ESSENTIAL READING

Supply Stocktake (10/10)

Note title: **The Supply Stocktake**

STRUCTURAL ECONOMIC ANALYSIS DIVISION

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ESSENTIAL READING

MPC MEMBERS Copies to: MA-HoDs

From: James Bell

THE SUPPLY STOCKTAKE

1. You asked the staff to prepare material so that the Committee might take stock of its supply-side assumptions in the May *Inflation Report* round. The pack that this note accompanies contains a set of papers, each on a different aspect of the stocktake. There is a fair amount of material to navigate. The aim of this note is to provide a storyline to help you navigate through the analysis and, hopefully, to prompt thoughts that you would like us to investigate further. Whether you agree with all of the conclusions drawn and inferences made here or not, I hope it is useful starting point.

A) Pre-amble

2. When the recession began, output and productivity fell sharply (Chart 1). Following our usual practice during the Great Moderation – and in the apparent absence of a good reason to do otherwise – our initial reaction was to assume that the reduction in productivity was cyclical, that it would recover, and that the slack it created would be disinflationary while it lasted. However, the enormous estimates of the output gap that this assumption generated resulted in provisional inflation forecasts that were horrifyingly low. The MPC quickly rejected them as implausible – rightly so, as it turned out. And, quite soon, indicators of capacity utilisation, alongside curiously robust employment growth, appeared to suggest that the degree of spare capacity within firms was much more limited that one might have expected given the size of the fall in output. Perhaps some of the reduction in productivity was structural, after all.

3. Consequently, during 2009-10 there sprang up a mini-industry in Monetary Analysis (as well as outside the Bank) aimed at identifying and quantifying potential structural or semi-structural explanations for the shortfall of the level of productivity relative to where it would have been had its pre-crisis trend simply continued. In particular, we sought explanations that were related to the nature of the financial crisis itself and the impairment of the banking system that it had caused. We had a fair degree of success in doing this, although we were never able to get things to add up perfectly or to explain the full extent of the measured productivity shortfall. Before long, the consensus in the UK economics profession was that: (a) a large proportion of the reduction in productivity was probably (semi-)structural; (b) while there was a range of possible explanations of this kind, none of them were entirely compelling by themselves; and (c) the sheer size of the productivity shortfall was nonetheless hard to reconcile with what structural explanations we *could* identify and the scale of 'slack' that was implied by business surveys and the strength of employment growth. There was, in the argot, a 'productivity puzzle'.

4. As time has passed, productivity growth has remained weak, seemingly adding credence to the semi-structural/financial-crisis related arguments that have been produced along the way. And we have come slightly grudgingly to accept as largely inevitable the cross-country empirical result that recessions

following financial crises tend to involve a permanent (or very long lasting) loss in the level of output and productivity but do not permanently affect growth rates. As a result, our default position, and our forecasting practice, has flipped from where we started: we have come to assume that weak productivity performance, and that of supply more broadly, should be locked into one's expectation of the future level of output *unless* we can positively identify cyclical 'gaps' or 'slack' into which the economy can grow without causing inflation.

5. That approach is the starting point for the way I interpret the results of the supply stocktake so far. In what follows, I begin with the long run and work towards the present, taking in one or two topical issues along the way.

B) Medium to long-run growth prospects.

6. As described above, the now accepted empirical result is that the recessions and recoveries that follow financial crises tend to involve permanent losses of the level of output, but have no long-run effect on growth rates. That is the baseline assumption. But are there reasons to doubt it? Are there reasons to aim off the assumption that productivity growth will return to average rates at some point in the future?

7. There are horror-stories in circulation that make one wonder whether the lacklustre productivity growth of the past few years is just the beginning of a longer-term 'secular stagnation' brought about by a prospective lack of technological advancement. Amongst other things, supply pessimists emphasise that the decline in the relative price of ICT goods in the US (the 'frontier country') has waned – an indicator that relative productivity growth in that sector has fallen away and, with it, the promise of the continued diffusion of ICT as a general purpose technology that will continue to support growth – perhaps for decades – in the way that the economic diffusion of steam-power and electrification did.

8. and find, however, that the evidence in favour of taking this 'supply pessimism' view as a central case is not at all convincing (see note). In fact, there are dozens of reasons to be hopeful about the prospects for the development of technology, e.g., the further application of the digital revolution, and the way in which digital technology has transformed the process of scientific research itself. Moreover, to infer that there are scant prospects for new technological breakthroughs simply from our all-too-human lack of imagination about what might be just beyond the horizon is to misunderstand the nature of the relationship between scientific advancement and the unexpected technological discoveries that are its by-products.

