



BANK OF ENGLAND

Speech

One Car, Two Car, Red Car, Blue Car

Speech given by

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As someone whose family hails from the North-East, and who themselves was born in the North-East, it is wonderful to be here in Redcar. Regional visits like this are crucial for the Bank of England. They enable us to take the temperature of the local economy by speaking to a broad cross-section of businesses, charities, social enterprises, schools, further and higher education institutions and trade unions.

Here in the North-East, it is clear the temperature of the local economy is not as high as either you or I would wish. Despite having come down rapidly over recent years, the unemployment rate, at over 6%, is still higher than for any other region in the UK. And the closure of the steelworks down the road a little over a year ago was a further blow to Teesside, with the loss of 2,200 jobs.¹

Yet it is not all doom and gloom. There are more people in work in the North-East today than at any time in its history. Over 48,000 more people have found jobs over the past 12 months. And the North-East alone has contributed 20% towards the overall fall in national unemployment over the last year. Or, if you like, the increase in employment over the last year is 7 times that at Nissan's Sunderland plant alone. Despite the media headlines, the North-East has been one of the most dynamic areas of job creation in the country recently.

Underpinning this above-average jobs performance has been above-average productivity growth in the region. So it is particularly appropriate to be here today at the Materials Processing Institute, which has been a global centre for research on the iron and steel industry since 1945. The Institute has contributed importantly to Teesside having a high concentration of high value-added industries, such as chemicals and processing, which have boosted jobs and productivity in the region.

Today, I want today to discuss the economy, at both a national and regional level. I want to discuss what monetary policy can and, as importantly, cannot do to support the economy, nationally and regionally. And I will also touch on what role other policies might play in supporting growth, here in the North-East and nationally, in particular when it comes to boosting skills, innovation and productivity.

A Two-Car Economy

I want to set the scene by describing an imaginary economy. Now I know what you are thinking – typical economist, head in the clouds, aimlessly theorising without any grounding in the real world. But bear with me on this one, as I think my stylised economy might help in making sense of the real world to which I promise I will then return.

This imaginary economy comprises, for simplicity sake, two regions - Red Car region and Blue Car region. These two regions have quite different economies. The economic make-up of their firms and households is

¹ BBC News *October 2015*, 'SSI Redcar Steelworks to be shut'.

different in terms of their production processes and spending patterns. So too, as a result, is the level of activity, income and productivity in the two regions.

Red Car region comprises a set of firms who make red cars. To do so their production processes rely on few machines and lots of workers. Because there are few machines, the workers employed do not need especially high skills. And because firms employ lots of these lower-skilled workers, their levels of productivity – the number of cars produced per worker – is relatively low.

Households in Red Car region earn income from working in red car firms. Because these firms have low productivity, they tend to pay low wages to these workers. And because, as a result, household incomes are low, workers can only afford to buy one red car and often having to borrow money from the bank. In other words, households in Red Car region have lower net wealth.

Blue Car region is, in some respects, its mirror image. Firms produce blue cars using lots of machines and relatively few workers. To operate these machines, workers require high skills. Given this mix of machines and skilled workers, blue car firms have high levels of productivity. And as high levels of productivity translate into higher profits, blue car firms have less need to borrow from the bank than red car firms.²

Meanwhile, households in Blue Car region benefit from higher wages, courtesy of their higher level of skills and productivity. These high incomes enable them to own two blue cars, often without needing to borrow from the bank at all. In other words, households in Blue Car region have higher net wealth than in Red Car region.

The Role of Monetary Policy

Now let's hit this hypothetical economy with a nasty surprise – say a shock to the banking sector, which reduces its willingness to lend to households and firms, or increases the costs of doing so. This tightening of credit conditions affects households and companies in both regions, as both rely on banks to some degree.

Firms whose credit conditions have tightened face a profits squeeze and cut their production of (red and blue) cars. Households facing the same tightening in credit conditions face an income squeeze and cut their consumption of (red and blue) cars. As a result, aggregate activity or GDP in the economy – the sum of red and blue car production – falls in this hypothetical economy. There is a recession.

While both regions are affected, the impact of this recession is not felt equally. Red firms might borrow more than Blue ones and Red consumers more than Blue ones. This means the tightening of credit conditions

² In practice borrowing behaviour is likely to be driven by several other factors, such as expectations of future earnings, access to finance and the amount of collateral with which to borrow against.

has a larger impact on Red Car than Blue Car region - its recession deeper, the impact on unemployment greater. This further widens the income gap between Red Car and Blue Car regions.

What can be done? Enter a central bank with a mandate to support the whole economy. They can do so in two ways. First, they can cut the interest rate at which they lend to banks which, in turn, is reflected in banks' lower cost of lending to companies and households. Second, they can buy assets – which, in this hypothetical economy, means cars – increasing demand for them and hence their price.

These actions lower the cost of borrowing and raise the price of assets in the two-car economy. Both support the production of cars by firms and the consumption of cars by households. In this way, aggregate activity in the economy is boosted, at least in the short run. By lowering interest rates and purchasing assets, a central bank can help meet its mandate of supporting the economy as a whole.

If the *aggregate* impact of looser monetary policy on the economy is positive, what about its *distributional* impact across regions? In this simple setting, lower interest rates boost the incomes of net borrowers in Red Car region, while reducing the income of net savers in Blue Car region. As the income of Red Car consumers is lower than Blue Car consumers, this *shrinks* the distribution of incomes across the economy.

The effect of asset purchases is to boost the wealth of all car owners, with the bigger boost felt by those whose car wealth is largest. So although both regions are better off in net wealth terms, Blue Car region benefits more than Red Car region. Put differently, the distribution of wealth across regions may *widen* as a result of asset purchases. Or that at least is what this simple, stylised economy would imply.³

The Real Economy

Now let's return to planet earth, from the hypothetical to the real world. In fact, as you might have guessed, these two worlds are not as unlike as might first appear.

