



BANK OF ENGLAND

Speech

The labour market

Speech given by

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This talk focusses on the labour market, and in particular the limited response of wage growth to falling unemployment. At first glance, the labour market now looks very tight. The jobless rate is down to 4.8%, slightly below both the 2000-07 average and the MPC's estimate of the equilibrium rate, which are about 5%¹ (see figure 1). The jobless rate has only been below current levels for a few months in the last 40 years². The short-term jobless rate is the lowest since data began in 1992. The number of job vacancies is around a record high, and the ratio of unemployment to vacancies matches the 2005 low (see figure 2).

However, even with relatively low unemployment, average weekly earnings growth remains modest, at 2-3% YoY³. Unit labour cost growth is perhaps still slightly below the pace consistent with the inflation target over time⁴. There is little sign of significantly higher pay growth for 2017 (see figure 3).

The labour market models used by most forecasters, which presumably are based on past behaviour, have not done well in explaining and forecasting the modest trend in pay growth. In recent years, pay growth has repeatedly undershot consensus expectations, OECD forecasts and BoE forecasts⁵ despite falling unemployment (see figures 4 and 5). Indeed, the UK has seen the biggest average undershoot in pay growth of any country compared to the OECD's forecasts in recent years (see figure 6).

Most forecasts have looked for the relation between unemployment and pay growth to return to something like that seen before the 2008-09 recession, whereas in practice this relation seems to have shifted downwards again (see figure 7)⁶.

Of course, all forecasts are fallible. But such repeated and widespread forecast errors are interesting because they hint that the underlying behavior of wage growth has changed. This is also evident in figure 8, showing the gap between average pay growth in 2014-16 and projections based on simple wage Phillips curves (i.e. regression of pay growth on unemployment) fitted over 2000-13 across OECD countries – with a marked undershoot in the UK.

I suspect the subdued trend in wage growth in part reflects structural changes which these models may not fully capture, including greater labour market flexibility and insecurity, extra labour supply, increased under-employment, broader educational attainment, and changes to the tax and benefit system. These changes probably imply greater downward pressure on pay growth for any particular jobless rate than previously.

¹ Both are actually 5.1%.

² The low of the last 40 years was 4.7%, seen for a few months in 2004-05.

³ Note that weakness in pay growth is not a quirk of the AWE data, but evident also in guides such as the LFS, average hourly pay, ASHE surveys, BoE Agents and the CIPD pay surveys. BoE research previously identified the effect of composition changes in dampening pay growth (see Broadbent 2015), but this effect has faded recently.

⁴ Over the period 1997-2015, CPI inflation averaged 2.0% YoY, unit wage cost growth averaged 2.2% YoY and ULC growth averaged 2.4% YoY. Unit wage cost growth was 1.2% YoY in Q3. ULC growth was 2.3% YoY, which may reflect the sharp YoY rise in employers' social contributions. If we assume that ULC growth in Q4-2016 matches the Q3 pace, average ULC growth in 2016 would be 2.0% YoY.

⁵ See Haldane (2015).

⁶ The BoE's November IR forecasts repeat this pattern, projecting that two years ahead the jobless rate will be around 5½% and pay growth around 4% YoY.

The BoE's 5% estimate of the equilibrium jobless rate is based on a mix of empirical observation from the pre-crisis period (the last time the economy had a near-zero output gap), time series analysis and a labour market search and matching framework. This search and matching framework consists of a Beveridge Curve (BC), which shows combinations of unemployment and vacancies for a particular level of search efficiency, and a job-creation curve (JCC), which shows V-U combinations of equal profit for firms. In this model, higher unemployment makes it more attractive to create vacancies and hire people as the match rate is higher, but there are diminishing returns to creating vacancies as the jobless rate falls and the labour market becomes 'congested'. The intersection of these lines is the equilibrium jobless rate. The gap between the actual jobless rate and this equilibrium is used as an input to a standard wage Phillips curve model (with some role for inflation expectations).

There was an apparent rightward drift in the Beveridge curve in 2013-14 (see figure 10), which suggested reduced labour market matching efficiency⁷. Recent data bring us roughly back to the 2002-05 trends. Hence, assuming the job creation curve has not shifted, one could infer that the natural jobless rate is about the same as the pre-crisis period.

The search and matching model has advantages of solid theoretical underpinnings. However, as noted, the forecasts for pay growth derived from this natural rate estimate have not been very accurate in recent years.

One issue is that the derived natural jobless rate has a sizeable margin of error, especially because parameters of the job creation curve are poorly observed. This also means that these models are quite slow to reflect structural changes. And, as Peter Diamond argues, the US Beveridge curve often shifts out as unemployment starts to fall, but these shifts have not been useful predictors of the jobless rate that the economy attained at the end of subsequent expansions⁸. In addition, the search and matching model aims to measure a long-run equilibrium. At any particular time, this may not necessarily be the same thing as the NAIRU, defined loosely as the jobless rate consistent with on-target inflation once shocks from the exchange rate etc have worked through⁹. For example, increased labour supply might shift the NAIRU for a period, especially if new entrants behave differently to the existing pool of workers.

Moreover, the search and matching model assumes that the level of vacancies is a consistent guide to labour demand over time. This may not be valid. In particular, costs of recruitment advertising have plunged with the shift from ads in newspapers and magazines to internet-based ads. Average advertising spend per job vacancy is down by 53% in real terms over the last five years and by 80% over 10 years¹⁰ (see figures 11 and 12). For firms who advertise vacancies through their own web site, it is almost costless to keep an ad running for an extra month or two.

⁷ See Bova et al (2016).

⁸ See Diamond and Sahin (2014).

⁹ The BoE has also at times used a more time-varying short-term equilibrium jobless rate.

¹⁰ Using an 85-item disaggregated split of the CPI, only one CPI category (photographic and cinema equipment) has seen bigger price declines over that 10-year period.

The collapse in the cost of recruitment advertising may lift labour demand a little, because total hiring costs are slightly lower than before. But, the more important effect may be to increase the number of recorded vacancies and reduce recruitment intensity, as firms become more “picky” in hiring and more likely to engage in what search theorists call speculative ‘fishing’. That is, firms may post more job vacancies and for longer, with more specialised requirements, with little expectation or intention they will all be filled. Research in the US has identified this effect¹¹, and suggests that it increases when the economy weakens or credit availability worsens. Hence, we may see less observed cyclical variation in official vacancy data and greater cyclical variation in recruitment intensity.

The same may be happening here, with a marked recent discrepancy between the vacancy data (which indicate very high labour demand) and surveys of firms’ hiring intentions (which suggest labour demand is around average), see figure 13. Likewise, although the CBI reports the greatest skilled labour shortages in manufacturing since 1989, business surveys overall do not suggest the labour market is the tightest in recent decades (see figure 14).

Short-term *changes* in the number of vacancies probably remain a useful signal of whether labour demand is rising or falling. But a given *level* of vacancies may not signal as much labour demand or labour shortages as 10 years ago, with lower and more variable recruitment intensity. This effect might well produce an apparent rightward shift in the Beveridge curve even if there has been no underlying change in this relation. Or, it could disguise an underlying leftward shift in the Beveridge curve. It probably would also affect the job creation curve. All this would increase the likelihood of misleading signals from labour market slack measures based on the search and matching model.

Two widely-cited explanations for recent weakness in pay are low productivity growth and low headline inflation. If these views are valid, then pay growth might well be about to recover markedly, either because of higher inflation or higher productivity growth, even if the jobless rate is stable or rising.

However, while these factors probably have played a role, I doubt they are the whole story. There is a close long-run link between real pay growth and productivity growth. But the causality in recent years has probably gone both ways: low productivity growth has capped pay, but low pay growth (due to other factors) probably has lifted labour demand and lowered productivity growth, via the substitution of labour for capital and expansion of labour-intensive sectors with low average levels of pay and productivity (see figure 15). Hence the UK has ended up with low pay growth, higher employment and low productivity growth.

By international standards, the recent slowdown in UK pay growth is far more exceptional than the productivity slowdown (see figure 16). UK productivity fell sharply in the 2008-09 crisis. But, productivity growth over 2011-16 (averaging 0.6% YoY) has been similar to the OECD average¹². The slowdown versus

¹¹ See Capelli, 2013, Davis et al, 2010, 2012, Gavazza et al, 2016 and Faberman, 2014.

¹² Data published in the Dec-2016 OECD Economic Outlook.

the precrisis pace (down by 1.2pp from 1.8% YoY in 1997-07) also is similar to the OECD average (down by 1.0pp). However, the slowdown in pay growth in the UK over 2011-16 (down by 3.5 pp versus 1997-07) was roughly twice the OECD average (1.8pp). Hence, unit labour cost growth slowed much more in the UK than the OECD average and indeed more than any other G7 country.

Likewise, at a sectoral level, there is little link between weakness in productivity and pay growth (see figure 17). To be sure, with the UK's flexible labour markets, one would not expect sectoral differences in productivity growth to be *fully* reflected in sectoral variations in pay. But if the productivity slowdown is the main driver of weakness in pay, one might expect at least *some* link at a sectoral level, given that people cannot always move seamlessly between sectors¹³.

Moreover, unit labour cost growth (which roughly equals pay growth less productivity growth) has also undershot the BoE's internal forecasts in recent years. By contrast, if weakness in pay just reflected a surprise productivity slowdown, one would expect higher ULC growth, because wage growth would probably not respond one-for-one to weaker productivity unless unemployment rises.

Regarding the theory that low inflation caused low pay growth, I note that pay growth has undershot forecasts when inflation has been relatively high (e.g. 2011-12) and low (2014-16). Moreover, it is hard to find statistical evidence of a consistent link from headline inflation to pay in recent years. Figure 18 shows various regressions that seek to explain private sector pay growth (ex bonuses), using unemployment, productivity growth, and inflation (or inflation expectations)¹⁴. In the equations fitted over 2001-2010, inflation or inflation expectations do not really play much role, and are jointly insignificant in statistical terms. And the equations fitted over 2001-2010 all project that pay growth now "should" be above 3% YoY. Since 2011, inflation and expectations are jointly significant, but expectations outperform the headline inflation rate¹⁵.

If we use both headline inflation and inflation expectations in the same equation, the coefficients on headline inflation are either insignificant in statistical terms or negative (ie implying that lower inflation, without a shift in inflation expectations, would lift pay growth). To be sure, results may differ slightly over other sub periods. But that would reinforce the point that there does not seem to have been a stable link from headline inflation to pay. The effect of the jobless rate appears more pronounced in recent years¹⁶.

I do not suggest that recent low inflation rates had zero bearing on pay growth. But, their effect is probably embodied in inflation expectations and - since these are already included in forecasts - does not explain surprise shortfalls in pay. The CIPD pay survey suggests that firms' ability (or inability) to pay more matters far more than headline inflation in determining pay growth¹⁷. And, as with productivity, the causation may run

¹³ Especially given that labour market churn – the movement of people from one job to another -- has been relatively low in recent years.

¹⁴ Also with lagged pay growth.

¹⁵ Expectations also outperform the current and lagged perceived inflation rate, as measured by the BoE survey.

¹⁶ See Gregg et al (2014), Blanchflower and Machin (2016).

¹⁷ See CIPD (2016).

both ways; lack of wage pressure may have contributed to low inflation, particular when weak wages have come as a surprise to policymakers.

The structural changes in the labour market are too recent to allow a definitive estimate of the new equilibrium jobless rate. In any case, it may still be changing. Some of these factors might lower the natural jobless rate, but perhaps not easily fit into a search and matching model. Others may not permanently alter the natural unemployment rate, but may reduce wage growth for a given jobless rate for a sustained period of time - perhaps well beyond our forecast horizon.

Flexibility and insecurity. In the last five years, the numbers of people that are self-employed has risen by 14%, the number of agency workers is up by about 30%¹⁸, and the number of businesses registered in the UK is up by 40%. There has been also been the expansion of zero hours contracts and the “gig economy”.¹⁹ Among people in work, the proportion that are full-time employees (ie not self-employed, not part-time, not in a temporary job) remains well below pre-recession levels (see figure 19). Of course, some people may prefer flexible work structures or seek to reinvent their career through self-employment. But, given that on average these less secure forms of work are also less well-paid²⁰, the expansion of contingent work probably also reflects the erosion of secure and well-paid jobs from technological gains and greater emphasis on cost control.

Another factor lifting job insecurity is that the costs of losing a job appear to have risen significantly. For example, there is tentative evidence that wage scarring – that is, the adverse effects on someone’s future pay levels from a spell of unemployment²¹ – has increased, at least initially. Using LFS micro data, figure 20 shows the disparity in wage levels between people in work now but unemployed a year earlier, compared to those that were also in work a year earlier, controlling for other factors such as age, education, gender, tenure, industry, occupation etc. This wage gap was falling up to 2010 but has risen to about 11% on average in 2015-16 (and over 12% in 2016). Moreover, the number of people receiving jobless benefits is now only about half the number unemployed, with far tougher application of work search tests since 2010. By contrast, 20 years ago, the number receiving jobless benefits was equal to 80% of the number out of work²².

