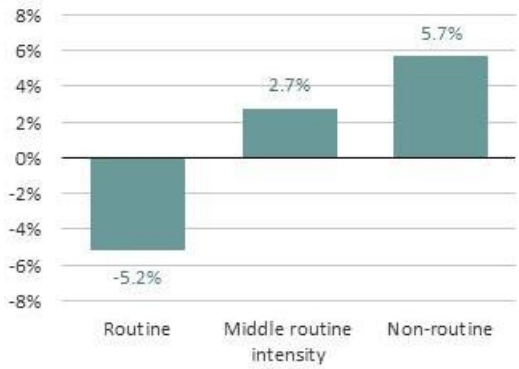
In between these two results, jobs with mid-level routine intensity have seen an apparently more cyclical response to the downturn. Their employment figures fell in the early post-crisis years and then recovered, though this recovery ran alongside a squeeze on real wages.

Our finding that routine jobs have been hit hardest by the downturn helps to explain the occupational polarisation seen in Figure 3. This is because routine jobs are over-represented in the middle of the skill distribution while non-routine jobs are relatively more likely to be either low- or high-skilled.

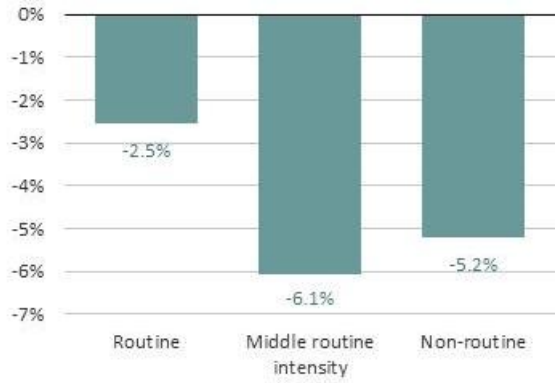
Figure 7: The wage squeeze and employment for different types of jobs

Real wage growth and employment growth by routine-intensity of occupation, 2007-2012

Change in employment, %, 2007-12



Change in average real wages, %, 2007-12



Notes: 'Routine' occupations are those in the top third of routine-intensity, 'middle routine intensity' relates to occupations in the middle third of routine-intensity, and 'non-routine' relates to occupations in the bottom third of routine-intensity. See Annex B for full methodology for defining routine-intensity.

Source: Labour Force Survey and O*Net dictionary of occupational information

Table 1: Trends in real wages and employment for different occupations

Real wages and total employment by routine-intensity of occupation, 2007-2012

	2007	2008	2009	2010	2011	2012		
Employment (thousands)							**Change 2007-12**	**Trend 2007-12**
Routine	9,250	9,180	8,950	8,910	8,830	8,770	-480 (-5.2%)	
Middle routine intensity	9,480	9,470	9,270	9,330	9,580	9,740	260 (2.7%)	
Non-routine	9,340	9,550	9,550	9,560	9,590	9,870	530 (5.7%)	
Share of total employment							***ppt change 2007-12***	
Routine	33.0%	32.5%	32.2%	32.0%	31.5%	30.9%	-2.1ppt	
Middle routine intensity	33.8%	33.6%	33.4%	33.6%	34.2%	34.3%	0.5ppt	
Non-routine	33.3%	33.9%	34.4%	34.4%	34.3%	34.8%	1.5ppt	
Average real wage (£ per hour, 2010 prces)							***% Change 2007-12***	
Routine	9.81	9.82	9.82	9.66	9.59	9.56	-2.5%	
Middle routine intensity	10.54	10.55	10.64	10.46	10.15	9.90	-6.1%	
Non-routine	17.05	16.93	16.96	16.78	16.18	16.16	-5.2%	

Notes: 'Routine' occupations are those in the top third of routine-intensity, 'middle routine intensity' relates to occupations in the middle third of routine-intensity, and 'non-routine' relates to occupations in the bottom third of routine-intensity. See Annex B for full methodology for defining routine-intensity.