Chart 1 plots a map of the UK by region, shaded according to levels of nominal GDP per head prevailing in 2014, the latest date for which we have data. There are clearly significant differences across region. The GDP per head of the richest region (London) is around £45,000, 2.4 times higher than the poorest parts of the UK (Wales and the North East) at around £18,000 per head. These are, if you like, the Blue and Red Car regions.⁴ Indeed, regional differences in UK living standards are among the highest in Europe.⁵

³ I am simplifying here considerably. Lower interest rates will also boost asset prices, altering the distribution of wealth. And asset purchases will also influence borrowing costs, affecting savers and borrowers. This story also only considers the direct financial effects. Monetary policy can also have several wider indirect macroeconomic effects by boosting activity and employment which can also have distributional impacts. For further details see Draghi (2016).

⁴ See Haldane (2016), CBI (2016), Institute for Public Policy Research (2016).

⁵ According to data from Eurostat (2016), the gap in GDP per head between the richest and poorest regions in the UK ranked fourth in a sample of 20 EU countries on a comparable PPP adjusted basis in 2014.

The vast majority of national income – around three-quarters - is paid to workers in the form of wages.⁶ This means there is a close correspondence between the regional distribution of GDP per head and wages per household (Chart 2). The average weekly wage across the UK in the first half of 2016 was £540. In the highest-wage region, again London, it is £670 per week. That is around 40% higher than in the lowest-wage region, the East Midlands, at £480 per week. These are, if you like, the red and blue car households.

These regional differences in household incomes are mirrored in regional patterns of household spending and saving – spending on durables like houses and cars and savings in pensions and financial assets. Chart 3 shows the regional distribution of net wealth, based on the ONS Wealth and Asset survey of around 30,000 households. There is considerable dispersion, with the highest net wealth region (the South-East at £340,000 per household) holding assets 2.3 times larger than the lowest wealth region (the North East at £150,000).

Turning from saving to spending, Chart 4 shows the regional pattern of car ownership. This also shows wide dispersion, broadly mirroring the pattern of regional wages. The highest car-owning region is the South-East, with 1.3 cars per household. The lowest, excluding London, is the North-East, at around 0.9 cars per household.

So what explains these large regional variations in levels of economic activity, income and spending? Plainly, many factors are at work, economic, geographic, historic, social. There is a large literature on the determinants of growth, which suggests each of these factors is important.⁷ But let me focus on one which is I think key to understanding regional differences - levels of *productivity* among firms.

A few years ago, the US economist Paul Krugman noted: “productivity isn’t everything but in the long run it is almost everything”.⁸ Krugman was talking about the determinants of growth, and hence living standards, in the economy over the longer-run. He assigns productivity a central role. The raw numbers, looked at over long spans of history and large cross-sections of countries, suggest Krugman is right.

Take a simple example. Since 1850, inflation-adjusted national incomes in the UK have risen around 20-fold.⁹ This is a massive rise in living standards. How much of that was the result of higher productivity? Well, in the absence of productivity growth, UK living standards today would only be around double their 1850 value – in other words, at late-Victorian levels. In the UK, productivity has not been everything but it has been almost everything. The same is true elsewhere around the world.

⁶ ONS Quarterly National Accounts 2016 Q2, available [here](#)

⁷ See World Economic Forum (2016) for a summary.

⁸ Krugman (1994).

⁹ Hills *et al* (2016).

What is true across time is also true, by and large, across regions. Chart 5 looks at a regional map of firm-level productivity, where productivity is measured as output per hour worked. This map is built up from several sources of data on output and employment collected by the ONS using surveys covering tens of thousands of firms across all regions in the UK and all sectors of the economy.¹⁰ It paints a pretty comprehensive picture of the regional workings of the UK corporate sector.

This productivity map suggests, perhaps unsurprisingly, a wide degree of regional dispersion. The most productive region (London) has firms with levels of productivity almost 60% higher than those in the lowest productivity part of the UK (Northern Ireland). This map matches closely the regional pattern of GDP per head and wages, consistent with Krugman's conjecture. Much of the regional variation in economic activity and household income derives, it seems, from variations in productivity among firms.

These regional maps suggest a simple but coherent story about regional variations in living standards. The more productive a firm, the higher the wage it pays. If levels of regional productivity differ greatly, so too will regional levels of economic activity and household income. So Red and Blue Car regions comprise low and high productivity firms, and thus low and high income households, respectively. This is not an imaginary world; it is the real world. This is not a hypothetical story; it is the UK story.

If levels of productivity among companies hold the key to explaining regional variations in incomes, this naturally begs the question *why* does productivity differ by region. Past empirical studies have highlighted a range of factors - economic, geographic, technological, social – in explaining productivity.¹¹ From that potentially long list, let me highlight two factors: *physical capital* and *human capital*.

One important determinant of a firm's efficiency is the amount it invests in machines and technology - its physical capital stock. Measuring the capital stock is difficult even at an aggregate level and there are no reliable data on regional capital stocks. There are data, however, on regional patterns of business investment and research and development spending – the flow rather than stock of physical capital.

Chart 6 shows regional spending on R&D per head of the working age population. This shows a wide regional divergence, with the most R&D-intensive region (the East of England) having levels of investment four times those in the least R&D-intensive region (the North East). This map has a close correspondence with regional measures of productivity, consistent with capital-intensive regions having higher levels of productivity.¹²

A second determinant of firm-level productivity is the skill level of workers, so-called human capital.

¹⁰ See ONS 'Sub-regional labour productivity', available [here](#).

¹¹ See Barnett *et al* (2014), IMF (2015), Haldane (2015), OECD (2015).