Reduced job security and the greater financial cost of unemployment may reduce workers’ bargaining power and create higher risk aversion – making people more likely to settle for modest or no wage growth and continued employment, rather than push for higher wage growth if that comes with risks of job losses. In addition, the tightening in criteria for benefit eligibility probably has also increased the pressure on the unemployed to get into work.

¹⁸ See Judge and Tomlinson, 2016.

¹⁹ See Gregg and Gardiner (2015), Brainard (2016), and Gardiner (2016).

²⁰ See “*The income of the self-employed*”, Department for Business Innovation and Skills, February 2016. Gardiner (2016) also finds that agency workers, temporary staff and people on zero hours contracts also earn less than less insecure forms of employment. Note that the average earnings figures do not include the self-employed.

²¹ See Gregory and Jukes (2008), McQuaid et al (2014), Laureys (2014), Upward and Wright (2015).

²² Job seeker’s allowance claimant count /unemployed at year end 1996.

Under-employment. The rise in part-time work also has been associated with more widespread under-employment. The ONS reports that 8.4% of people in work would like (and are available) to work more hours, including part-time and full-time workers and those willing to work more hours in an extra job²³. Unlike the unemployment rate, under-employment remains somewhat above the pre-crisis average (6.7% over 2002-07, see figure 21). Moreover, one should also consider under-employment in terms of skills: the ONS reports that 47% of recent graduates are in non-graduate jobs, up from 37% in 2001.

Education attainment. Education attainment has risen sharply in recent years. Since 2000, the share of the population aged 25-74 years with tertiary (ie university level) education is up from 21% to 38%, while the share who did not complete secondary education is down from 27% to 20% (see figure 22)²⁴. The share of people with tertiary education - and the rise since 2000 - are among the highest of any EU country²⁵. Given that the tertiary education rate among people aged 25-44 years exceeds 45%, the overall tertiary education rate will rise further in coming years due to cohort effects, even if the numbers entering tertiary education stabilises.

This matters because on average, people with tertiary education are far less likely to be unemployed than people with low educational attainment²⁶. Over 1992-2015, the jobless rate among people with tertiary education in the UK on average was 5-6 pp below that for people who did not finish secondary education (see figure 23). The graduate pay premium has shrunk in recent years, but the gap in jobless rates has been roughly stable²⁷. Moreover, jobless rates among the less educated are far more cyclical than among those with better education²⁸.

The marked broadening in education attainment over recent years should therefore imply a lower structural jobless rate, as the overall population becomes more adaptable to change and employable across a range of areas. As a rough estimate of this effect, if we freeze the jobless rate by education attainment at the 2000 average, and track forward the change in educational attainment since then, the jobless rate now “should” be about 1 percentage point below the 2000 level (see figure 24).

Rising participation rate. The bound between workforce participation and inactivity is proving much more flexible than previously. The participation rate among people aged 16-64 years is up from 76.6% in 2011 to

²³ I use here the share of people who are under-employed. The ONS also reports figures for the number of extra hours that people would like to work, but there is evidence that people overstate the number of desired extra hours, see Weale (2014).

²⁴ Among people in the workforce, the tertiary education rate is up from 26% in 2000 to 42% now, the share without secondary education is down from 28% to 16%.

²⁵ Only Luxemburg and Ireland have seen a bigger rise in the share of the population with tertiary education. Among EU countries, only Sweden, Finland, Estonia, Cyprus and Ireland have a higher share of the 25-74 year age population with tertiary education. The average for both the EU and Euro Area is 28%, compared to the UK level of 38%. Data from Eurostat. In terms of absolute numbers, the UK has more graduates than any other EU country.

²⁶ The gap is particularly marked for long-term unemployment. Roughly 70% of people that have been unemployed for more than 12 months do not have A-levels (or equivalents) or further education (source ONS).

²⁷ In Q1-Q3 2016, the jobless rate for people without secondary education was 8.5%, while that for people with tertiary education was 3.0%. The gap, of 5.5pp, matches the average for 2000-07.

²⁸ Using annual Eurostat data, the jobless rate among people with tertiary education varied from 2.2% to 4.9% over 1992-2015, while that for people without secondary education varied from 6.0% to 12.5%.

78.3%, close to a record high, while participation among people aged 65-74 years is up from 14.4% to 17.1%²⁹. Hence, workforce growth has averaged 0.9% YoY from the start of 2011, far above the growth in the working age population (0.2% YoY). In recent years, more people moved into work from inactivity than from unemployment. This implies that potential labour supply exceeds the unemployed: it also includes people currently outside the official workforce statistics but likely to join the workforce in coming quarters and move directly into employment.

Various factors are lifting participation rates, including rising life expectancy and improved health, the rising female retirement age, and technological gains that facilitate flexible work. The expansion of in-work tax credits has greatly increased the rewards from being in work, even if low-paid, especially for people with children³⁰. Increased educational attainment also is a factor, especially the drop in the numbers of people who did not complete secondary education. Participation rates are much lower for this group (see figure 25), and as the numbers in this category fall, participation rates naturally rise. This factor alone can account for much of the observed rise in participation rates for the 20-64 year age group in recent years (see figure 26), outweighing potential downward effects from population ageing.

The uptrend in participation may not be over. Participation rates exceed UK levels at most age groups in a range of Northern European countries (see figure 27). The female retirement age is still rising and the concept of a fixed retirement age (eg 65 years) no longer applies. Adverse effects from population ageing are likely to continue to be balanced by the drop in the share of the adult population lacking secondary education. Moreover, low annuity rates and the prospective erosion of real wages from currency-induced inflation may pressure some people to work longer out of economic necessity.

Inward migration. Official data on inflows of foreign workers to the UK workforce are incomplete, but ONS data suggest that people born outside the UK accounted for more than half of the growth in employment over the last five years, and 95% of the last year's employment growth (see figure 28).

Migration has complex effects on the labour market. Clearly, inflows expand labour supply, especially given that foreign workers generally integrate very effectively into the UK labour market. Unlike most other EU countries, foreign-born people in the UK have a similar jobless rate to UK-born people. But migration inflows also boost labour demand. Availability of foreign workers probably encourages firms to expand and invest in the UK. Increased employment boosts consumption and housing demand.

Academic research suggests that migration inflows have not reduced overall UK wage levels, but may have depressed pay at the bottom end³¹. However, most studies have focussed just on the change in pay growth,

²⁹ Source: Eurostat. A higher average age in employment can also directly drag on wages (aside from augmenting labour supply) through career life cycle effects. Evidence from the US suggests that wage growth tends to decline after the age of around 40 – a finding robust to across educational attainment. See Rich et al (2016).

³⁰ See Saunders (2016).

³¹ See Nickell and Salaheen (2015).

rather than the change in pay growth for a given jobless rate and in the context of demand-boosting effects of migration.

Research by Bentolila suggests that increased migration inflows have helped shift the wage Phillips curve down in Spain³². I suspect the same has happened here. The attractions of working in the UK, which generally has high wage levels and low unemployment by EU norms, means that labour supply has expanded to meet demand with little upward pressure on pay. In particular, the greatest undershoots in pay growth relative to the jobless rate in recent years have been in regions with high migration inflows (e.g. London, South East, East England and East Midlands).

Prospects for inward migration to the UK in the next 2-3 years, especially from other EU countries, are uncertain³³. The lower pound may discourage inflows, because it reduces UK pay levels in foreign currency terms, but the UK's high employment rate will probably remain a strong "pull" factor.

Skill and regional mismatches. The high jobless rates of 20 and 30 years ago were exacerbated by the collapse of employment in manufacturing and construction in some regions, whereas job growth was concentrated in other sectors and regions. Such mismatches limited the extent to which high unemployment dampened pay growth. This issue appears less acute now. For example, the standard deviation of sectoral jobless rates³⁴ is at a record low (see figure 29). Similarly, recent job growth has been slightly stronger in regions with higher jobless rates, the opposite of the pattern in 1995-2007³⁵.

Regional disparities in income levels remain high³⁶. But there is also tentative evidence of increased internal migration within the UK. For example, the numbers of people moving between local authority regions has risen to record highs in the last two years (see figure 30). This may reflect greater mobility among international migrants within the UK. Or it may be that, with lower home ownership rates, it is less costly for people to move to another job.

Public sector pay. The squeeze on public sector pay and jobs may also have capped private sector pay, by reducing competition for labour. However, it is hard to find a consistent effect over time. In recent years, pay growth has not been particularly weak relative to the jobless rate in regions with a high share of public sector jobs (e.g. Wales, NE England)³⁷.

Other factors may also be at work, for example, self-fulfilling lower expectations for wage growth³⁸.

³² See Bentolila et al, (2007).

³³ See Portes and Forte (2016).

³⁴ Using the ONS data on jobless rates by industry of last job with a standard 14-sector split.

³⁵ The correlation between sectoral jobless rates and sectoral job growth in the next 4 quarters was minus 19% on average during 1999-2007 but +9% in the last three years.

³⁶ See Haldane (2016).

³⁷ See also Caunt et al (2016).

³⁸ Carney (2016) highlights the possibility of an "affect heuristic", whereby an event can change perceptions long after the original trigger becomes remote.

I acknowledge that this is all quite uncertain and imprecise. I suspect that the equilibrium jobless rate has fallen below 5%, but am unsure how far. Some of these factors could be consistent with a flatter Phillips curve, but the fact that pay growth has stayed modest even with the jobless rate at 4.8% suggests that the equilibrium is lower than previously as well.

If one were to simply extrapolate the wage Phillips curve of 2011-16 with stable inflation expectations, the jobless rate would probably need to fall to 4% or lower to lift pay growth to 4% YoY. I do not suggest this is the most likely outcome. The Phillips curve may indeed be curved rather than a straight line³⁹. Currency-induced inflation might lift inflation expectations sharply. Availability of migrant workers might decline sharply before and after Brexit. But it is also possible that Brexit-related uncertainties will reinforce other factors dampening pay, and that labour supply will expand as higher inflation erodes household spending power.

My hunch is that underlying pay growth will probably stay comfortably below the 4% pre-crisis norm during the next few years, unless the economy is strong enough to pull unemployment significantly lower and/or long-term inflation expectations rise markedly. To be sure, with modest productivity growth, the pace of wage growth consistent with the inflation target over time probably is lower than it used to be. But, even so, labour cost growth in 2017 seems unlikely to pose major upside risks to the inflation target.

In my view, this has several implications for a monetary policymaker.

First, comparisons of the jobless rate with historic norms or natural rate estimates may not be a totally reliable guide to labour market conditions at present. We should consider a range of indicators and acknowledge that estimates of the equilibrium jobless rate are somewhat fuzzy, and may change in ways that cannot be fully anticipated or understood at the time.

Second, there may now be more cyclical variation than before in insecure employment, under-employment, participation and productivity, and less cyclical variation in unemployment. Slack may change even if the jobless rate is little changed.

Third, monetary policy should not be set in a way that seeks to rule out sub-5% unemployment over time, unless we see clear evidence of markedly higher labour cost growth and/or long-term inflation expectations, or the tradeoff versus currency-driven inflation is much worse than expected. The economy might be able to run with lower unemployment than previously, consistent with the inflation target. But I stress that our target is for inflation not unemployment.