9. In sum, it seems like it would be an extreme assumption to take supply pessimism as the central long-run case for TFP growth. Rather, we would better off taking something similar to the average TFP growth rates seen in the years leading up to the crisis.

10. Even if you were sceptical about the prospects for continued technological development at the frontier itself (i.e., in the US), as Ben has argued, there may nonetheless be scope for UK productivity 'catch-up' *toward* the frontier. One might even claim that this scope was all greater given that the UK's productivity levels have fallen even further behind those of the US levels following the crisis (Chart 2).

11. Empirical evidence does indeed suggest the existence, in the 50 or so years pre-crisis, of a co-integrating relationship between the levels of US and UK TFP and labour productivity, with the UK catching up. Simple models would suggest that, were that relationship still to hold, there would be scope for a reasonably decent kick to UK productivity over the next few years. But, strikingly, the consequences of the crisis and its aftermath have been profound enough to wreck the historical co-integrating relationship when one tries to estimate it over the full data set. As puts it (see note): we have seen such a large shock to relative productivity levels during the financial crisis period that historically robust convergence trends have broken down. Whether those convergence trends will to reassert themselves is a matter of judgement. It seems plausible. But over what time frame?

C) Productivity over the next few years: diagnosing the 'productivity puzzle'

12. So far, our analysis has suggested that a return of productivity growth to something like the average rates seen in the years leading up to the crisis remains a reasonable assumption. But this is clearly not something that has happened yet. So when might a normal pattern of growth resume? What about over the three years of the forecast period? How do we get from where we are now to the long run described above?

13. To answer that question, we need to ask why productivity has been so weak to date and then come to a view about how the different sorts of factors we have identified as inhibiting productivity might evolve over the next few years. That is to say, we need to develop a diagnosis of the productivity puzzle before we can reach a prognosis. Our most recently updated statement of this kind was published in the June 2014 *Quarterly Bulletin* ('The UK productivity Puzzle').

14. At that time, we thought that we were able to provide quantifications for about 12pp of the 16% shortfall of productivity relative to the level that would have been implied by a continuation of its pre-crisis trend. (The remaining 4pp we just did not have much to say about.) (Chart 3,

- A quarter of the shortfall seemed related to measurement issues, including the prospect of upward revisions to GDP.
- We thought we could connect a further half of the weakness of productivity to crisis-related supply factors that would probably persist for some period. These were the impact of the crisis/recession on investment in tangible and intangible capital and, perhaps of more quantitative significance, the effect of an impaired financial system (and conceivably the low level of Bank Rate) on the reallocation of resources around the economy.
- So long after the recession had begun, we did not think there was much evidence that any of the weakness of productivity could be attributed to classic cyclical labour hoarding. Capacity utilisation surveys looked roughly normal or a bit above normal (Chart 4). And evidence from the Agents corroborated that there was little hoarding of idle resources going on.

15. In the forecasts, made at the time, the MPC expected productivity growth to pick up over the three year projection period. Given our diagnosis of the productivity puzzle, that implicitly assumed that some of the crisis-related persistent factors (like impaired resource reallocation) would start to stop dragging on productivity growth. What have we learned since then? A bit, but not a huge amount, actually…

- We were correct to anticipate that the historical GDP data would be revised up, in part because of the incorporation of R&D spending in investment. By itself, that makes the measured productivity puzzle look a bit smaller.

- Sadly, those data revisions have been offset by the continued weakness of productivity relative to trend (and relative to the MPC's forecasts) over the past year. By 2015 Q1 that leaves us almost right back where we started at the time of the QB article with a productivity shortfall of about 15% to explain.

- Capacity utilisation surveys have not moved much. So out central estimate of the scope for a 'normal' cyclical recovery in productivity growth remains more or less nil.

- Our estimates of the extent to which the weakness of physical and intangible investment since the recession have restrained productivity growth have remained unchanged.

- We still think that impaired resource reallocation is contributing a similar sized chunk to the puzzle. The latest data (which, relating to 2013, are admittedly very lagged) show that the proportion of firms with shrinking output but stable workforces remains elevated – we have used this as evidence of impaired resource allocation in the past. The proportion of loss making firms in 2013 remained high, but corporate insolvencies remain historically low, including in more recent data for 2014 (Chart 5). The dispersion of productivity growth rates across firms remains exceptionally high (Chart 6). And M&A activity is still historically very weak (Chart 7).