Source: Resolution Foundation and Centre for Economic Performance analysis, Labour Force Survey and O*Net dictionary of occupational information

Section 2 – The story from the US

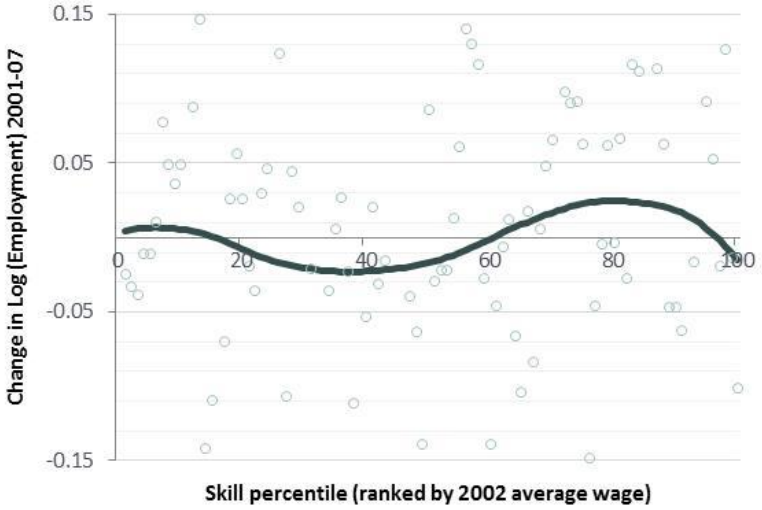
Having looked at recent trends in the UK, it is useful to draw comparison with the US labour market. In this final section of the note we present new findings for how the composition of the US jobs market changed before and after 2008.

The literature on labour market polarisation is more developed in the US than in the UK. Since the early 2000s, there has been evidence that routine occupations are in long-term decline in the US labour market relative to non-routine occupations (Autor, Levy and Murnane, 2003), meaning a similar occupational polarisation to that seen in the UK. In the US literature, there has also been significant work by labour market economists to formalise these findings into labour market models that can explain polarisation (Acemoglu and Autor, 2011). More recently, new research has explored the historic link between recessions and occupational polarisation (Jaimovich and Siu, 2012). As in the UK, recent research has also questioned the extent to which polarisation can explain rising wage inequality (Mishel, Schmitt and Shierholz, 2013).

Here we contribute to the literature by focusing on the more recent period. As with our results for the UK, we define the distribution of occupations on the basis of an occupation's average wage in 2002. Annex A also outlines our methodology and data sources for the US. Broadly speaking, we follow the method used in the established literature and use data from the Current Population Survey merged outgoing rotation group (CPS-MORG). Our use of a different base year for defining occupations (2002 as opposed to the late-1970s or mid-1980s more often used in the literature), means that our results are not directly comparable to some existing research, although in general our results concur with published findings.

Figure 8 shows how the share of employment made up by different occupations in the US labour market changed from 2001 to 2007. It is broadly consistent with the findings of Mishel, Schmitt and Shierholz (2013) which also suggest that the US labour market saw little polarisation in the 2000s. High-skilled occupations may have marginally expanded their share of overall employment in this period but the overall shape of occupational change was broadly flat. Our results differ marginally from other findings in the literature, for example Autor and Acemoglu (2011) which cover a slightly different time period and, as stated above, are referenced to a difference base year for defining occupations. In all, it seems likely that occupational polarisation slowed down in the pre-crisis US labour market.

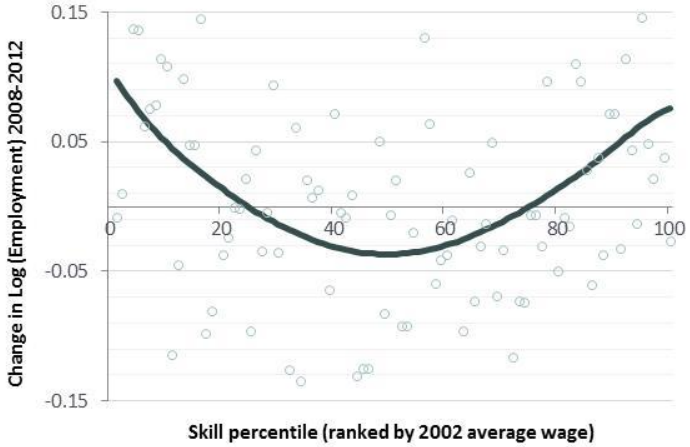
Figure 8: The changing shape of the US labour market before the crisis
Change in Log (Employment) across the skill-distribution of US occupations, 2001-2007