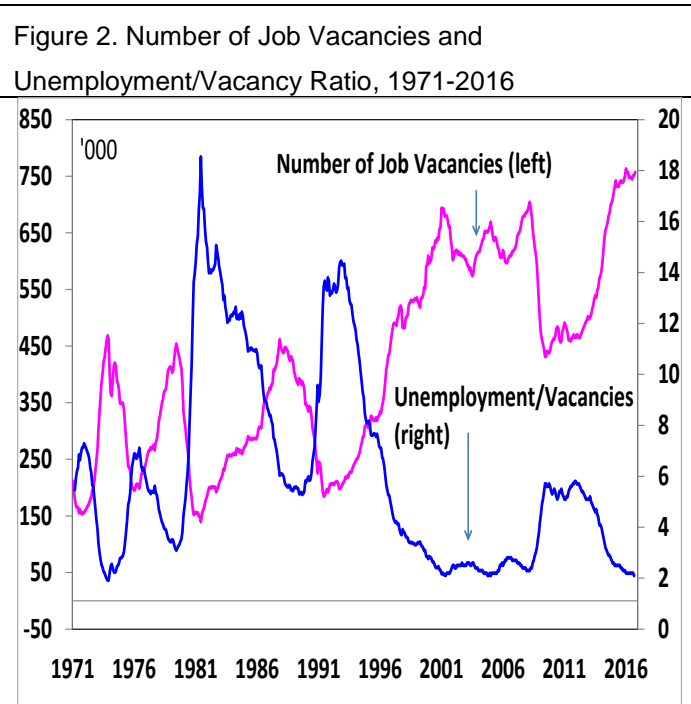
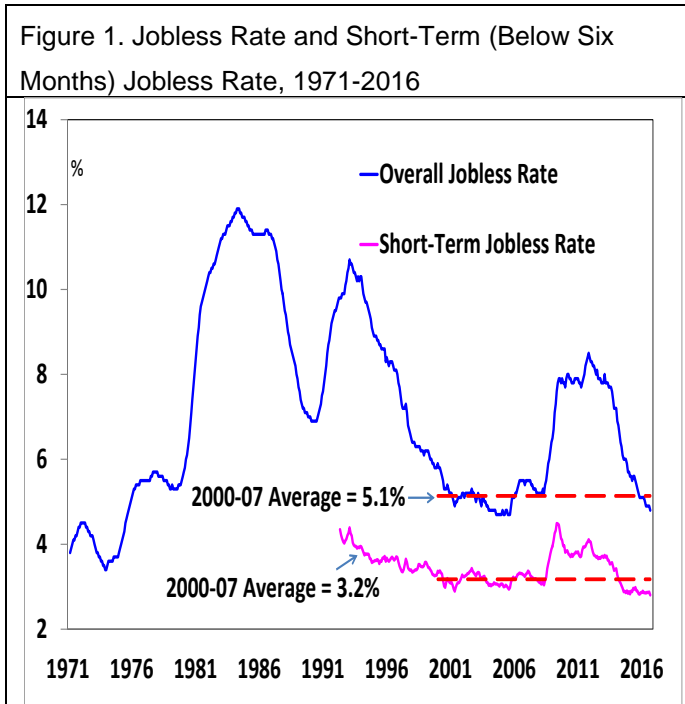
Fourth, a lower equilibrium jobless rate would not necessarily mean that it is appropriate to loosen policy further. Nor would it rule out tightening. Sterling's recent depreciation will probably lift inflation above target

³⁹ See Nalewick (2016).

this year, and economic growth recently has been stronger than expected. Rather than the rise in unemployment forecast in the November Inflation Report, it seems quite possible to me that the jobless rate will stay below 5% this year. In considering the appropriate policy, I will be taking account of all of this, rather than just one part.

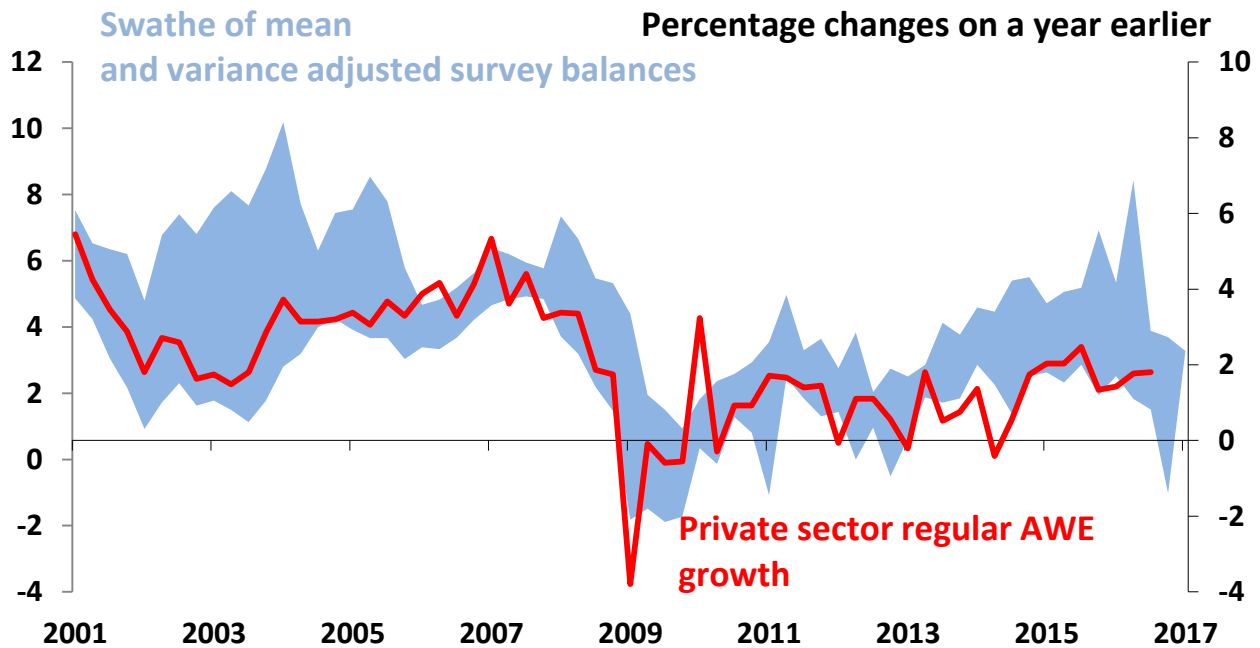
Also, I want to stress the uncertainties. I am conscious of historical episodes whereby overly optimistic assessments of slack were followed by a prolonged inflation pickup⁴⁰. If pay and other labour market guides give clear warning signs in coming months, then I might well have to revise my theory of a lower equilibrium jobless rate. This would probably have obvious implications for monetary policy, unless downside risks to economic growth rise significantly. Either way, the labour market data will probably be key guides to watch.

⁴⁰ See Orphanides et al 1999.



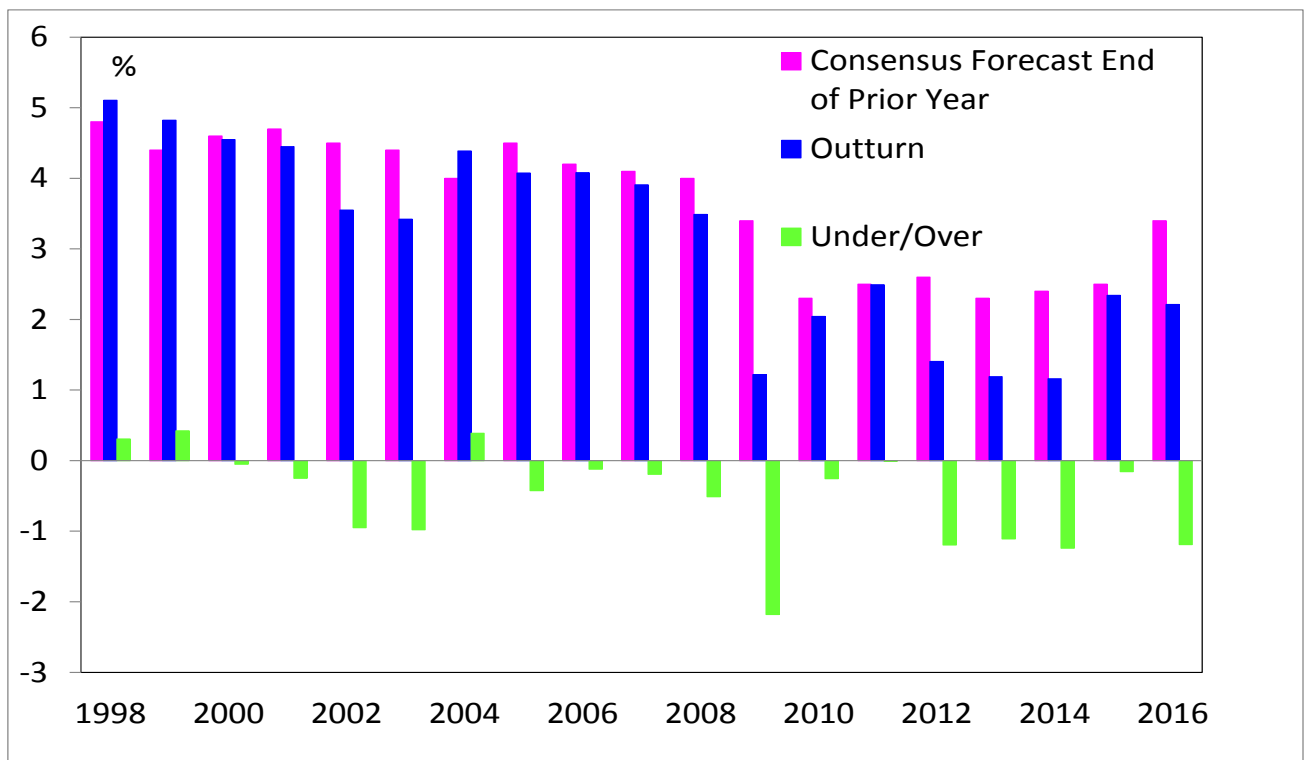
Source: ONS

Figure 3. Surveys and ONS Data on Pay Growth, 2001-17



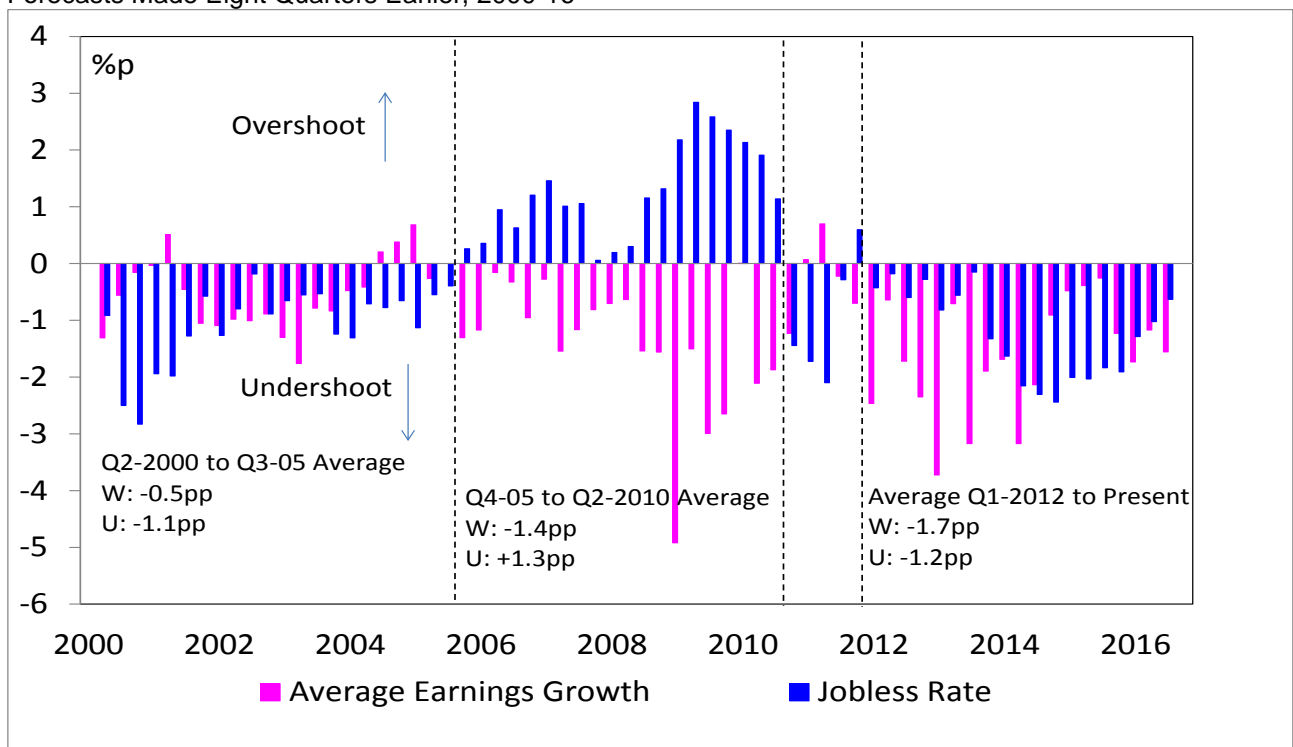
Note: Swathe includes survey measures provided by Bank's Agents, British Chambers of Commerce(BCC), Confederation of British Industry(CBI), Chartered Institute of Personnel Development(CIPD), Labour Research Department(LRD), VocaLink and Markit's Recruitment and Employment Consultancies(REC). VocaLink ceased reporting in 2015Q4.