- However, one can make a case that there are at least some positive signs that that resource reallocation bottlenecks are beginning to ease. Firm creation increased sharply in 2013 (Chart 8). There is (albeit slender) evidence from the 2013 ONS Annual Business Survey micro data that shifts in market share between incumbent firms are beginning to have a positive effect on productivity growth; labour market churn has picked up (Chart 9). And, as Kristin pointed out in her 'King Midas' speech, the share of investment accounted for by the tradables sector has recently increased.

16. On this front, then, although there are some tentative positive signs that the obstacles to resource reallocation and, therefore, productivity growth are beginning to ease, we are not in a hugely different position to the one we were in a year ago.

17. What *is* different form a year ago, however, is that staff estimates now suggest that the degree of cyclical slack in the labour market is close to being exhausted. A year ago there was sufficient slack that reasonable GDP growth rates could be sustained – even with sub-par productivity – by drawing more under- or unemployed labour into service. As time has progressed, and slack has diminished, we appear to have approached a crunch point. Either productivity growth will pick up in a way that supports the average rates of demand growth that the MPC has forecast. Or productivity will not pick up and, as a consequence GDP growth will be weaker. Or GDP *will* grow as forecast despite the lack of a pickup in productivity growth, but at the cost of higher wage and price inflation.

18. This thought leads us to an examination of our assumptions about potential labour supply growth and the labour market 'gaps'. How much slack is there left?

D) Labour market slack

19. By the August 2014 *Inflation Report* round, we had become concerned that wage growth appeared to have been weaker since the middle of 2013 than could easily be explained given developments in productivity and our estimates of labour market slack (Chart 10, taken from Andy's 'Drag and Drop' speech). There was a range of possible explanations for the weakness of wages (and still is). But to help reconcile the

puzzle to some degree, the MPC made a judgment to increase its estimate of the size of the output gap over the previous couple of years. We implemented this in part by lowering the assumption about the medium-term equilibrium unemployment rate (U*). This seemed reasonable given that the long-term unemployed had been more successful in finding jobs than we had anticipated. We also implemented the judgment in part by increasing our assumption about trend participation (PA*). That also seemed reasonable following new analysis indicating that, since the onset of the crisis, the effect of increased trend labour market participation amongst older age cohorts had slightly more than offset the structural decline in PA that ought to have resulted from the retirement of the baby boomers.

20. Since we made those judgements, the unemployment data have continued to decline, and participation has fallen back. On the face of it, that might lead one to question whether we got the balance of those two judgements right. With that at the back of our minds, let us take a fresh look at our labour market assumptions, and see if they still seem our best central estimates.

(i) Participation

21. The staff's cohort model suggests that a flat trend participation profile over the next few years remains reasonable – as baby boomer retirement (negative for participation) is offset by the effect of within-cohort participation trends (positive) (Chart 11). The demographic aging effect is expected to come to dominate after 2018.

22. A flat participation rate in the medium term seems reasonable enough. But, because we assume that the participation rate is currently below its assumed trend level (Chart 12), the Feb *IR* projection contained a cyclical recovery in participation over the next year or so. That now looks questionable. It is not just that the recent data have gone the wrong way (although they have). It is also that there no longer seems a great deal of evidence that one ought to expect a further noticeable cyclical boost to participation on top of the recovery we have already seen since 2011. As [redacted] explains: (a) the increase in labour market tightness we have seen during the recovery would econometrically 'normally' be associated with a recovery in the participation rate of around 0.5pp, and we have already had 0.3pp of that; and (b) the proportion of 'marginally attached' inactive people who say that they want a job (in contrast with those 'truly inactive' that have no plans to work) has fallen back almost to pre-crisis levels (Chart 13).

23. Overall, with the benefit of hindsight, we think that overdid the increase to our assumed trend participation rate in the August 2014 *IR* round. Our central estimate is now that the participation gap is worth probably only around 0.2% of GDP in 2015Q1, versus 0.6% in the February *IR*.

(ii) Average hours

24. During the recession, there was unquestionably an increase in involuntary part-time working (Chart 14). Our former colleague, David Blanchflower, has been amongst the most vocal in pointing this out. Responses in the LFS regarding how many additional hours individuals say that they want to work form the basis of our estimates of the average hours gap (the extent to which we believe hours to be below their trend level). But we do not take those responses at face value because, as Martin's work has found (and our

updates confirm), individuals' responses tend to exaggerate by a factor of roughly 2:1 the number of additional hours they choose to work when it comes down to doing it. This attenuated response is what has been factored into our estimate of the hours gap and therefore, by residual, of trend average hours. We suggest this remains the case.