Notes: Skill percentiles are defined on the basis of mean wage in 2002. See Box 1 and Annex A for full methodology.
Source: Resolution Foundation and Centre for Economic Performance analysis, Current Population Survey merged outgoing rotation group, National Bureau of Economic Research

Figure 9 reports results for the post-crisis years from 2008 to 2012. As with the UK, polarisation appears to be more marked in this period. Indeed, the effects of the crisis on occupational polarisation in the US appear to have been more pronounced than in the UK. Low-skilled jobs expanded their share of employment more rapidly than jobs above them in the spectrum, and the magnitude of this change was larger in the US than in the UK. Again, it important to remember that this analysis show changes in the *shares* of overall employment, not the absolute level of employment—that is, the results show that middle-skill jobs declined as a share of overall employment relative to low- and high-skilled jobs.

Figure 9: The changing shape of the US labour market after the crisis
Change in Log (Employment) across the skill-distribution of US occupations, 2008-2012



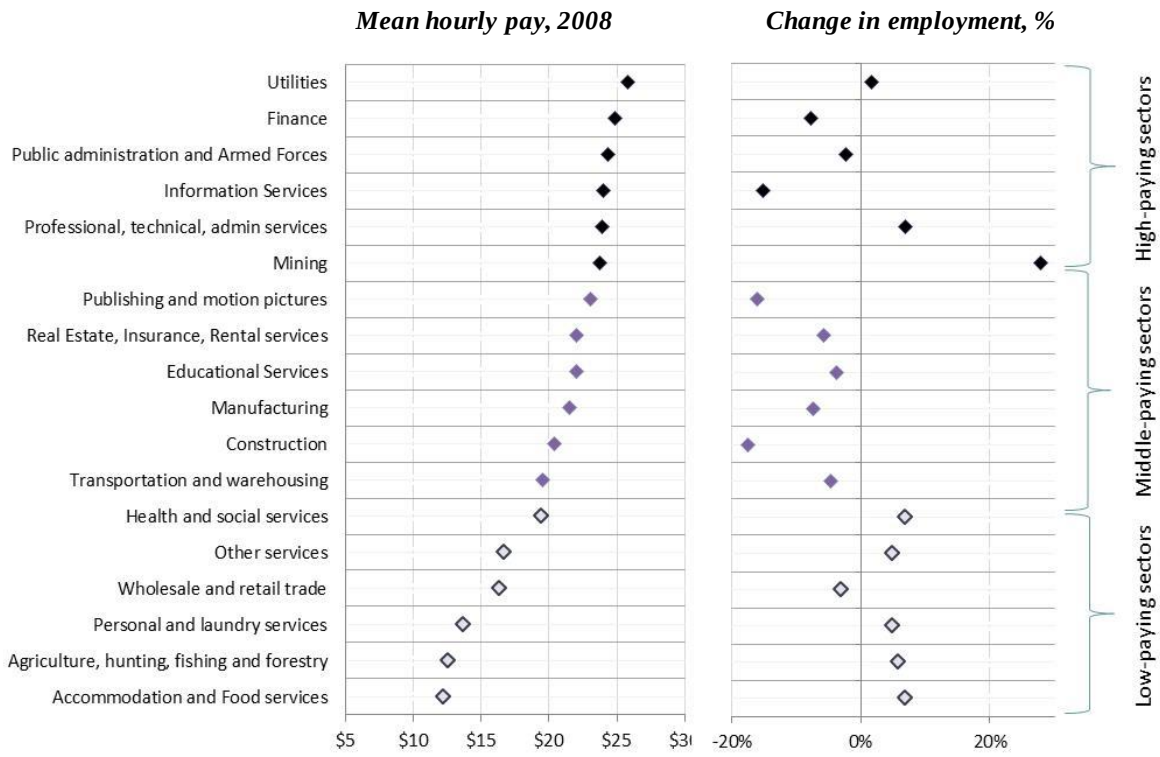
Notes: Skill percentiles are defined on the basis of mean wage in 2002. See Box 1 and Annex A for full methodology.
Source: Resolution Foundation and Centre for Economic Performance analysis, Current Population Survey merged outgoing rotation group, National Bureau of Economic Research