Figure 4. Outturns for Pay Growth Compared to Consensus Forecast in November of Prior Year, 1998-2016



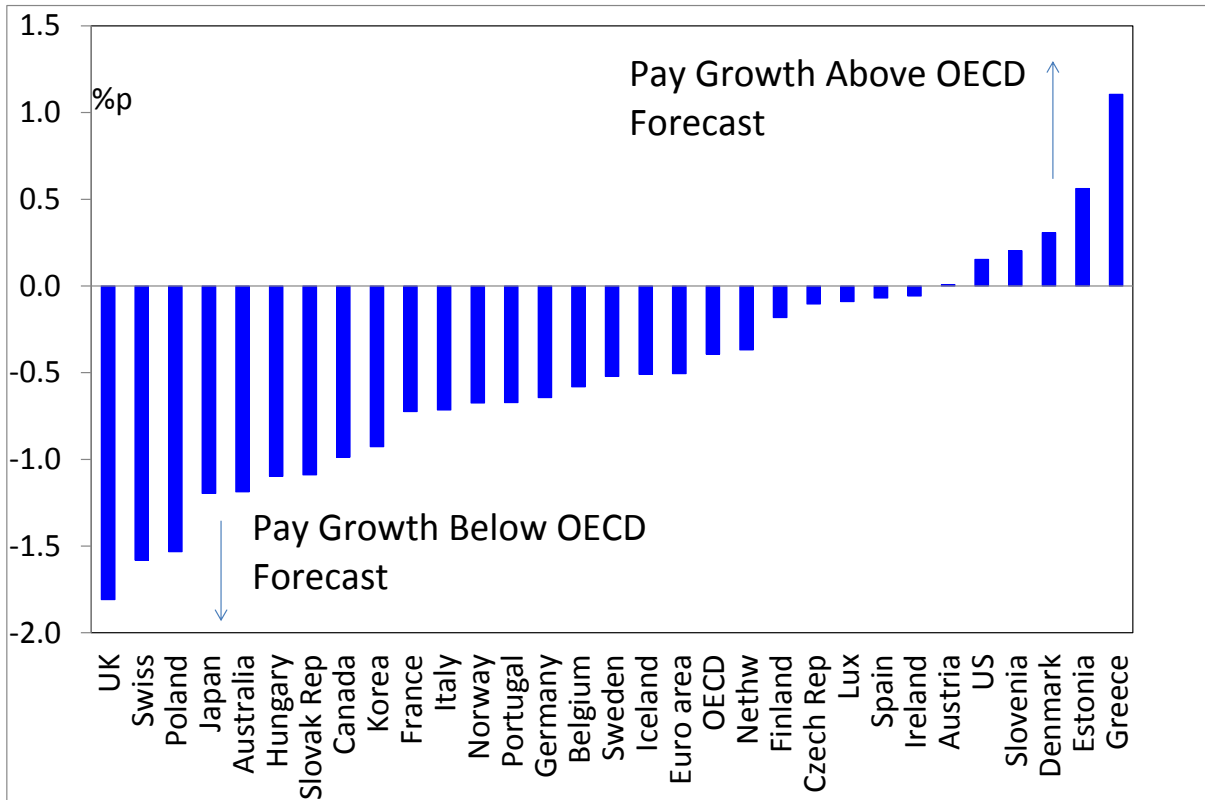
Note: Pay growth measured by AWE series since 2010, AEI series before that. Sources: HM Treasury and ONS

Figure 5. Outturns for Average Earnings Growth (W) and Jobless Rate (U) Compared to BoE Central Forecasts Made Eight Quarters Earlier, 2000-16



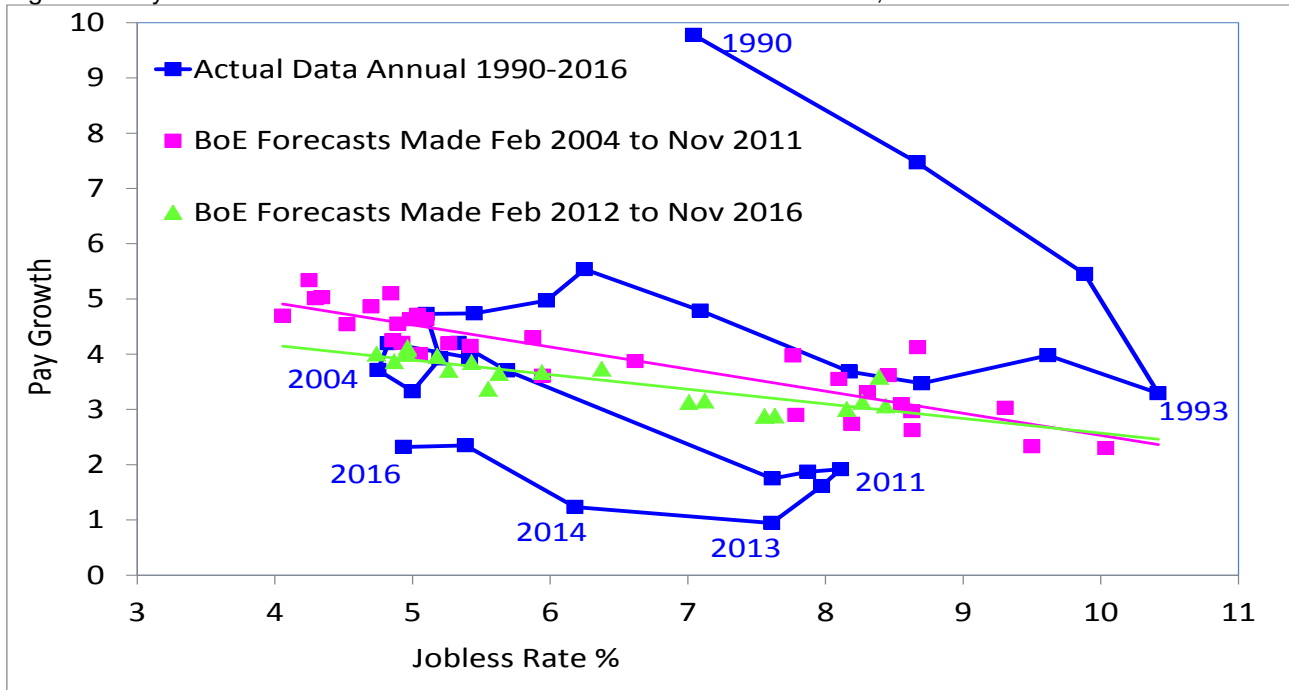
Note: The BoE forecast currently is for the average weekly earnings series, but used to be for the average earnings index. The appropriate measure has been used for the comparison in each quarter. Sources: BoE and ONS

Figure 6. Average Error in OECD Year Ahead Forecasts for Pay Growth, 2014-16



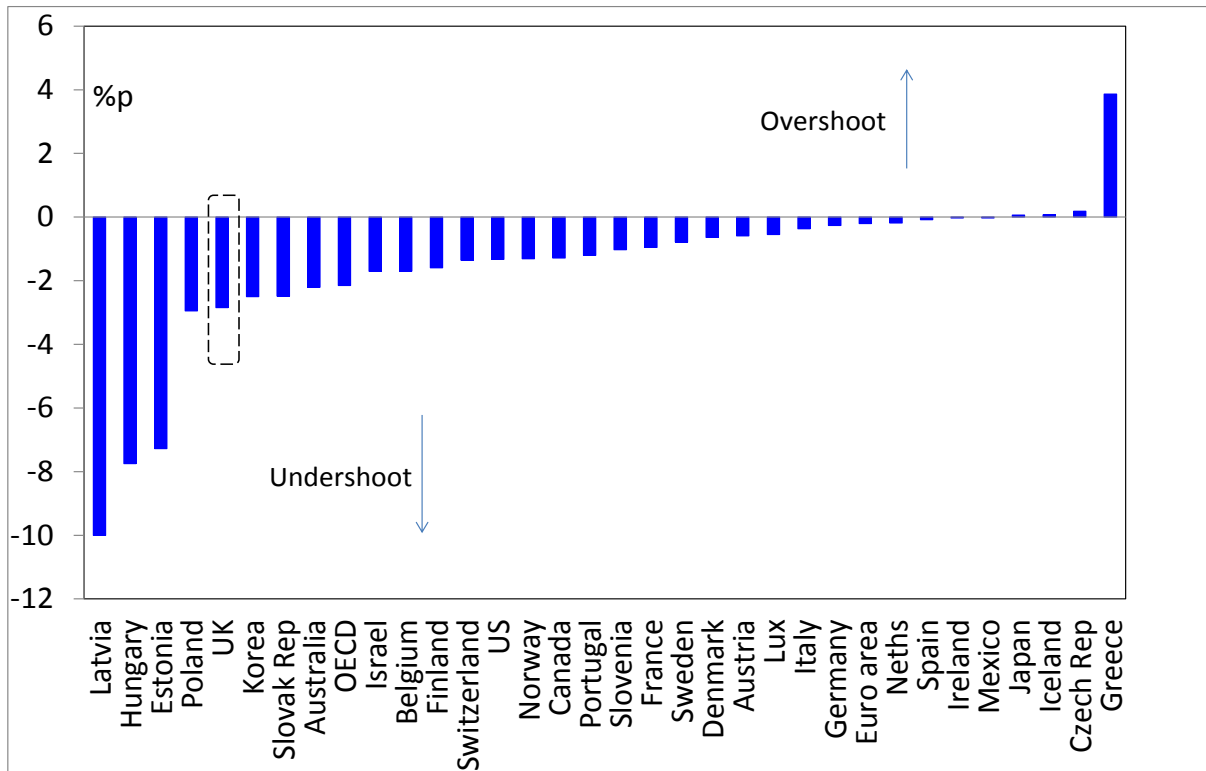
Note: The chart shows outcomes for pay growth in 2014-16 compared to the OECD forecasts for the year ahead made in the Economic Outlooks at the end of 2013, 2014 and 2015. Source: OECD

Figure 7. Pay Growth and Jobless Rate -- Actual Data and BoE Forecasts, 1990-2016



Note: The chart shows the actual average annual data for 1990-2016 (with the average for available data in 2016), and the BoE's central forecasts in successive Inflation Reports from 2004-2016 for pay growth and the jobless rate eight quarters ahead. Green and pink lines are fitted to the trends of forecasts made in 2004-11 and 2012-16 respectively. Sources: ONS and BoE.

Figure 8. Gap Between Average Outturns for Pay Growth in 2014-16 and Forecasts Based on Jobless Rate Fitted Over 2000-13



Note: Pay growth measured by compensation per person. Data from OECD Economic Outlook, November 2016. Source: OECD