25. Up until now, we would have said that there was a risk that we had under-stated the size of the hours gap. But, following the stocktake work, we are now more comfortable with our central view. This is because it appears that, just as there has been an increase in involuntary part-time working (implying scope for hours worked to expand) there has also been a marked reduction in the amount of holiday taken by those in full time employment (implying scope for it to fall back) (Chart 15). discusses this in more detail.

(iii) Unemployment and wage growth

26. We have no new analysis to bring to the table on U*. This does not mean that we are especially confident about our estimates of the long-run natural rate or of the hysteretic wedge between it and the medium-term U* concept: we are not. It is simply that we have little new to say at this stage.

27. The net result of our analysis on participation and average hours is to leave our estimate of the size of the output gap a little lower over the recent past (Chart 16). On the face of it, this sits a bit uncomfortably with the fact that the Committee previously took a deliberate judgment to increase the size of the output gap to help explain the path of wage growth over the past few years.

28. There are, of course, plenty of reasons for restrained wage growth beyond the scale of labour market slack, and we will no doubt want to come on to discuss them in the May forecast round. One could argue, though, that when we made the judgement to increase the size of the output gap in August last year, we got the balance between lower equilibrium unemployment and higher participation wrong. Although we have no particular analysis on which to base a reduction in our assumption about U*, and therefore do not pro-actively suggest it ourselves, making a small downward adjustment to the natural rate of unemployment assumption (currently around 5%) in order to offset the effect of the staff's suggested change to trend participation over the past (thereby fully preserving the MPC's 'weak wages' judgement) is an option that the Committee will probably want to consider.

29. One potential explanation for the soft wage growth of the past few years that has gained in popularity in recent months is the extent of net inward migration to the UK.

(iv) Population and migration

30. At almost 300k in the year to 2014Q3, net migration flows are estimated to have been considerably in excess of the ONS's official population projections from 2012, upon which our forecasts have hitherto been based (Chart 17). Updated official projections will not be available until the end of the year. But the gap between our outdated assumptions and the incoming data is now sufficiently large that we do not feel that we can plausibly wait for the new official estimates before doing something about it.

31. The migration data imply that the population is around 0.3% higher than we had supposed. To a reasonable approximation, this mechanically implies that the level of productivity is 0.3% lower than we thought. Two questions follow: (a) what should we assume about migration and therefore population growth looking ahead; and (b) to what extent might the strength of migration have lowered wage growth over the past?

32. On the first question, we have a problem. Although one would expect relative macroeconomic situations to influence the migration flows of those seeking work in the UK (which in fact largely means migrants from the rest of the EU), the empirical result appears to be that it is migration *policy*, rather than macroeconomic fluctuations that tends to drive the bulk of short-run changes to migration flows. (It is also true that a large proportion of migrants come to the UK to study – especially from outside the EU – and these flows are likely to be influenced primarily by the number of student visas available.) Our problem, of course, is that we cannot know what the migration policy of the new Government will be and it makes no sense to guess. In light of that, and in the absence of an up-to-date official population projection, we have made as neutral an assumption as we could (Chart 17). We assume that population flows will persist at their high levels for a little while, before declining roughly to post-2004 EU accession averages over the forecast period. This is a holding position until we have new official projections. The has the details.

33. The second question, over the extent to which the strength of migration might have lowered wage growth over the past few years, is one that we will want to pick up in the May *IR* forecast round. For what it is worth, tentative initial analysis suggests that the flows we have seen are likely to have had some impact – but probably a fairly limited one on aggregate wage growth: perhaps in the region of 0.1 or 0.2pp. Research following the post-2004 migration wave suggested that these effects were most likely to be felt towards the bottom of the income distribution.

34. One other point worth noting on this topic is that we have begun had a go at quantifying the likely scale of ‘latent’ migration – or, as one might more formally think of it, the size of the non-resident pool of potential workers who are searching for work in in the UK. We know how many migrants arrive in the UK having found work in advance. This flow, logically, is the product of a ‘latent’ migrant pool of non-resident job searchers and a job-finding probability. If we assume that non-resident searchers have a job matching probability similar to that of the UK-resident unemployed, it implies a pool of ‘latent migrators’ equivalent to about 0.5% of the UK workforce (Chart 18), which one might loosely think about as a number that can be added to the unemployment rate to get an estimate of the ‘true’ degree of slack. This is quite a fascinating quantification and a reasonably noticeable addition to the effective labour market ‘slack’ available to UK firms. But before we get too carried away with it, we should note that this statistic has been at around the 0.5% level since the start of 2005. It has increased only by about a tenth since the start of 2012, which seems rather unlikely to be able to explain much of the UK’s recent wage dynamics.