¹² See CBI (2016)

The greater those skills, the more productive workers are likely to be. Measuring human capital, as with measuring physical capital, also has its problems. But Chart 7 shows one measure of skills – the proportion of the workforce with at least NVQ Level 4 qualifications, roughly-speaking undergraduate degree level.

It points to sharp regional differences. The percentage of the workforce with higher-level qualifications is 20 percentage points higher in London than in Northern Ireland, Yorkshire and Humberside and the North East. These regional skill differences have, predictably, a high correlation with regional productivity. Human, as well as physical, capital accumulation appears to be a significant part of the regional productivity story.

One downstream consequence of lower levels of skills and investment is likely to be higher levels of unemployment. Chart 8 shows that this is true, with higher rates of unemployment in regions with lower levels of productivity and skills. This relationship appears to be particularly strong for levels of *youth* unemployment among those aged 16-24 (Chart 9). More generally, higher levels of productivity are often associated with higher levels of employment, not lower.

It is not just standard economic metrics, such as incomes, that show a high degree of regional variation. So too do measures of social well-being, such as mortality rates. The mortality rate among working age males in London is around half that of those living in Scotland and the North-East (Chart 10). Male life expectancy in London and the South East (at around 80 years) is 2 to 3 years longer than in these parts of the UK.¹³

So this is a story of wide regional differences in incomes and well-being sourced, to a significant extent, in regional differences in firm-level productivity. Those differences are themselves rooted in differing levels of investment in machines and people, in technology and skills, in physical and human capital. We have red and blue firms hiring red and blue workers, resulting in red and blue car levels of income and productivity.

Which is the North-East? Levels of GDP per head, wages and productivity in the North-East are, respectively 25%, 8% and 11% below the UK average. Levels of physical and human capital accumulation are also lower. Levels of unemployment are currently 1.3 percentage points higher and 4.4 percentage points higher for young people. North-Eastern households own half as many assets and fewer cars than South-Eastern households. Redcar is a Red Car region.

The Role of Monetary Policy

These maps lay bare both some of the *challenges*, and the *opportunities*, facing the UK economy.

¹³ See ONS 'Life Expectancy at Birth and at Age 65 by Local Areas in the United Kingdom', available [here](#).

The challenges include the fact that growth in income and productivity at an aggregate level has recently been slower than in the past - the economic pie has not risen rapidly. They also include the fact that the distribution of income and productivity across regions has been uneven: the pie has been unequally sliced.

The opportunities flow from these challenges. Given these sharp regional differences, if a way could be found of raising the productivity of lower-performing regions, this could have a material impact on aggregate productivity and hence national income. For example, if all of the regions in the lower part of the productivity distribution were lifted to the UK average, this would raise average levels of UK productivity by around 6%. If all regions were lifted to the average level of London and the South East, this would raise the average level of UK productivity by 20%. Levels of UK productivity would then rival those in France and Germany.

But how is this to be achieved? At least over the longer run, it is reasonably clear that monetary policy is ill-equipped for the task of either expanding the economic pie or altering the way it is sliced. Over those horizons, nominal things like money and monetary policy cannot affect real things like productivity, skills and investment. In the language of economics, money and monetary policy are neutral in their impact.¹⁴

You do not have to be an economic theorist to see why. If printing money or setting interest rates had a durable impact on activity, incomes and living standards, economic policy would be simple and we would have long since cracked it. Raising living standards could be achieved by simply keeping the printing presses running. Countries that have done so have found this tends to end, not in triumph, but disaster.

Monetary policy is also unable to influence the *distribution* of outcomes across the economy over medium-term horizons. The reason is that central banks cannot set different interest rates for different sectors or regions, for different households or companies, or for borrowers and lenders.¹⁵ Monetary policymakers are, at least in normal times, one club golfers.

None of this is to suggest that monetary policy is entirely unimportant in its impact on the size of the economic pie, and its distribution, over *shorter-run* horizons. As our two-car economy example illustrated, it is perfectly possible for monetary policy to influence both aggregate income, and its distribution, in the shorter run. That being the case, it is worth assessing the evidence on that over recent years.

(a) Aggregate Impact

Starting with the impact of monetary policy on *aggregate* activity, since the dawn of the global financial crisis monetary policy has been loosened significantly in a large number of countries around the world, using a combination of lower official interest rates and, in some cases, asset purchases or QE. These measures have aimed to cushion the impact of the financial crisis on the economy and on jobs.

¹⁴ Not all economists agree on this, for example see Aghion and Howitt (1998).

¹⁵ In addition, there is limited information on regional consumer prices and how much variation there is in regional inflation rates.

Here in the UK, interest rates were lowered from 5% to 0.5% between September 2008 and March 2009 by the Bank's Monetary Policy Committee (MPC). This took interest rates to their lowest levels in the Bank of England's over 300-year history. This was augmented with £375 billion of asset purchases between 2009 and 2012, almost exclusively in government securities. In interest-rate equivalent terms, this amounted to a monetary stimulus worth around 7 percentage points.¹⁶ Exceptional times called for exceptional measures.

What impact have these exceptional measures had? One simple way to begin to answer that question is to look at how aggregate activity has evolved in the period since. Chart 11a looks at the growth in inflation-adjusted GDP per head across the UK regions since the MPC's monetary stimulus was put in place. All regions have experienced a rise in nominal GDP per head over that period, averaging 12%. Not all regions have experienced an inflation-adjusted increase, with growth strongest in London (a rise of 6.6%) and weakest in Northern Ireland (a *contraction* of 4.6%).