Figure 9. Stylised Example of Labour Matching Model for Natural Jobless Rate

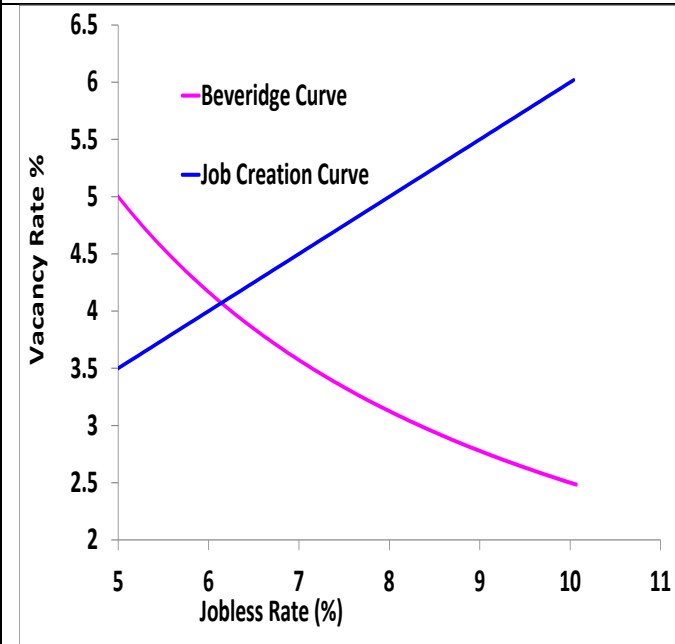
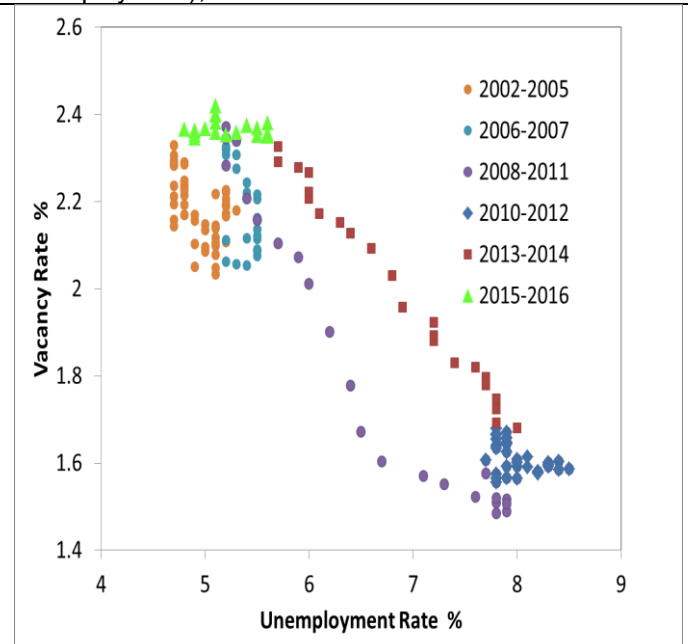
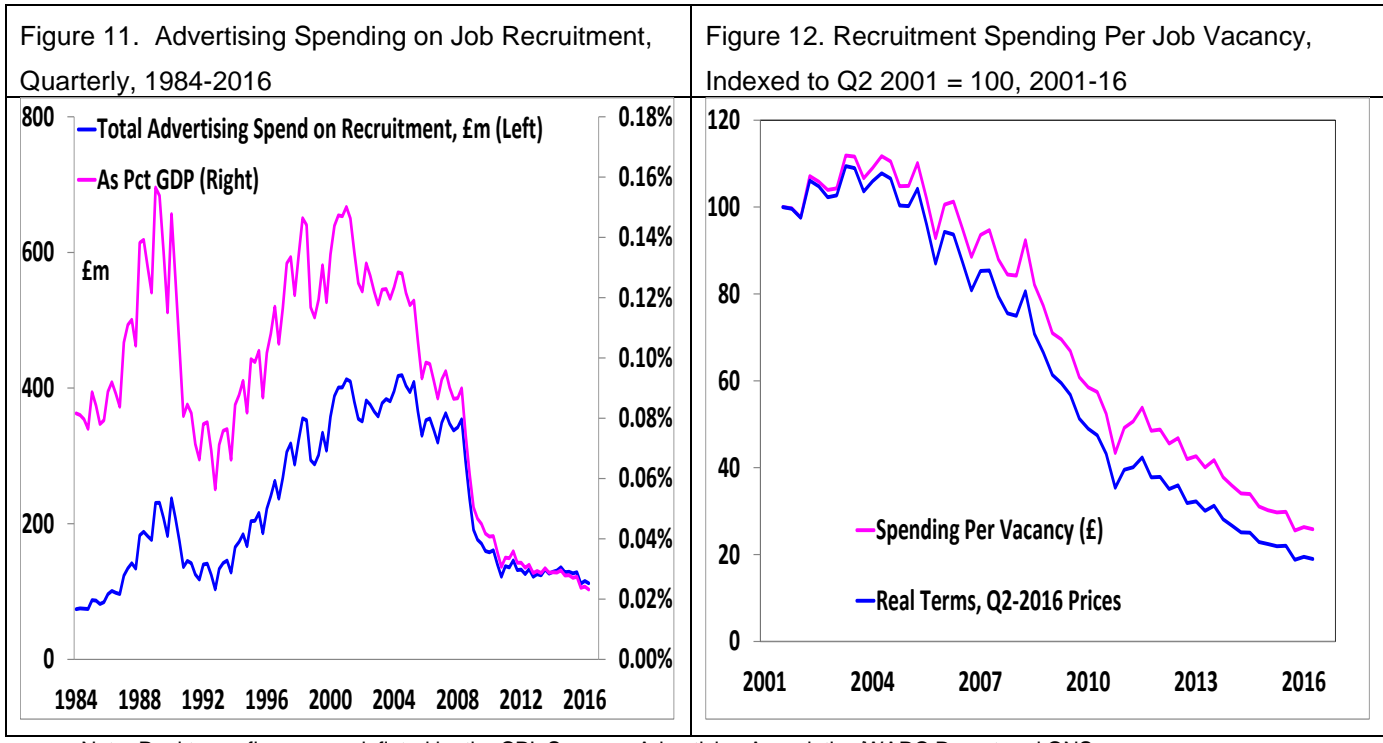


Figure 10. Beveridge Curve (Vacancies and Unemployment), 2002-16

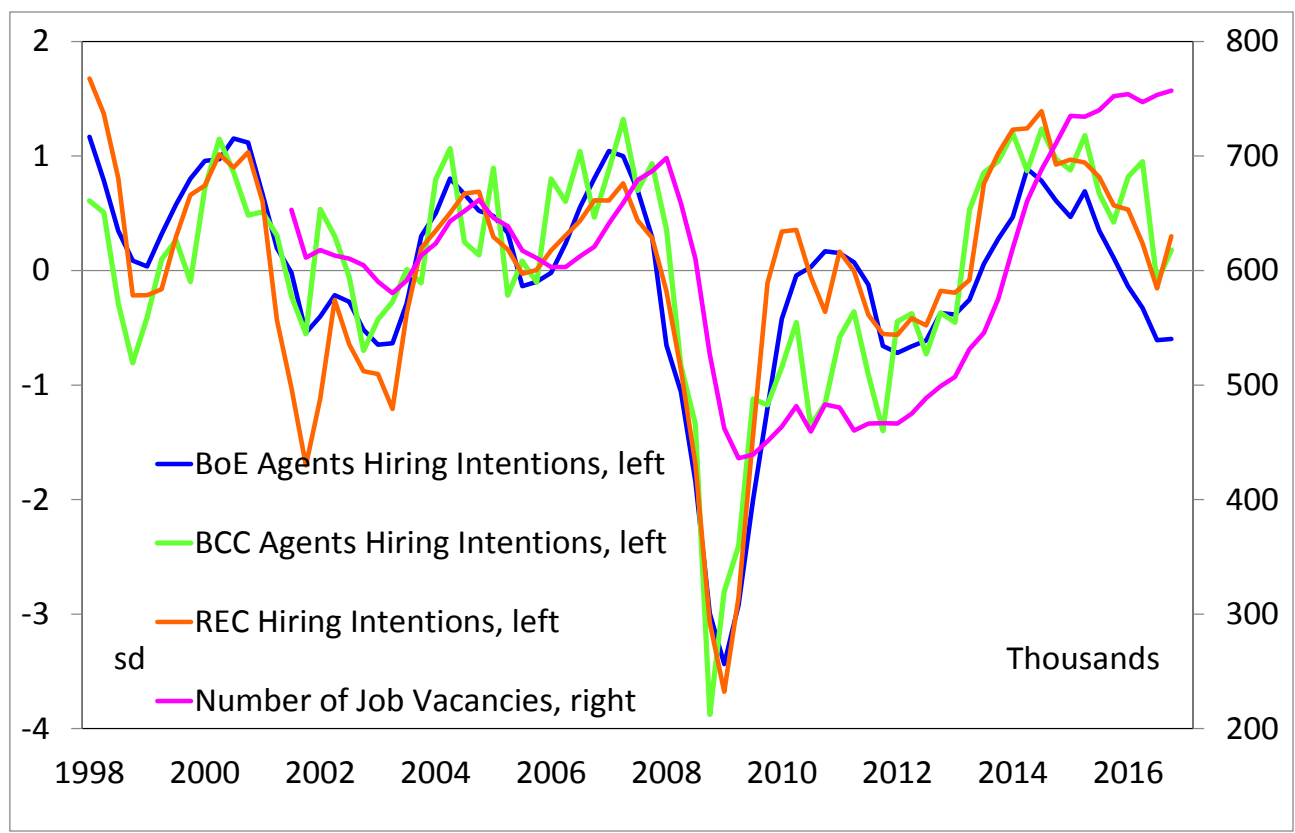


Note: The vacancy rate is the number of vacancies divided by the number of people in work. Source: ONS



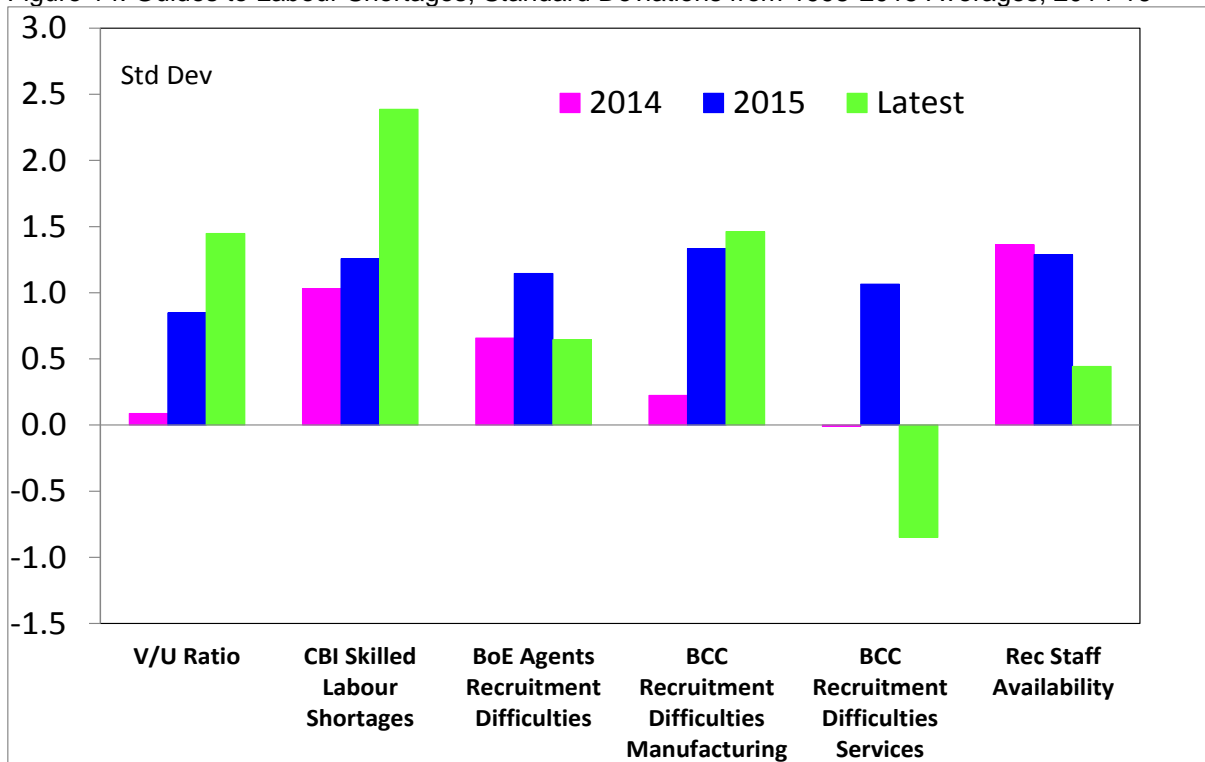
Note: Real terms figures are deflated by the CPI. Sources: Advertising Association/WARC Report and ONS

Figure 13. Surveys of Firms' Hiring Intentions and ONS Vacancy Data, 1998-2016



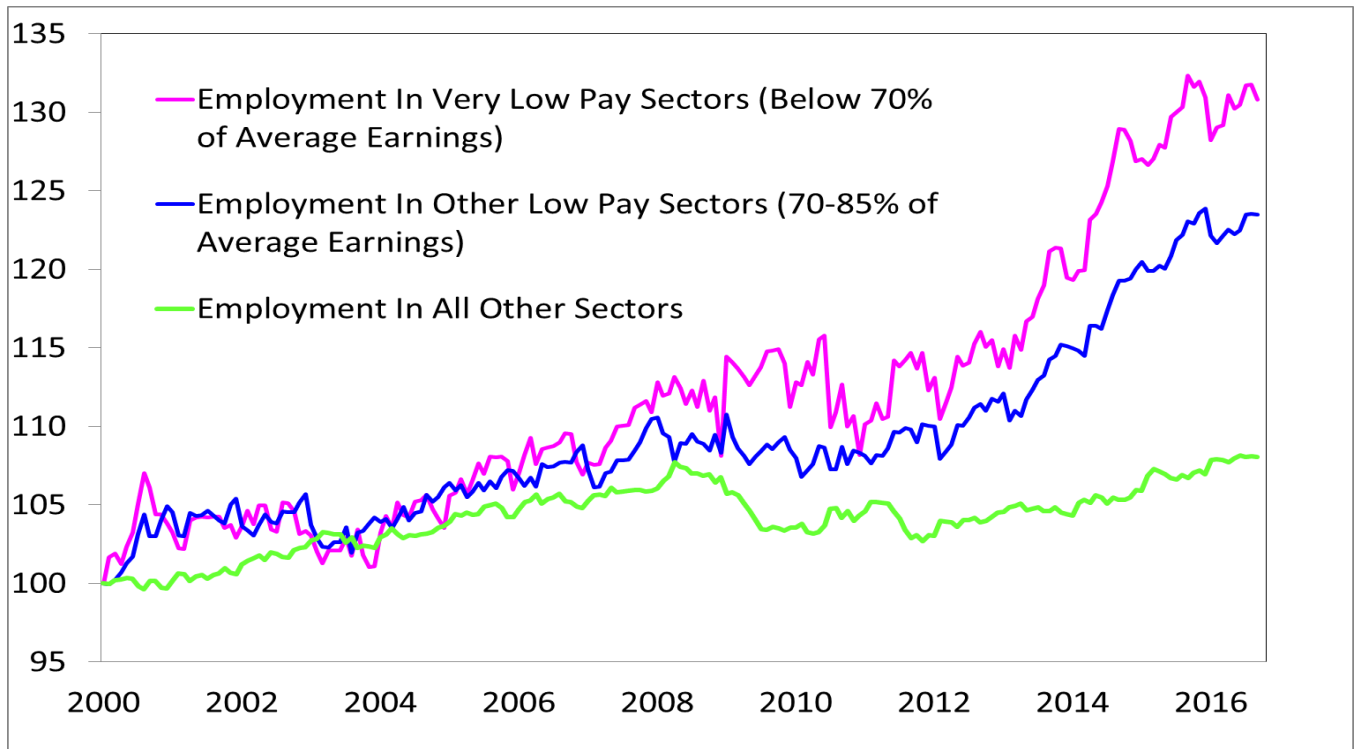
Sources: British Chambers of Commerce, Bank of England, REC and ONS.