E) Where does all this leave us?

35. We have come to accept the empirical regularity that the financial crisis has resulted in a permanent (or at least very long lasting) loss of the level of productivity, output and income. But there is every reason to suppose that productivity *growth* will ultimately recover to historically normal rates (including because of the possibility of UK productivity 'catch-up' towards the global frontier).

36. Our view on when that recovery will happen should depend on our diagnosis of the 'productivity puzzle' and how speedily the factors we identify as holding back productivity will dissipate. In truth, we have not learned an enormous amount about this since our last review of the issue, published in the June 2014 *Quarterly Bulletin*. Semi-structural or persistent factors related to the nature of the financial crisis still appear a significant impediment to productivity, in particular, via their effect on the allocation of resources around the economy, although there are some tentative signs that these resource reallocation constraints might be easing. Overall, to the extent that we felt that a pickup in productivity over the three-year forecast period was a plausible assumption a year ago then we should still think it plausible today. But one understandably might want to draw some signal from the fact that, yet again, another year has passed without any notable recovery in productivity growth having occurred.

37. What is different from a year ago, however, is that our estimates suggest that the degree of slack in the labour market is getting to the point of being exhausted. If that is correct, then the economy cannot easily rely of the absorption of underutilised labour to support growth at historically normal rates. This underlines the key uncertainty over the outlook. Will productivity pick up, and so support the healthy growth rates that the MPC is expecting? Or will it not? And, if it does not, will the consequence be lower growth, or will growth rates around historical norms be achievable only at the cost of higher wage and price pressures?

38. The staff's stocktake of our labour supply assumptions suggests that, with the benefit of hindsight, it looks like we overdid the upward adjustment we made to the trend participation rate in August last year. But we remain comfortable with our assumptions on average hours – probably more comfortable than we were before, in fact. By themselves, those would suggest that our estimate of the output gap over the recent past ought to have been slightly smaller (although this would make the soft wage growth of the past year or so a little harder to explain).

39. Migration has been stronger since 2012 that the official ONS projections on which our forecasts were based would have implied. We have adopted a holding position that is as neutral as possible which we await both updated official projections and the formation of a new Government whose policies are likely to have a significant influence on migration flows. It is possible that stronger than assumed migration has been a factor restraining pay growth. At this stage, however, our tentative analysis suggests that the role of migration is likely to have been fairly limited. We will, of course, be returning to the issue of pay growth in the May *IR* round.

Monetary Analysis
Structural Economic Analysis Division (TS-2 BD)
2 April 2015
James Bell

ESSENTIAL READING

Chart 1: Labour productivity

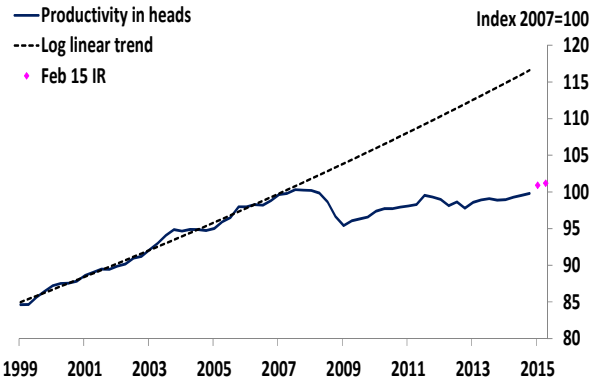
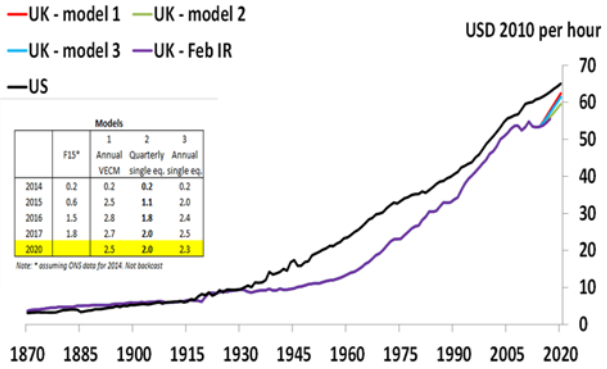