Employment trends by industrial sector

It is also interesting to look at trends in employment by industrial sector. Sectors are defined differently in the US data so the results are not perfectly comparable with our results for the UK. We can however draw some general conclusions about how employment in different industrial sectors of the US has changed since the crisis, and about how these changes compare in broad terms to those seen in the UK. We start by looking at growth rates before turning to the question of how these trends have reshaped the industrial composition of the US labour market. When it comes to changes in net employment in different industries, some sectors in the US labour market stand out:

- **Low-skilled sectors of the US economy have performed consistently well, in relative terms, since 2008**. Five of the six lowest paid sectors in the US economy saw growth in employment from 2008 to 2012. Among low paying sectors, only *Wholesale and Retail Trade* saw a decline.
- **The US *Mining* sector saw very strong employment growth from 2008 to 2012**, with the number people employed in the sector growing by 27.9 per cent (226,000 jobs) in just four years. This is likely to reflect the recent boom in US domestic energy generation, linked to technological breakthroughs.
- **There were big declines in employment in the *Information Services* and *Publishing and Motion Picture* industries**. The only sector that saw more significant declines in employment was *Construction*, where employment fell by 17.5 per cent, in similar fashion to the UK.

Figure 10: The winners and losers among US industries after the crisis
Growth in net employment by industrial sector, 2008 to 2012

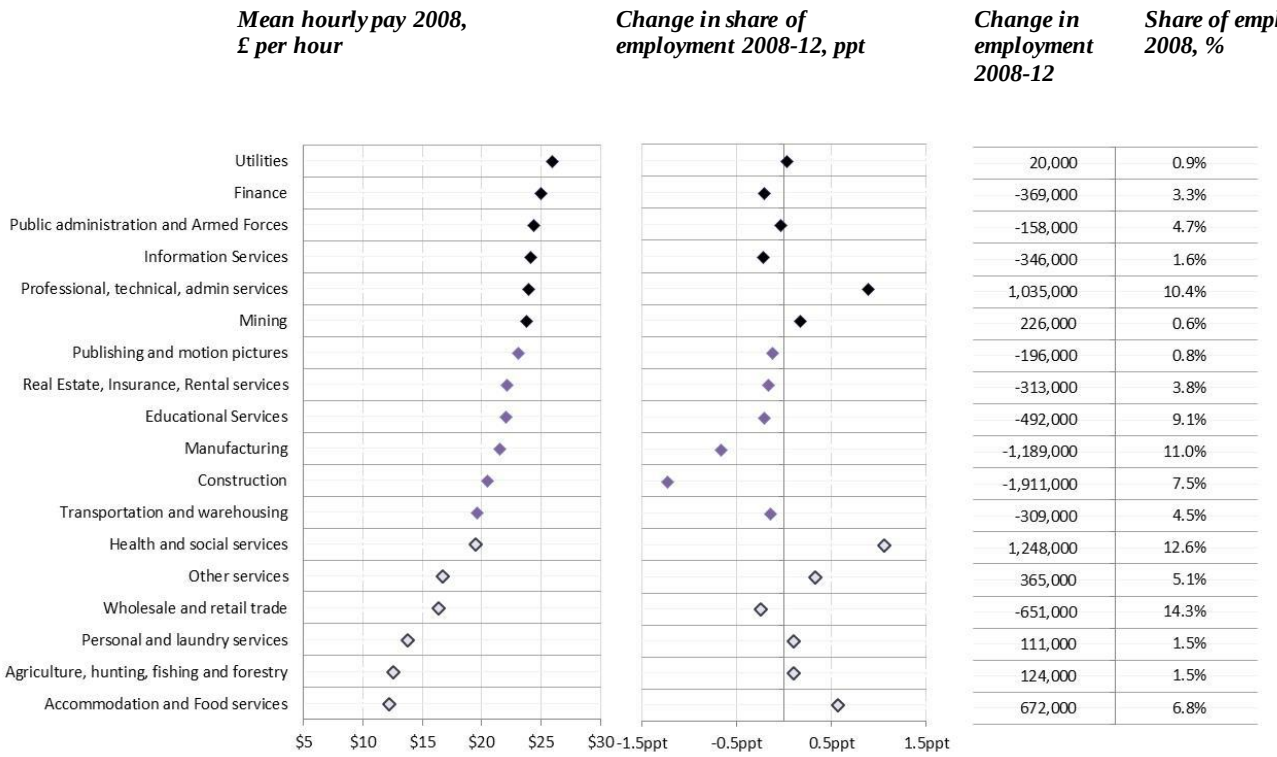


Source: Resolution Foundation and Centre for Economic Performance analysis, Current Population Survey, National Bureau of Economic Research