Figure 14. Guides to Labour Shortages, Standard Deviations from 1998-2015 Averages, 2014-16



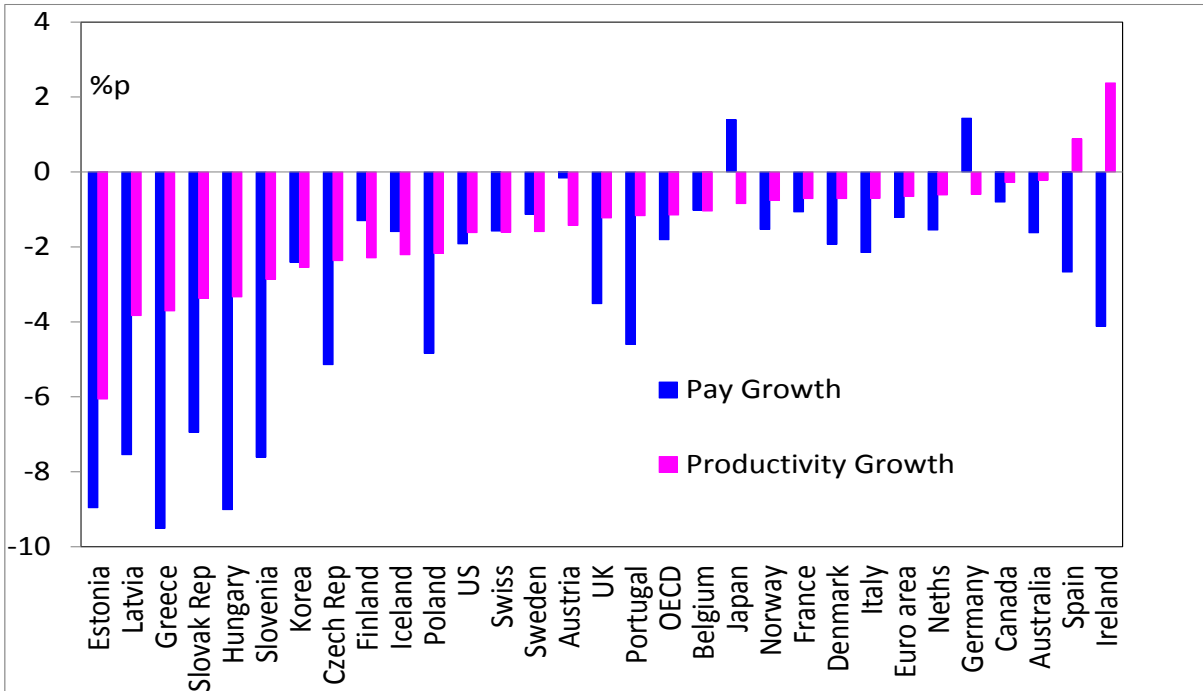
Sources : ONS, CBI, BCC, REC and BoE

Figure 15. Employment Split By Average Sectoral Pay Level, Indexed to Jan 2000 = 100, 2000-16



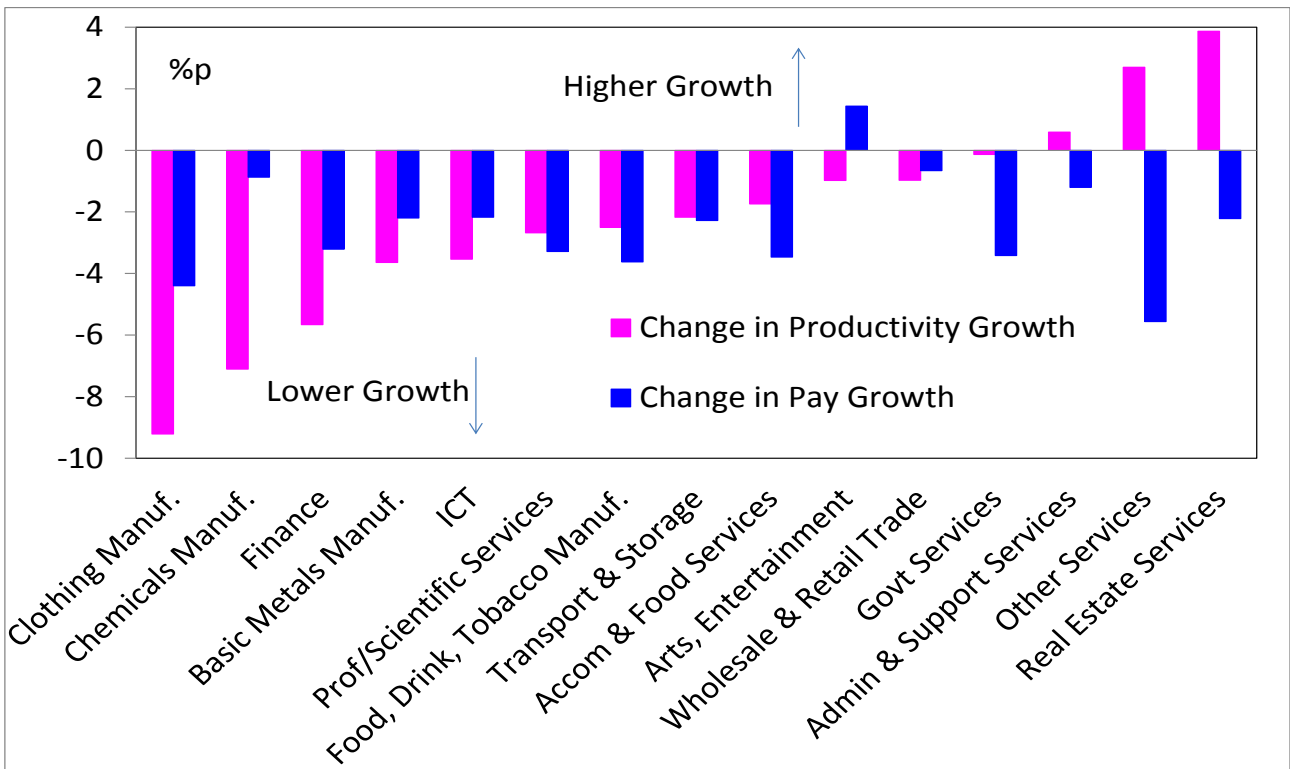
Source: ONS

Figure 16. Change in Pay Growth and Productivity Growth, Comparing 2011-16 Average With 1997-07 Average



Note: Productivity measured as real GDP per hour worked. Source: OECD

Figure 17. Change in Productivity Growth and Pay Growth By Sector, Comparing Period 2011 to Q3-2016 With 2001-07



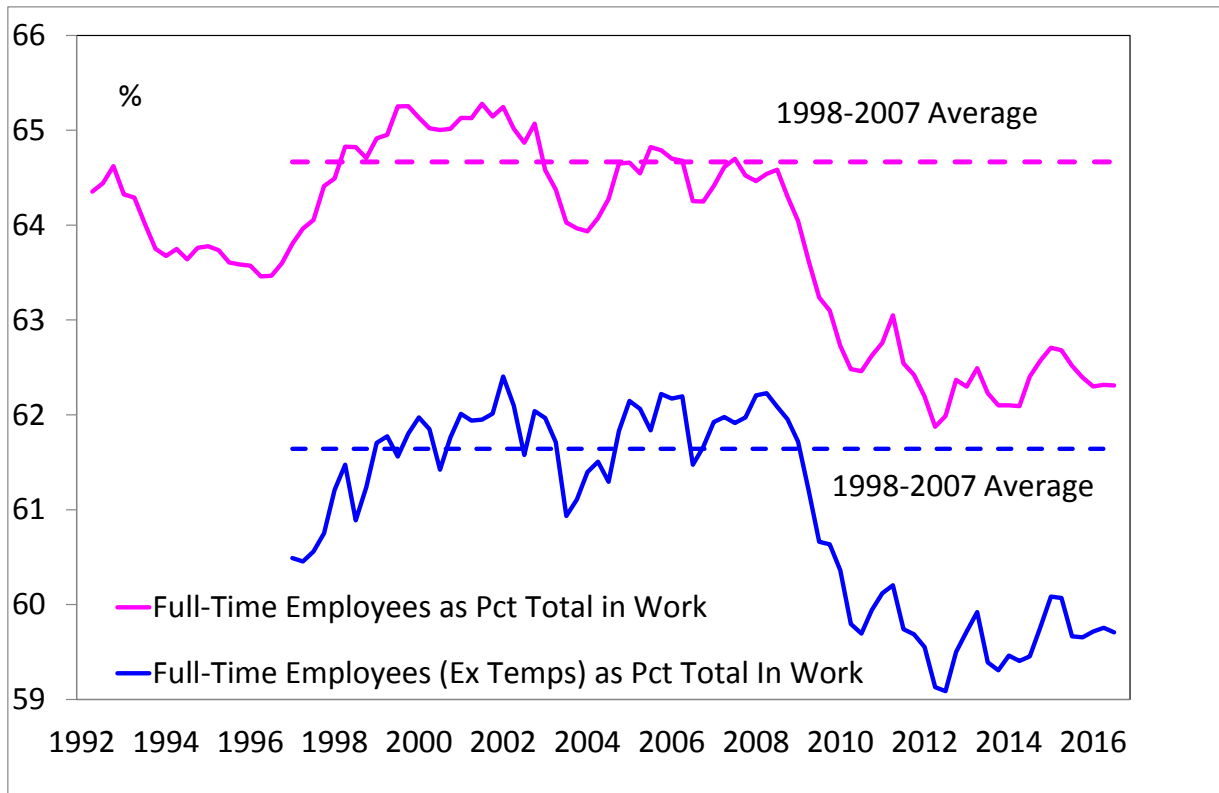
Note: Productivity growth measured by GDP per hour. Pay growth measured by average weekly earnings. Source: ONS

Figure 18. Regressions of Private Sector Average Weekly Earnings Growth on Unemployment and Inflation/inflation Expectations, 2001-16

	2001Q2-10Q4	2011Q1-16Q3	2001-16Q3
Equation 1			
AWE (-1)	0.67***	0.51***	0.62***
Unemp (-1)	-0.22	-0.54**	-0.31**
CPI(-1)	0.08	-0.20	0.03
CPI(-2)	0.08	0.74	0.20
CPI(-3)	-0.06	-0.36	-0.07
CPI(-4)	-0.04	0.16	-0.01
Prod (-1)	0.10***	0.15**	0.12***
Equation 2			
AWE (-1)	0.65***	0.38**	0.66***
Unemp (-1)	-0.19	-0.54***	-0.23***
RPI(-1)	0.03	-0.18	0.00
RPI(-2)	0.11	0.38	0.16
RPI(-3)	-0.10	0.01	-0.11
RPI(-4)	0.07	0.11	0.05
Prod (-1)	0.09**	0.11	0.09**
Equation 3			
AWE (-1)	0.71***	0.47***	0.64***
Unemp (-1)	-0.16	-0.81***	-0.24***
ST Infl Exp (-1)	0.18	0.49***	0.18
ST Infl Exp (-2)	-0.43	0.12	-0.07
ST Inf Exp (-3)	0.67**	0.31***	0.21
ST Inf Exp (-4)	-0.65**	0.07	-0.15
Prod (-1)	0.07	0.13**	0.11***
Equation 4			
AWE (-1)	0.71***	0.56***	0.64***
Unemp (-1)	-0.14	-0.76***	-0.23***
MT Infl Exp (-1)	-0.18	0.54***	0.02
MT Infl Exp (-2)	0.04	0.20	0.02
MT Infl Exp (-3)	0.31	0.28**	0.17*
MT Infl Exp (-4)	-0.05	0.09	0.05
Prod (-1)	0.12***	0.10	0.12***
Adj R-Squared			
Eq 1	0.82	0.75	0.87
Eq 2	0.82	0.72	0.87
Eq 3	0.83	0.79	0.87
Eq 4	0.82	0.77	0.87
AIC			
Eq 1	1.77	0.81	1.37
Eq 2	1.75	0.93	1.38
Eq 3	1.71	0.66	1.38
Eq 4	1.75	0.75	1.40
Is Sum of Coefficients on Inflation/Expectations Terms Significantly Different to Zero (5% level)?			
Eq 1	No	No	No
Eq 2	No	Yes	No
Eq 3	No	Yes	No
Eq 4	No	Yes	Yes