Unemployment rates rose sharply during the financial crisis. But they have since fallen across every region in the UK since 2011 and by roughly similar amounts, on average 3 percentage points (Chart 12a). To complete the picture, net wealth has also risen across the majority of regions since 2008, on average by 13% (Chart 13a). In only three regions (the North East, East Midlands and West Midlands) has net wealth fallen. These patterns are broadly as we would expect if monetary policy has loosened credit conditions, boosted asset prices and wealth and thereby supported domestic demand, at least in the short-run.

That said, this is a rather imperfect experiment. Factors other than monetary policy are also likely to have contributed to movements in GDP, unemployment and wealth (in particular housing wealth) over that period. To pinpoint the specific contribution made by monetary policy, we need a model of the economy. By using the Bank of England's suite of macro-economic models, we can quantify the specific role played by monetary policy in explaining movements in incomes and jobs, albeit rather imperfectly given that all models are imperfect.

Charts 11b, 12b and 13b plot the change in real GDP per head, unemployment and wealth respectively since 2008, under the hypothetical assumption that monetary policy had not been loosened over the period but had remained at levels prevailing in 2008.¹⁷ This paints a stark picture of what might have been in the UK.

¹⁶ This is set against a trend decline in global real interest rates and what economists refer to as the 'neutral' level of interest rates. This means that it is very unlikely that Bank rate will return to the levels seen immediately before the crisis in the near future. See Haldane (2015) and Broadbent (2016) for further details.

¹⁷ These simulations take no account of regional variations in the monetary policy transmission mechanism. They assume that Bank rate would have stayed constant, and there would have been no quantitative easing programme. This stylised simulation is estimated at the aggregate level, and applied uniformly across the UK. All regions are affected by the same percentage change in each variable. Net wealth is assumed to move in line with nominal GDP, and no distinction is made between the various different types of wealth (such as housing or financial wealth). It also assumes that the monetary regime does not change and agents do not alter their view of the MPC's reaction function, despite observing extremely large economic shocks.

Without the support of looser monetary policy, *all* regions would then have experienced a *contraction* in real GDP per head since 2008. Every part of the UK would have been a Red Car region. This contraction would have been large, averaging 7%, equivalent to an annual average income loss of £1,600 per person. Here in the North-East, the loss in annual income for the average household would have been similar in magnitude.

The picture is similar if we turn to unemployment. In the absence of a monetary policy easing, unemployment would have risen further after the crisis in every region in the UK, by an additional 4 percentage points. Around an extra 1.5 million people would have found themselves out of work. Here in the North-East, the unemployment rate today would have been over 10%, or an extra 50,000 people out of work. That is the equivalent to losing nearly seven Nissan factories.

Absent a monetary policy loosening, net wealth would also have contracted across all UK regions, on average by around 20% or around £35,000 per household. Here in the North-East, that decline of wealth would have been around £60,000 for the average household or more than three times annual GDP per head. Without a monetary policy loosening, almost every town and city in the UK would have been painted red.

Of course, it is possible these model estimates overstate the impact of monetary policy in boosting demand and asset prices. These estimates also make no explicit allowance for the fact that different regions might be affected differently by a given monetary policy stance. Nonetheless, it is clear monetary policy has played a material role in lifting *all* boats since the financial crisis broke. Indeed, without it, it is plausible to think the vast majority of regional boats would have sunk.

(b) Distributional Impact

Even if monetary policy has lifted all boats, and could plausibly do so again if needed, that does not mean it has done so equally. In particular, concerns have been expressed about the potential distributional effects of monetary policy. In the simple two-car economy described earlier, monetary policy did have some potential short-run impact, potentially shrinking the distribution of income but raising the distribution of wealth. What does the real-world evidence suggest?

Several of my colleagues on the MPC have recently presented evidence which speaks to this issue. For example, Ben Broadbent has looked at evidence on the Gini coefficient – a measure of the degree of inequality - for UK households' income and wealth over recent years. He finds no evidence of these inequality measures having increased over the period since the UK's monetary policy loosening.¹⁸

Jan Vlieghe has recently looked at how monetary policy may have affected the fortunes of, among others, savers, pension funds and pensioners. The empirical evidence does not suggest these cohorts have been

¹⁸ Broadbent (2016).

disadvantaged to any significant degree by the monetary policy stance. For most members in each cohort, the boost to their asset portfolios and the improved wages and profits due to a stronger economy more than offset the direct loss of income from lower rates.¹⁹

If we look at the *regional* dispersion of wages, unemployment and wealth over the period of the UK's monetary policy easing, the picture is roughly as we might expect. Comparing Charts 2 and 15, there is little correlation between levels of wages and the change in them over recent years. In other words, the regional distribution of incomes does not appear to have changed materially during the period of monetary loosening. The same is true of unemployment rates (Charts 9 and 12a). There is some evidence of the higher-wealth regions benefitting more than the lower-wealth regions over the period since the crisis (Chart 3 and 13a).

(c) Recent Monetary Policy

In August this year, in the light of the EU referendum result, the Bank's MPC undertook a further round of monetary policy easing. Interest rates were lowered further, to 0.25%. And the MPC agreed to undertake a further £70 billion of asset purchases, of which gilts comprised £60 billion and corporate bonds £10 billion. The Bank also introduced a Term Funding Scheme (TFS) to facilitate the pass-through of lower official interest rates to the retail interest rates facing households and companies.

It is too early to assess what impact this further monetary policy loosening will have on activity and unemployment. Estimates from the Bank's model suggest it could increase activity by around 0.5% over a three year horizon and support around an extra 100,000 jobs. In an environment of heightened uncertainty about future growth and jobs, these gains are not to be sniffed at.

In the period since the MPC's easing in August, there have been two pieces of material news about the performance of the economy. The first is that growth in the immediate aftermath of the referendum has been stronger than the Bank, and other major forecasters, had expected. For example, growth in the third quarter of 2016 is currently estimated to be 0.5%. This compares with 0.1% growth in the third quarter expected at the time of the Bank's August *Inflation Report*.