Chart 2: UK and US productivity



Models

	F15*	1 Annual VECM	2 Quarterly single eq.	3 Annual single eq.
2014	0.2	0.2	0.2	0.2
2015	0.6	2.5	1.1	2.0
2016	1.5	2.8	1.8	2.4
2017	1.8	2.7	2.0	2.5
2020		2.5	2.0	2.3

Note: * assuming ONS data for 2014. Not backcast

Chart 3: Explanations of the productivity puzzle

Factors contributing to the weakness in UK labour productivity

(in pp)	2013 Q4 (original vintage)	2013 Q4 (latest vintage)	2014 Q4
Shortfall relative to trend	16	13.5	15
Measurement issues	4	2.5	3
Measurement of output	2	0.5	1
o/w R&D capitalisation	1.5	-	-
Lower trend in some sectors	2	2	2
Actual shortfall to explain	12	11	12
Cyclical	0	0	0
Lower CAPU	0	0	0
Labour hoarding	Uncertain	Uncertain	Uncertain
Persistent	6-9	7-9	7-9
Lower physical and intangible capital	3-4	4	4
Impaired resource allocation & high firm survival rates	3-5	3-5	3-5
Total left unexplained	3-6	2-4	3-5

Chart 4: CAPU

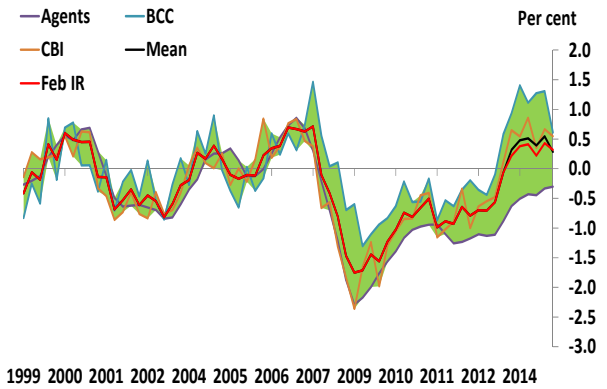


Chart 5: Liquidations and loss making firms

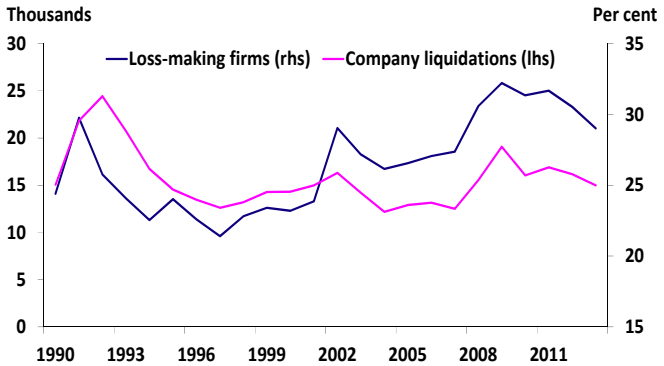


Chart 6: Productivity dispersion across industries

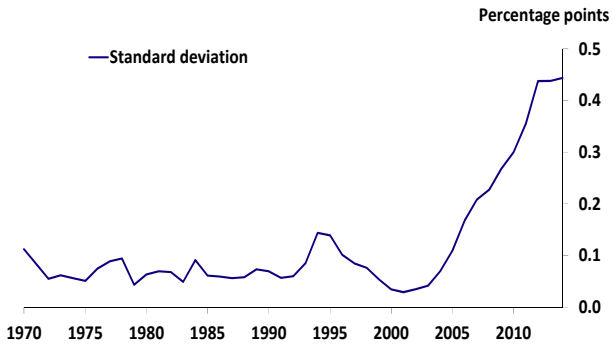


Chart 7: M&A

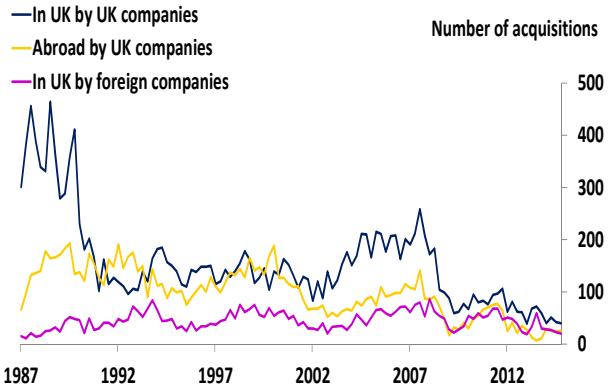


Chart 8: Company births and deaths

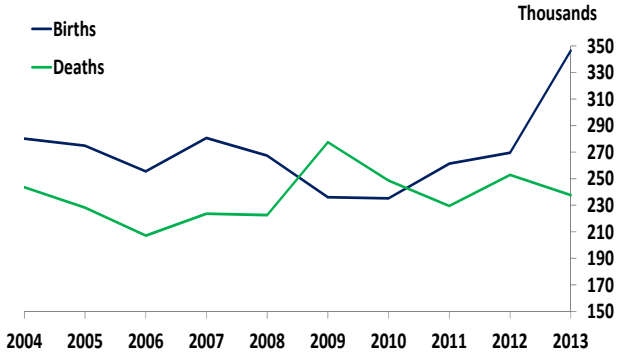


Chart 9: Private sector job-to-job flows

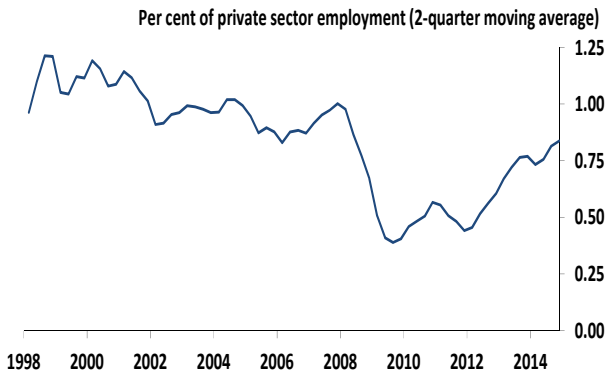


Chart 10: Actual and estimated UK wage growth

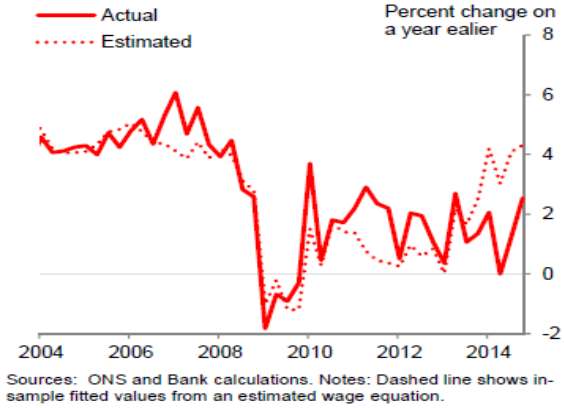


Chart 11: Cohort model of participation

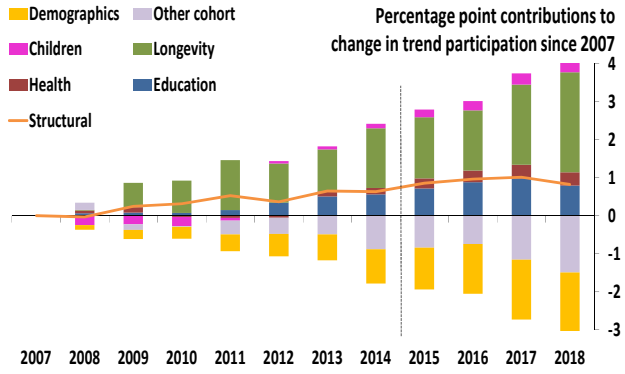


Chart 12: Trend participation assumptions

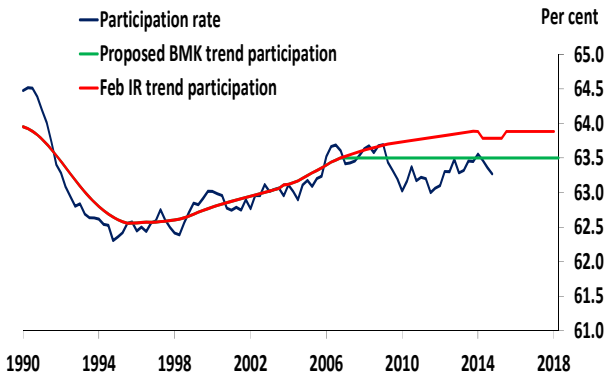


Chart 13: Inactive wanting a job (16-64)