Some of these changes relate to small sectors and so had minor impacts on the overall composition of the US jobs market. Figure 11 accounts for this by showing the change in different industries' shares of overall US employment from 2008 to 2012. It shows some similar patterns to the UK but also some differences:

- **In the higher-skilled portions of the US labour market**, *Professional, Technical, Management and Administrative Services* (broadly similar to the UK category of *Business Activities*) has seen very strong growth. While *Finance*, as in the UK, has shrunk slightly, the more general rise of high-end traded services has continued.
- **In the lower-skilled portions of the US labour market**, both the hospitality sector (called here *Accommodation, Food Services and Drinking Places*) and *Health and Social Services* saw strong growth in employment. This pattern is similar to the UK and suggests a common theme of hospitality and health as employment-absorbing industries in mature economies. *Health and Social Services* in fact saw the strongest growth of any sector, with employment rising by 1.25 million in just four years. As in the UK, the US *Retail* sector has also seen a decline in employment, although a less rapid decline than that seen in the UK.
- In the period from 2008 to 2012 as a whole, **the US *Manufacturing* sector has seen a decline**. From 2008 to 2012 net manufacturing employment fell by 1.2 million from 15.9 million to 14.7 million. This masks different trends within the period, with manufacturing employment falling steeply from 2008 into 2009 and recovering slowly from then on. The US *Construction* sector has also seen a sharp slump in terms of its share of employment, with employment falling from 10.9 million to 9 million, a decline of 1.9 million from 2008 to 2012.

Figure 11: The shifting industrial make-up of US employment after the crisis
Change in share of US employment, 2008 to 2012



Source: Resolution Foundation and Centre for Economic Performance analysis, Current Population Survey, National Bureau of Economic Research

The performance of low paying industries in the US has been more unambiguously positive than in the UK, with net employment growth from 2008 to 12 in five of the six lowest paying sectors. In total, the lowest-skilled third of the US economy (on the basis of average pay in 2008) saw employment increase by 1.9 million from 2008 to 2012. Meanwhile, every industry in the middle-third of the economy saw employment fall in this period, some significantly. In total, employment fell by 4.4 million in these sectors. In the highest-skilled third of sectors, employment rose by 409,000. As in the UK, we should remember that these patterns hide significant variation between sectors, with the outlying performance of a handful of sectors driving the overall trend. And we should remember that pay varies significantly within sectors, so that growth in a low paying sector may not necessarily mean growth in low paying jobs.

Conclusion – interpreting the results

It now seems likely that Britain is joining America in a sustained labour market recovery. As things stand, the one thing that is clear about this recovery is that the road will be long; in the UK, 805,000 additional jobs are still needed simply to restore the employment rate of 2008.[2] But what will the recovery feel like for workers in terms of their wages and the quality of their jobs? And how will the UK and US labour markets be scarred by recent years? To answer these questions, it is useful to understand how the post-crisis period has reshaped labour markets, changing the balance of employment across occupations and industries.

Our findings suggest that the fallout from 2008 has accentuated the long-running phenomenon of occupational polarisation. If anything, it appeared that the polarisation of the US and UK labour markets had become less pronounced in the 2000s. But since the crisis, a clearer pattern has re-emerged, as low-skilled and high-skilled occupations have again increased their share of employment while middle-skilled occupations have seen a relative decline. This impact has been more pronounced in the US, where the performance of low-skilled occupations has been particularly strong since 2008. In the UK, we also find evidence that the crisis has accelerated the decline of routine occupations. Routine roles have seen stronger falls in employment while non-routine jobs have absorbed the impact of the downturn more through falls in real wages. The post-2008 shakeout seems to have shed jobs whose grip was already weak while, *on average*, non-routine occupations have held firm.