This is welcome news. The main source of this upside news to activity has been the buoyancy of consumers. They appear to have kept calm and carried on spending on the high street, in the car showrooms and in the estate agents. The Bank's latest survey of UK households explains why. It suggests UK households' perceptions of income and job prospects have, at least so far, been largely unaffected by Brexit. That is true too in surveys of consumer sentiment which remain around historical average levels.

¹⁹ Vlieghe (2016).

Spending by companies shows a more mixed picture. For example, according to the Bank's new company Decision Maker Panel²⁰, just over half of all firms anticipate no material impact of Brexit on their investment plans over the coming year. That leaves just under a half of all firms expecting some impact on investment, consistent with surveys of gently falling investment intentions by the CBI, BCC and the Bank's Agents.

The second piece of significant news since August has been around the exchange rate. This is currently around 12% lower than immediately prior to the EU referendum. Indeed, uncertainty about the outcome had already caused the exchange rate to depreciate ahead of the vote, such that it is now 17% lower than a year ago. The Bank's contacts in financial markets attribute this fall in sterling to expectations that the UK's future trading arrangements, and hence income-earning capacity, will be materially less favourable than at present.

Whatever the precise explanation for sterling's fall, its near-term impact on inflation and growth is likely to be significant. It will provide some support for net exports in the short-term. But it will also cause a sharp rise in import prices, and in time consumer prices, over the course of the next few years. That will in turn tend to depress inflation-adjusted household incomes, and hence consumer spending, over this period.

It is unclear at present how the disconnect between the relative optimism of households and some companies, on the one hand, and the relative pessimism of financial market players and the other half of companies, on the other, will be reconciled. Is this a case of skittish financial market players over-sensitive to economic risks that may never materialise? Or sluggish consumers insensitive to the weaker economic prospects that lie ahead? Only time will tell.

In the meantime, however, the MPC needs to form its own judgement on prospects for inflation and output. These were set out in the November *Inflation Report*. The projections for inflation were the highest ever published by the Bank, while the forecasts for output growth were the lowest ever published. In other words, these projections highlighted the difficult trade-off facing the MPC in keeping inflation close to target, while supporting output and jobs growth in the economy.

In the MPC's judgement in November, managing this trade-off was best achieved by maintaining the current monetary policy stance, with a neutral bias on the direction of the next move in interest rates. Consistent with this neutral bias, the MPC judged the risks to inflation and output to be broadly symmetric and, given heightened uncertainty since the referendum, larger than usual.

My own personal judgement on the appropriate monetary policy stance is close to the MPC consensus. In August, I believed the risks to inflation and output lay to the downside, even after the stimulus measures.

²⁰ See <http://www.bankofengland.co.uk/research/Pages/onebank/decisionmakerpanel.aspx>.

That is why I supported forward guidance on a further lowering of interest rates in the run-up to the end of the year, provided the economy evolved in line with the MPC's projections for inflation and output at the time.

In the event, output has out-performed those expectations, while expectations of inflation have picked up, largely as a result of sterling's depreciation. That configuration now leaves me comfortable with the current stance of monetary policy, with no bias on the direction of the next move in interest rates. Consistent with that, my subjective distribution of risks around these projections is now symmetric.

On the upside, the fall in sterling has had a quite pronounced and, as importantly, persistent impact on financial market and, to a lesser extent, consumer measures of inflation expectations. Financial market measures of expected inflation five years ahead over the following five years have risen by around 60 basis points from their mid-year low-point. There has also been a tick-up in equivalent measures in the US and euro-area over the past few months of around 50 and 30 basis points respectively (Chart 16).

In each case, this does no more than take inflation expectations back to around where they were at the start of the year. In other words, recent adjustments have removed the downside skew to inflation expectations which had emerged. In that sense, the recent adjustment in inflation expectations is benign and helpful. Nonetheless, a further large upwards shift in expectations from current levels would, I think, be less benign and possibly unhelpful, especially if it were expected to persist.

On the downside, I think there is still a material chance that growth could under-perform relative to expectations during the course of next year – for example, if the squeeze on household incomes prompts a larger adjustment in household spending. In that event, the upside pressures on inflation would be weaker than expected. In that event, the chances of the zero low bound constraint on interest rates coming into play would increase, potentially limiting somewhat the effectiveness of any monetary policy loosening.

Bank staff have conducted simulations to assess the probability of this zero lower bound constraint binding in future, based on the likely constellation of future shocks to the UK economy. Given the MPC's existing set of tools, this puts this probability broadly in the range 15-40%. So this is a material risk, for monetary policy and for the economy, which needs to be weighed in the setting of policy. My personal view is that this provides grounds for not proceeding too hastily with any tightening of the monetary policy stance.

The Role of Industrial Policy

If monetary policy can provide only short-term support for economic activity, and can do little to shape the distribution of activity across regions, sectors and individuals, what other policy options are available?

The short answer is policies which act to improve skills, investment and productivity at source. This is one of the key aims of the Government's Industrial Strategy and underlines its importance, nationally and regionally.²¹

Last week's Autumn Statement outlined a number of measures to boost investment, skills and productivity. For example, a significant increase in spending on infrastructure was announced, through a new "National Productivity Investment Fund". This will result in an extra 0.1% of GDP in infrastructure spending in 2017/18, rising to 0.3% of GDP by 2021-22. Over five years, the incremental spending amounts to an extra £23 billion. This fund will be focussed on transport, housing, telecoms and research and development.²²

Just yesterday, the CBI published a report on differences in regional productivity performance and outlined a sequence of measures to help boost productivity and narrow regional differences. These measures included developing regional scorecards to enable productivity hotspots (and coldspots) to be identified; increased investment in skill-building through improved school and vocational education; increased infrastructure, in particular transport, spending; and improvements in managerial practices.