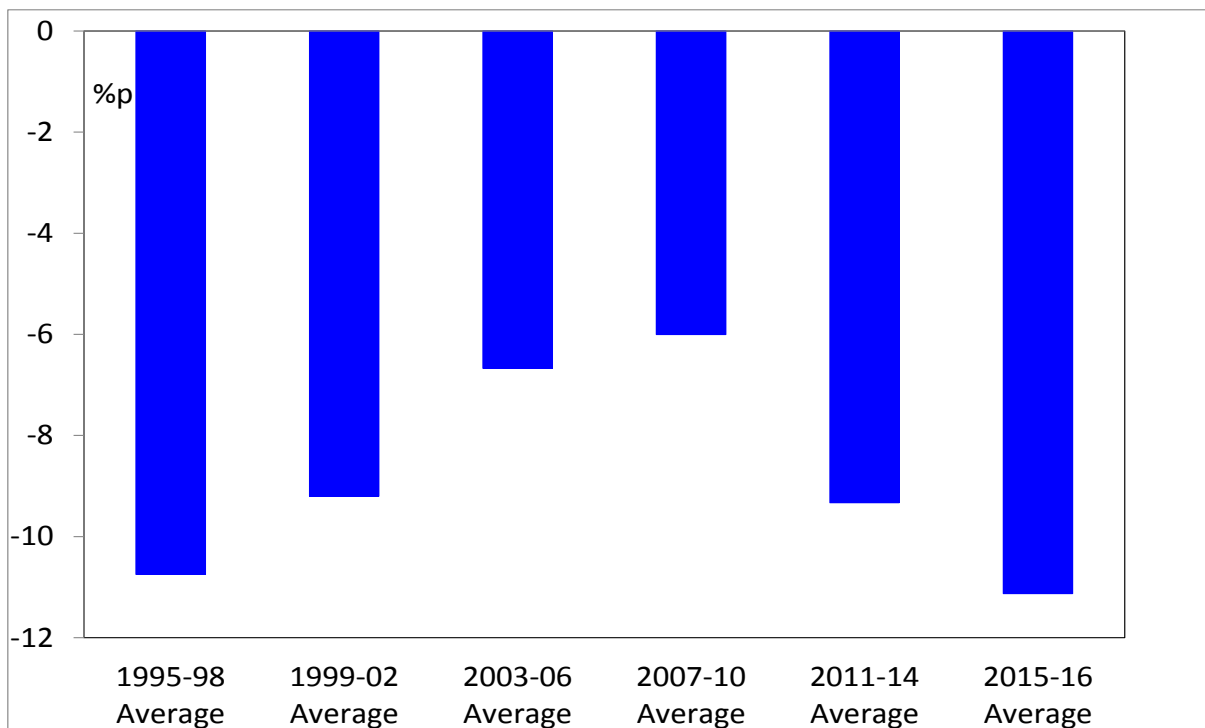
Note: Short-term inflation expectations are for the year ahead, while medium-term are for the next two years, both using the Barclays Basix survey. All regressions also use a lagged dependent variable. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively. Sources: ONS and Barclays Basix survey.

Figure 19. Number of Full-Time Employees (Incl and Ex Temps) as Pct Total Number in Work, 1992-2016



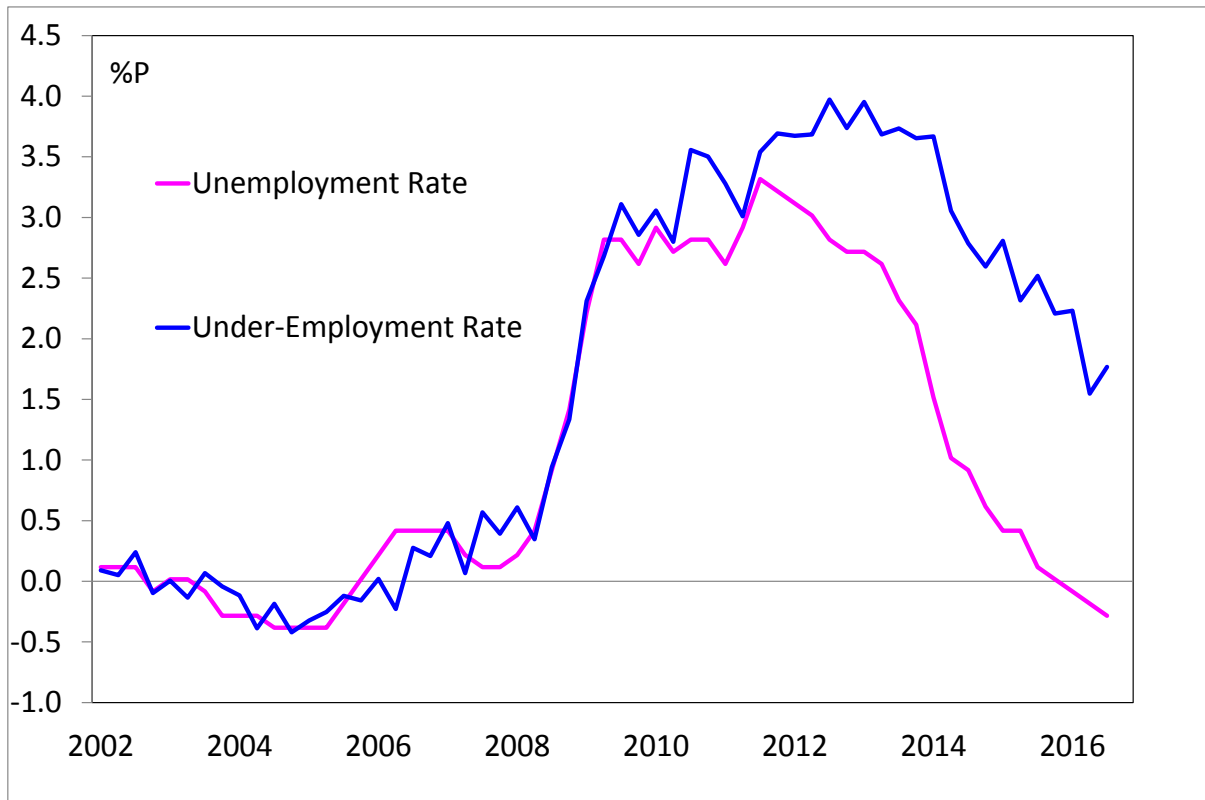
Source: ONS

Figure 20. Disparity In Pay Levels For People Returning from Unemployment and Those in Continuous Employment Over Last Year, 1995-2016



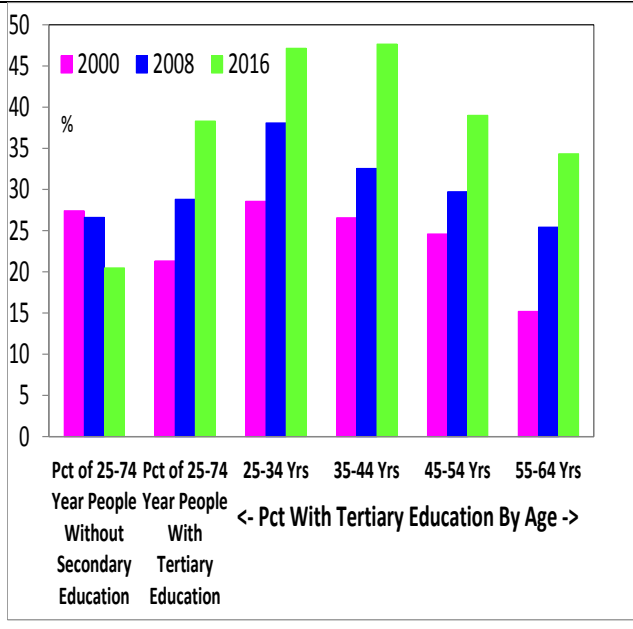
Note: Separate equations for each year estimated using LFS micro data, controlling for age, education, gender, tenure, industry, occupation. Sample size is around 12,000 people per year. Source ONS

Figure 21. Unemployment Rate and Under-Employment Rate Compared to 2002-07 Averages), 2002-16



Source: ONS

Figure 22: Educational Attainment Over Time, 2000-16



Source: Eurostat

Figure 23. Unemployment Rates By Educational Attainment, 2000-16

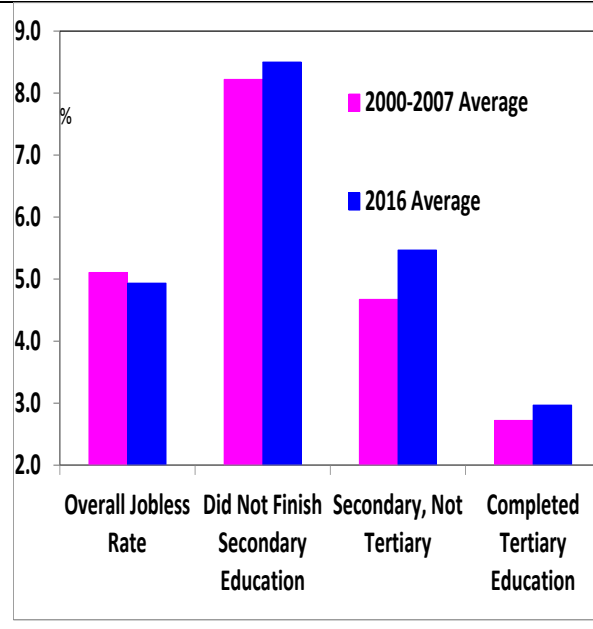
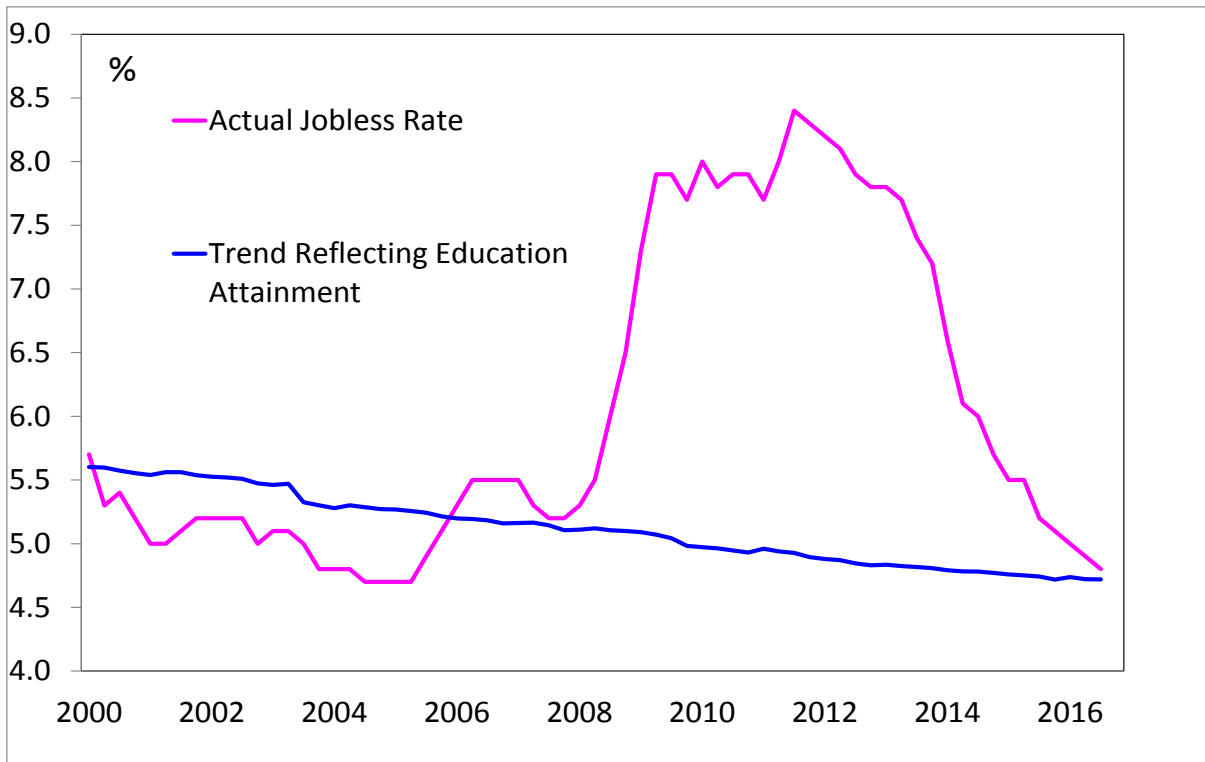