When it comes to industries, the US has again seen strong growth in low paying parts of the labour market. And in both the UK and US, the standout success stories of recent years lie at the two ends of the jobs market. At the bottom, employment has grown in the large and low-paying sectors of *Hospitality* and *Health and Social Work*. And at the top, *Business Activities* have been an outstanding success story with rapid employment growth. Overlaid onto these trends, the cyclical impact of the crisis is clear: a collapse in *Construction* employment in both Britain and America, an accelerated decline in *Manufacturing* jobs and, in the UK, steep falls in employment in *Public Administration and Defence*—but not in the protected areas of *Education* and *Healthcare*.

Yet if the findings of our analysis are clear, they nonetheless need to be interpreted carefully. First, it is important not to overstate these results. Middle-skilled jobs are not 'disappearing' from the UK and US labour market—they are simply declining as a share of overall employment, as both the US and UK create these jobs at a slower pace than low- and high-skilled occupations. It is important to remember that, even as middle-skilled occupations decline, demand for middle-skilled workers will remain strong as new cohorts are needed to replace those retiring each year. And of course there is huge variation between middle-skilled occupations: some are expanding while others decline.

Second, it is important not to assume that a polarising labour market means rising wage inequality. This link is not straightforward. A polarising labour market *could* mean rising wage inequality, pushing workers into the two ends of the labour market to create more low- and high-paid people. But a polarising labour market could instead mean falling inequality if growing demand for low-skilled workers pushed up their pay and if a rising supply of graduates kept track with rising demand for high-skilled workers. Our results alone do not tell us which of these will happen—this would require a fuller account of changes in supply and demand. It would mean, for example, considering changes in the supply of skills in the workforce, in the supply of workers through immigration and, importantly, in labour market institutions like the decline

[2] The UK employment rate for adults aged 16 and over in March-May 2008, at the onset of the decline in employment, was 60.3 per cent. In July-September 2013 the employment rate stood at 58.8 per cent.

of collective bargaining. Pay also, of course, varies significantly within occupations and industries, so the rise of a low paying sector may not necessarily mean the rise of low paying jobs.

Third, we should remember that different dynamics affect labour markets in a downturn than in times of economic growth. This means that our findings do not resolve ongoing theoretical debates about the causes of polarisation. On the one hand, our results could strengthen the view that technological advances are driving deep structural changes in labour markets, particularly because we find employers in the UK shedding routine jobs after 2008. On the other hand, our findings could be explained simply by post-recession changes in demand. For example, employment in construction has fallen steeply since 2008, yet these are precisely the kind of jobs — non-routine and non-traded — that we might think would expand over time. This is because the collapse in demand in construction has outweighed all other dynamics. There is more than one force at work here and unpicking these forces will take time.

Annex A – Methodology, data sources and labour force survey reclassification method

Data sources

The analysis we present for the UK is based on quarterly data from the Labour Force Survey (LFS). We use LFS quarterly data from January/March 1993 to October/December 2012. In addition to LFS data described below, we also use the General Household Survey 1985 in order to study a skill structure in the UK before computerisation took place. All UK datasets were downloaded from the UK Data Service website -http://discover.ukdataservice.ac.uk/ . For our analysis of the US labour market, we use the Current Population Survey (CPS) merged outgoing rotation groups (CPS-MORG) available from the National Bureaue of Economic Research (NBER).

Creating consistent time series for the UK

The industry classification used for our analysis of the LFS is a simpler more aggregated version of the 2-digit Standard Industrial Classification from 1992 (SIC92). There is one change in the way occupations are classified in SOC in 2010, changing from SOC2000 (353 categories) to SOC2010 (369 categories). To compute a consistent occupation classification over the studied period, we use the fact that in 2011 the data was double-coded using both classifications. Using this Labour Force Survey (LFS) double-coded data we calculate the composition of SOC2010 in terms of SOC2000. We then exclude all associations below 20 per cent and compute all intersections between occupational categories to create a consistent classification that involves the minimum level of aggregation that is consistent over time. We end up with a total of 297 'occupational bins' and use this consistent classification when studying changes in the UK occupational structure over time.

For our longer term analysis of the UK, considering the 1993-2012 period, we use the wage structure from 1985. This data encompasses four different occupational classifications: the Classification of Occupations 1980 (CO80), SOC90, SOC2000 and SOC2010. There is no one to one correspondence table between theses classifications so again we construct a consistent occupation classification over the studied period. We do this by using a similar procedure to that described above. The double coded-data CO80-SOC90 was retrieved from LFS data in 1991. The double-coded SOC90-SOC2000 was provided by ONS directly and is based on LFS files from 1996 considering only male workers[3]. The double-coded SOC2000-SOC2010 data is the same as that described above.