The work of the "Productivity Commission", chaired by Sir Charlie Mayfield, has identified a long tail of companies across all sectors in the UK whose productivity performance is falling short.²³ The Commission are developing, among other things, a tool which would enable firms to benchmark themselves relative to others in their sector along several key business dimensions. This could then serve as a prompt for action, enabling firms to boost their productivity performance through targeted action.

I think this micro-level assessment of productivity is a useful way to formulate plans which support productivity, and narrow productivity differences, regionally and sectorally. For example, recent work by the OECD has looked at the changing distribution of productivity across firms over time.²⁴ It suggests a widening – or bifurcation - of this distribution, with a small set of frontier firms whose productivity growth continues apace but a long tail of laggard firms whose productivity has effectively stagnated.

The UK broadly matches that picture. Chart 17 plots some percentiles from the distribution of productivity (output per worker) at the firm level, based on a sample of 30,000 companies from the ONS Annual Respondent Database (ARDx) since 2002. This database combines data from the ONS Annual Business Survey and employment surveys, which are used to inform the aggregate National Accounts and Labour Market statistics, and allows us to analyse what is going on at the firm level. Several features are striking. First, it is clear that at least three-quarters of all firms in the sample have seen productivity flat-line over the past 15 years. There is a long tail of companies who have, at least in efficiency terms, stood still.

²¹ See May (2016), Clark (2016) and House of Commons (2016).

²² CBI (2016), HMT (2016).

²³ Mayfield (2016).

²⁴ OECD (2015).

Second, it is only firms in the upper echelons of the productivity distribution that have seen any growth and only those in the top 1% or above who have seen rapid growth. And this growth has been rapid, with the productivity of the top 1% of companies increasing by on average around 6% per year since 2002. These are the frontier firms. It is clear that, at the same time as the long tail of companies have been stagnating, they have been sky-rocketing. Or put differently, the distribution of UK firm-level performance has itself been widening or bifurcating over time.

This pattern of productivities goes some way towards explaining, at least in an arithmetic sense, the large and widening divergence between regional levels of productivity. High-productivity regions have more of the frontier firms, and fewer of the long tail, than low-productivity regions. Or, put differently, high-productivity regions have greater numbers of companies from sectors with high productivity – for example, high-valued added chemicals companies, like those in Teesside.

Charts 18 and 19 plot the estimated distributions of labour productivity, measured as output per employee, at the firm level across different regions and different sectors using the ONS ARDx dataset. What is striking is that differences in productivity *within-region* and *within-sector* are far larger than the differences *across-region* and *across-sector*. *Every region and every sector* has a range of both high and low productivity firms, with huge overlaps across regions and across sectors.

There are, of course, some regions, such as London, and some industries, such as Information & Communication and Professional & Scientific services, which have a larger number of frontier firms in the far right-hand side of the distribution. But the North-East clearly also has its own set of productivity pioneers.

This underscores the value of the Mayfield Commission's benchmarking work. It also begs the question of what is preventing the diffusion of processes and technologies used in one firm to other firms operating in a similar region or sector.

Are there barriers to technological diffusion, legal or competitive, which are stymieing productivity trickle-down? Are first-mover advantages and economies of scale simply larger for frontier firms these days, entrenching their advantages? Could more be done by frontier companies to promulgate their practices to companies lower down the supply-chain? I do not know the answers. But finding them strikes me as key for unlocking the growth and productivity potential of the long tail of companies and hence of UK PLC.

Conclusion

The UK, perhaps more than any other country in the European Union, is an agglomeration of quite different micro-economies – micro-economies of high and low incomes, high and low skills, high and low investment, high and low productivities, Red and Blue Car regions. Closing these gaps would not only boost the size of the aggregate economic pie, but would lead to a more equitable distribution of its slices.

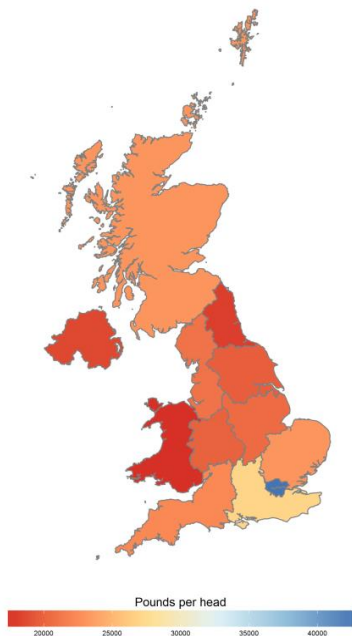
As much as anywhere in the UK, the North-East exemplifies some of those challenges. Incomes and productivities are towards the bottom of the UK league table and unemployment rates towards the top. In many ways it could be seen as a Red Car region. With these differences so large, it would be easy to view the UK glass, economically and socially, as half-empty.

But Teesside also gives grounds for optimism. Productivity and jobs-wise, it is one of the fastest growing in the country. With support for skills and technology, the like of which is being provided here at the Materials Processing Institute, that progress can continue and those differences in productivity and unemployment can be closed. In the North-East, there are good grounds for believing the glass is half-full.

If that could progress here in Teesside could be replicated nationally, the UK's fortunes really could be transformed. Those regional micro-economies would converge, their colours would merge, their glasses would fill. Economically and socially, the prize could scarcely be larger.