Figure 24. Actual Jobless Rate and Trend Reflecting Wider Education Attainment, 2000-16



Note: The trend maintains the jobless rates for each category of education attainment at the 2000 average, and reflect the shift in the mix of the workforce since then. Source: Eurostat

Figure 25. Workforce Participation Rate By Education Attainment, Q3 2016

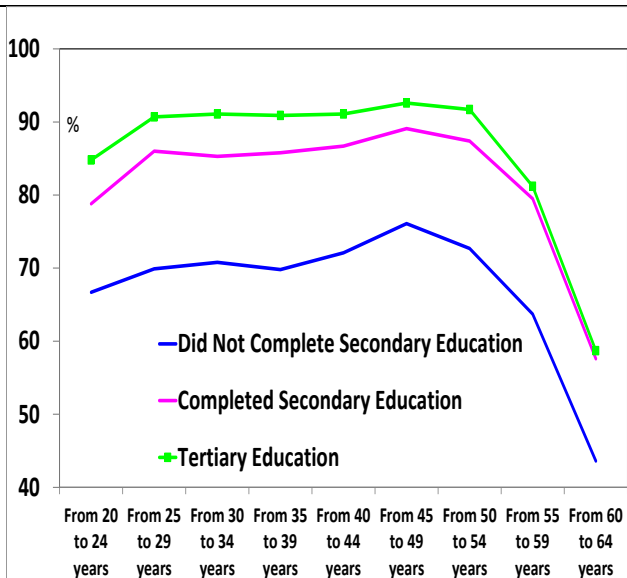
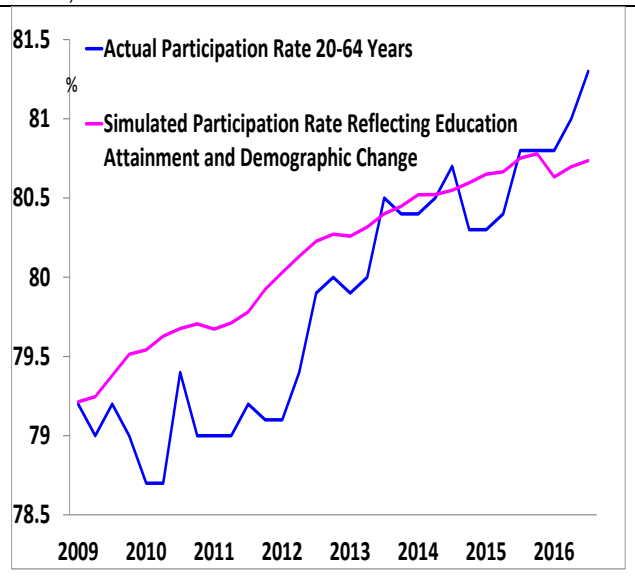
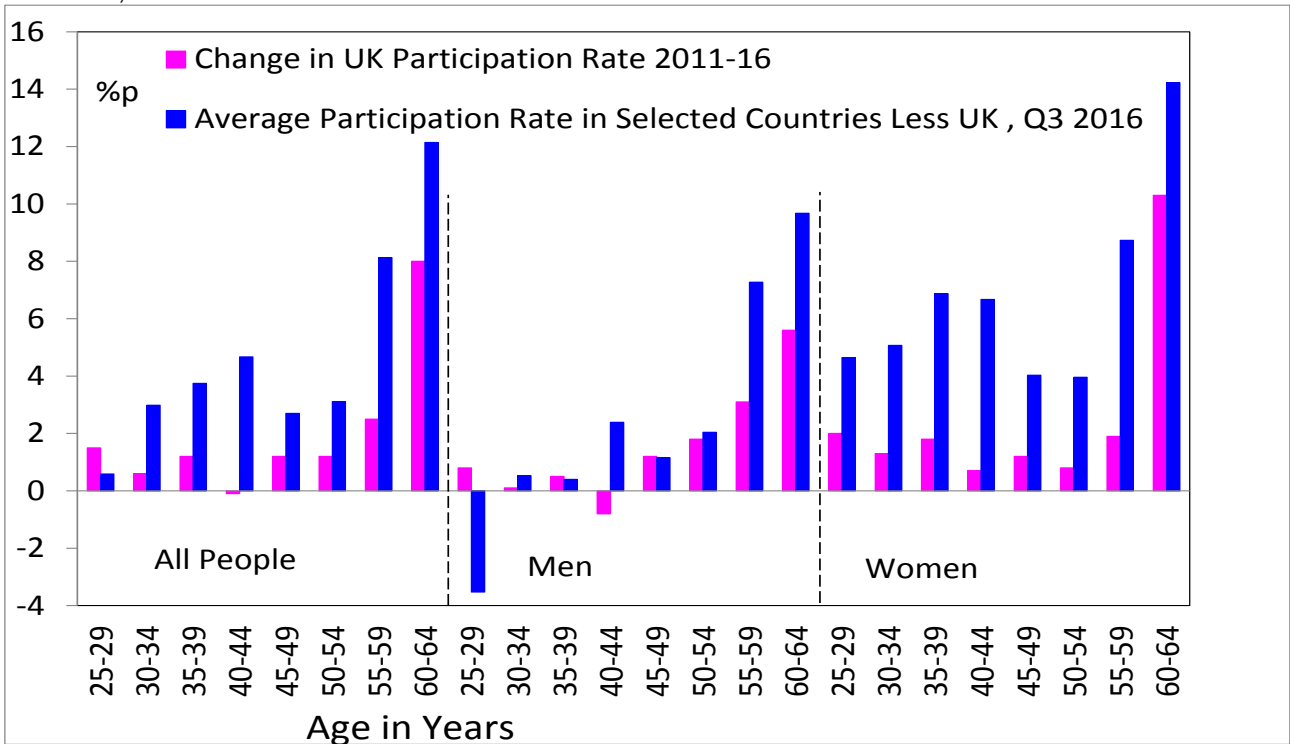


Figure 26. Effect of Education Attainment and Demographic Change on Workforce Participation Rate, 2009-16



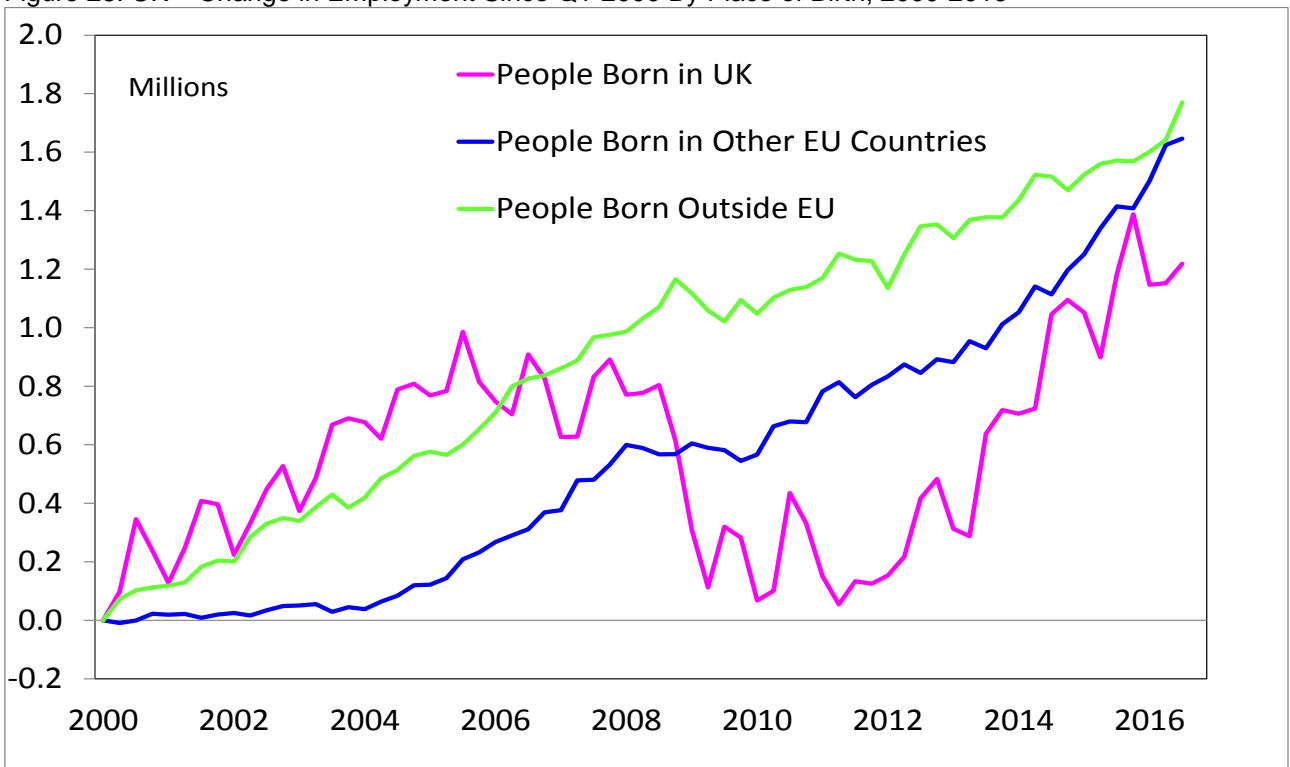
Note: Simulation keeps participation rates by age category (20-24 years, 25-29 etc), gender and education attainment stable at Q1-2009 levels and allows for subsequent changes in the share of the 20-64 year age population in each category. Data not seasonally adjusted. Source: Eurostat

Figure 27. UK – Change in UK Workforce Participation Rates 2011-16 and Gap Versus Selected European Countries, 2016



Note: Countries used are Denmark, Germany, Iceland, Netherlands, Norway, Sweden and Switzerland. Source: Eurostat

Figure 28. UK – Change in Employment Since Q1-2000 By Place of Birth, 2000-2016



Source: ONS

Figure 29. Disparity in Jobless Rates Across Industry Sectors, 1995-2016

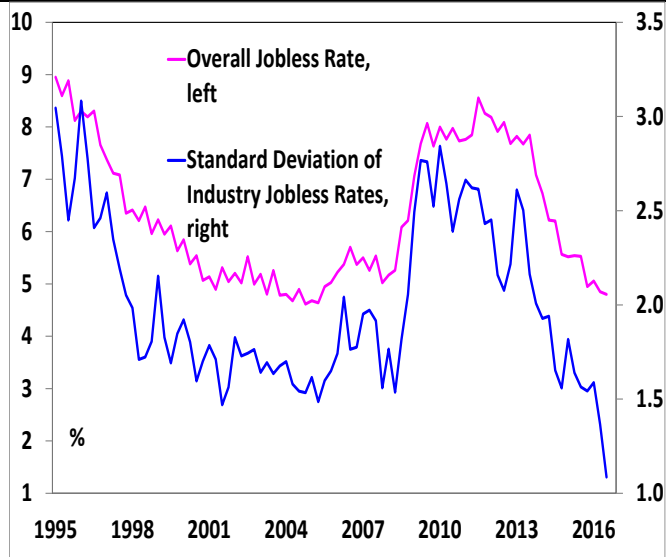
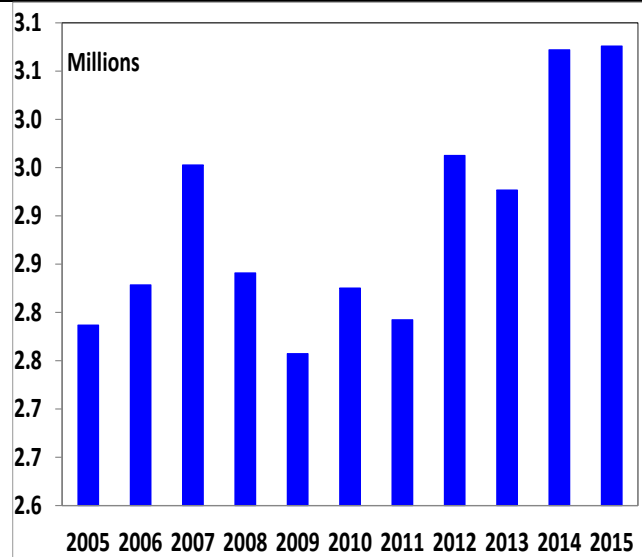


Figure 30. Internal Migration Within Great Britain (Numbers of People Moving Between Local Authority Boroughs), Millions, 2005-15



Source: ONS

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