We start our procedure with the CO80-SOC90 file, calculate the composition of OC80 in terms of SOC90, exclude all associations below 20 per cent and compute all intersections between all occupational categories, creating a minimum level of aggregation that is consistent between the two classifications. We then merge this file with the SOC90-SOC2000 by SOC90 and run the same procedure, now obtaining consistent occupational bins for the triad CO80-SOC90-SOC2000. Finally, we merge this file via SOC2000 with the SOC2000-SOC2010 table, rerun the procedure and obtain our final classification, consisting of 133 consistent occupational bins.

With this classification in hand, we use GHS data from 1985 to rank occupations based on weekly earnings (hourly earnings were not available) and we use this rank to calculate the skill percentiles in different years. Earnings figures use weekly earnings (windsorized in the 99 percentile by occupation) based on the main job, restricting the sample to those age 16 or over and excluding the self-employed.

[3] Some occupations, associated only with females, were matched manually.

Creating consistent time series for the US

In the case of our US data, there is one change in the Census Occupational Code in 2010 and the Bureau of Labor Statistics provide a correspondence table between the two classifications. We use CPS earnings data from 2002 to rank occupations based on hourly earnings and we use this rank to calculate the skill percentiles in different years. The sample focuses on hourly earnings in a person's main job and the sample is restricted to individuals aged 16 or over and excludes the self-employed. We use individuals' earning weights provided in the CPS and apply the same weights to calculate employment figures.

The industry classification used for the US is a simpler, more aggregated version of the 2-digit consistent industrial classification created by the NBER. This is an NBER created 2-digit SIC-based Detailed Industry Classification Code that is consistent over all the years covered by the CPS morg.

Annex B – Defining routine and non-routine occupations

In order to analyse trends for UK occupations on the basis of their routine-intensity, we use routine measures from O*Net, a dataset that provides detailed descriptions of the task-content of occupations (http://www.onetonline.org/). For simplicity, we use O*Net information from 2012 only. Following Acemoglu and Autor (2011), we calculate our routine intensity variable using the importance value scale that is provided in O*Net for the following ability- and work activity/context-variables:

Table 1: O*Net measures

Nonroutine Cognitive: Analytical
Analyzing Data or Information
Interpreting the Meaning of Information for Others

Nonroutine Cognitive: Interpersonal
Establishing and Maintaining Interpersonal Relationships
Guiding, Directing, and Motivating Subordinates
Coaching and Developing Others

Routine Cognitive
Importance of Being Exact or Accurate
Importance of Repeating Same Tasks

Routine Manual
Controlling Machines and Processes
Pace Determined by Speed of Equipment
Spend Time Making Repetitive Motions

Nonroutine Manual Physical
Spatial Orientation
Operating Vehicles, Mechanized Devices, or Equipment
Manual Dexterity
Spend Time Using Your Hands to Handle, Control, or Feel Objects, Tools, or Controls

Because the variables are provided in scales that are not directly comparable, we standardize each scale to have mean 0 and standard deviation 1 (among occupations). We then take a simple average of the measures to obtain the values for the 5 categories seen above (Routine Cognitive, Routine Manual, Non-routine Cognitive Analytical, Non-routine Cognitive Interpersonal and Non-routine Manual Physical).

To obtain routine measures we first convert O*Net classifications (based on US Standard Occupational Classification (SOC)) to International Standard Classification of Occupations 2008 (ISCO08). This allows us to link the O*Net measures to UK SOC2010 classification. After matching the two tables, we aggregate the 5 categories above by the 133 occupational bins (using the employment values by SOC2010 in 2012 as weights). A total of 25 (out of 133) occupational bins could not be linked to the routine measures. This corresponds only to approximately 7 per cent of our sample.

Finally we standardize the 5 categories above by the 108 matched occupational bins and construct the final RTI variable as follows:

RTI = *Routine Cognitive + Routine Manual - Nonroutine Cognitive Analytical - Nonroutine Cognitive Interpersonal - Nonroutine Manual Physical*

This value is standardized for the last time then and used to create the three categories used in part 2: non-routine, with low routine-intensity; middle routine-intensity; and routine, with high routine-intensity.

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