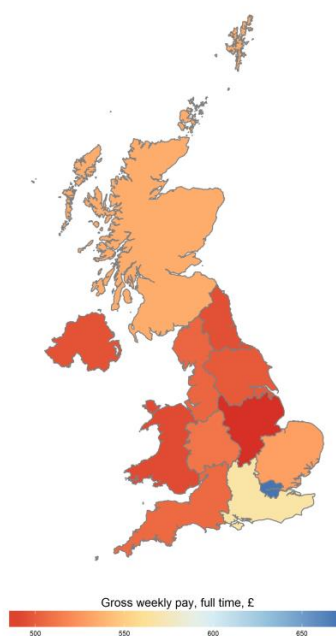
Annex

Chart 1: Nominal GDP per head (2014)



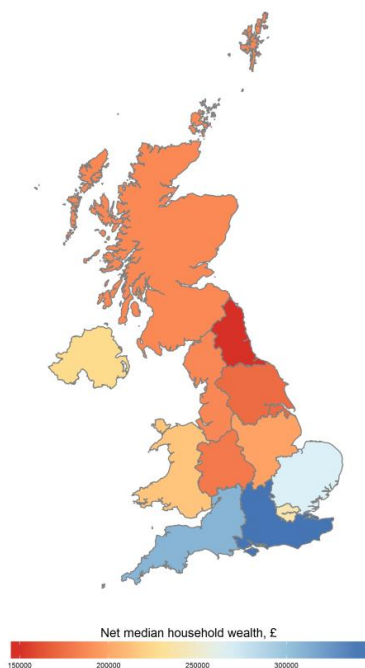
Source: ONS Regional GVA; Bank calculations.

Chart 2: Average weekly pay (2016)



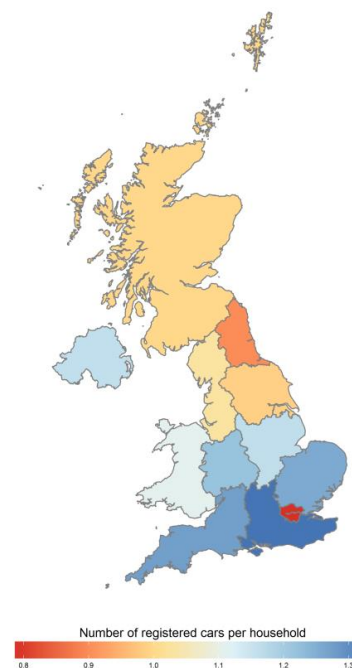
Source: ONS Annual Survey of Hours and Earnings (ASHE); Bank calculations. Pay is measured as median gross weekly earnings of full-time employees.

Chart 3: Median household net wealth (2012/14)



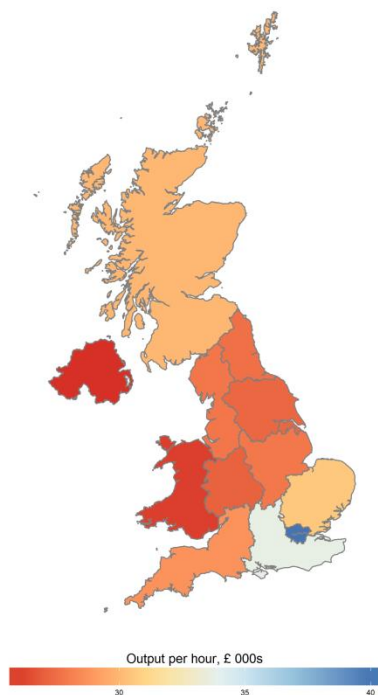
Source: ONS Wealth and Asset Survey; Bank calculations.

Chart 4: Car ownership (2014)



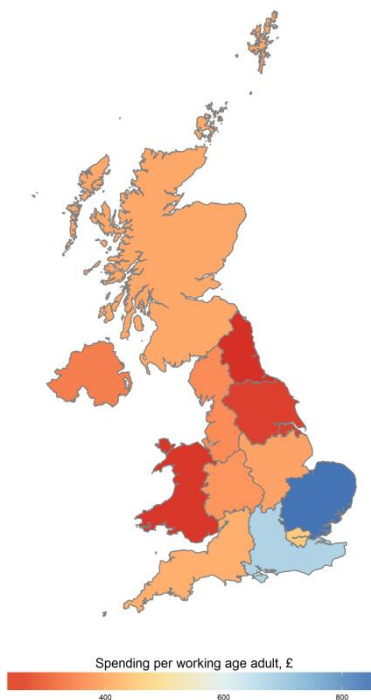
Source: Eurostat (2016); ONS; Bank calculations. The chart shows the number of registered passenger cars by region divided by the number of households.

Chart 5: Labour productivity (2014)



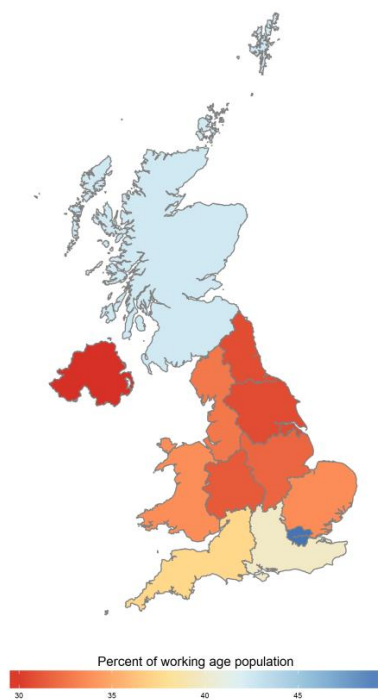
Source: ONS Regional Labour Productivity; Bank calculations.