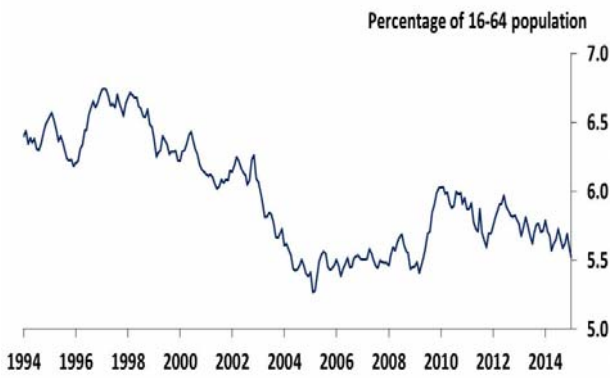


Chart 14: Part-time workers that want a full-time job

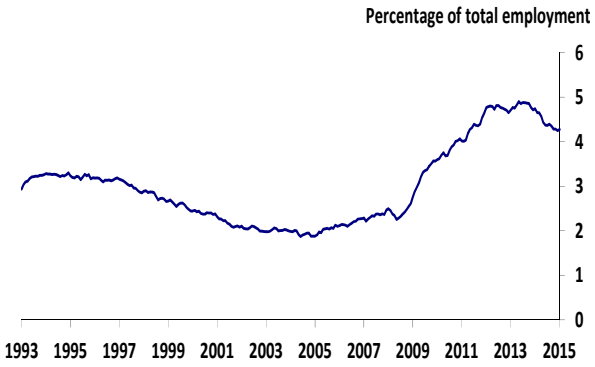
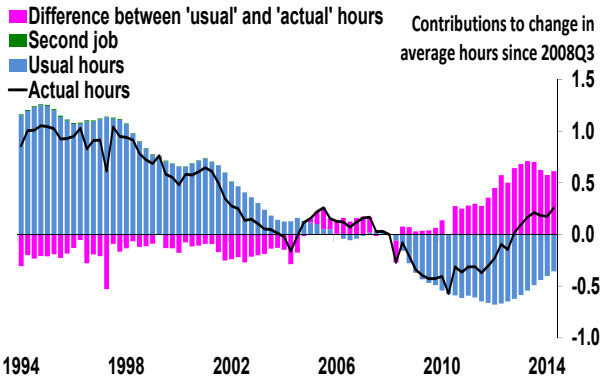


Chart 15: Decomposition of actual average hours into 'usual' hours and wedge

Chart 16: Contributions to the output gap



	Feb IR		May BMK	
	Q1	Q2	Q1	Q2
U gap	-0.2	-0.2	-0.2	-0.1
AVH gap	0.0	0.0	-0.3	-0.2
LP gap	-0.6	-0.5	-0.2	-0.1
CAPU	0.3	0.2	0.2	0.2
Total	**-0.6**	**-0.5**	**-0.4**	**-0.3**

Chart 17: Migration BMK projection

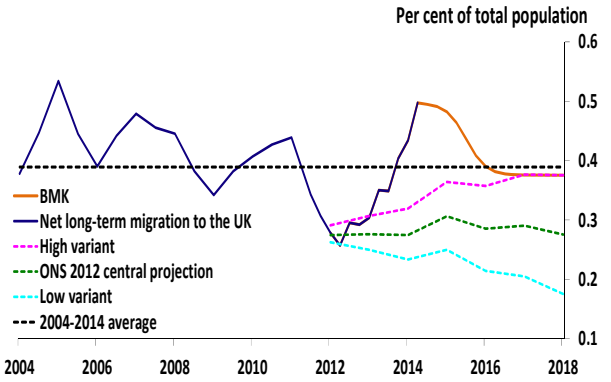
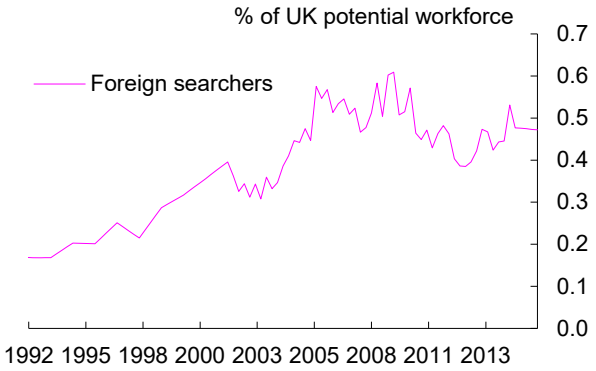



Chart 18: The pool of foreign workers searching for UK jobs appears to be similar to that pre-crisis