Chart 6: Research and Development spending per head (2013)



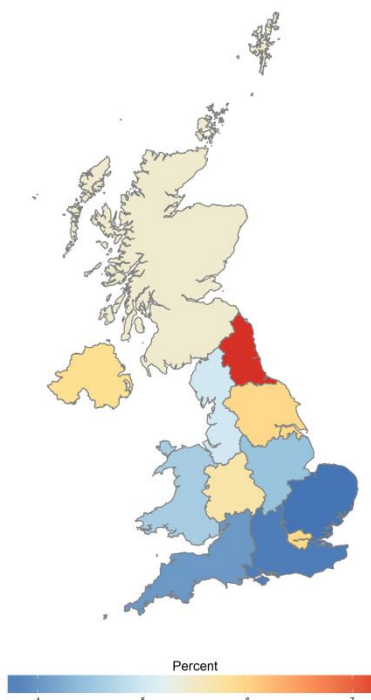
Source: Eurostat (2016); ONS; Bank calculations.

Chart 7: Percent of population with at least an undergraduate degree (or equivalent) (2015)



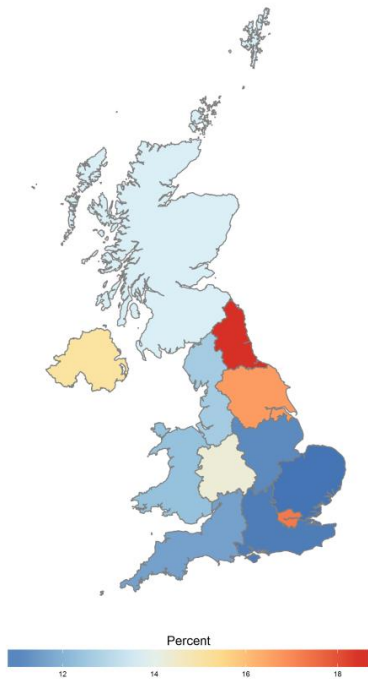
Source: ONS Annual Population Survey; Bank calculations.

Chart 8: Unemployment rates (2016)



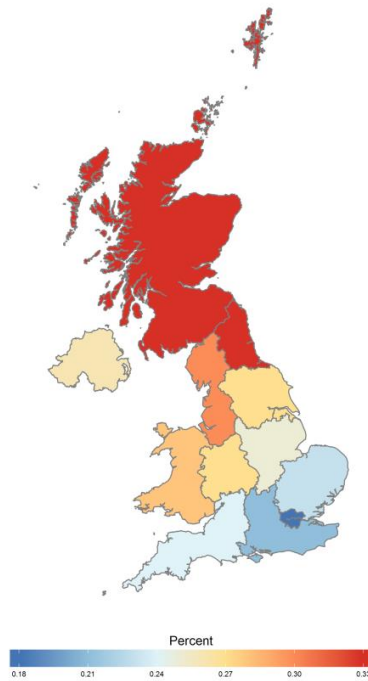
Source: ONS Labour Market Statistics; Bank calculations.

Chart 9: Youth (16-24) unemployment rates (2016)



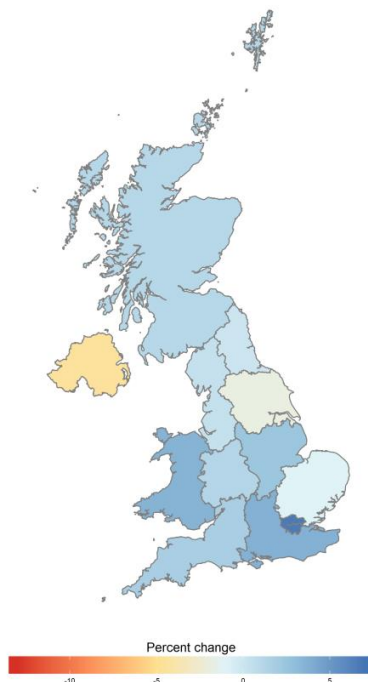
Source: ONS Labour Market Statistics; Bank calculations.

Chart 10: Working age mortality rates, males (2014)



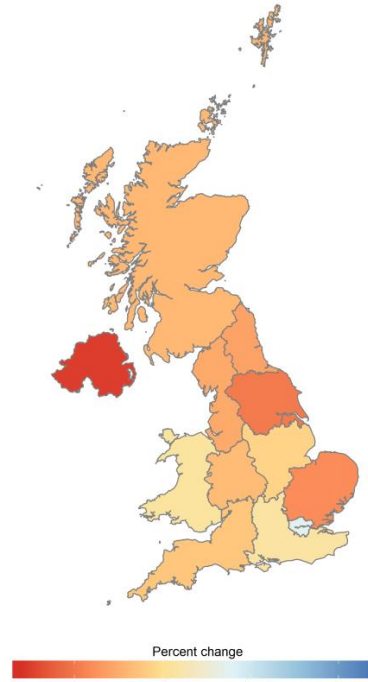
Source: ONS Mortality Figures for England and Wales, Scotland and Northern Ireland; Bank calculations.

Chart 11a: Real GDP per head growth (2008 to 2014)



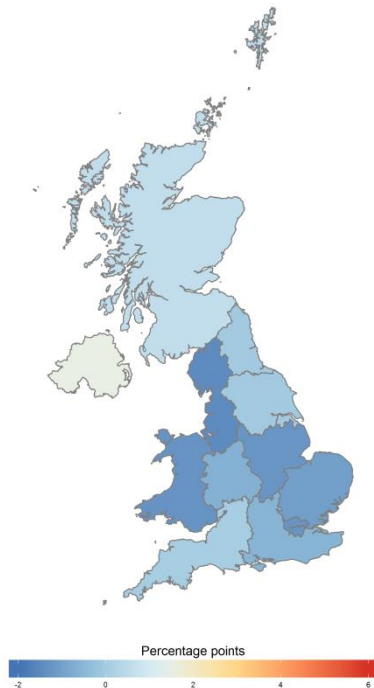
Source: ONS; Bank calculations.

Chart 11b: Scenario - Real GDP per head growth (2008 to 2014), without monetary stimulus



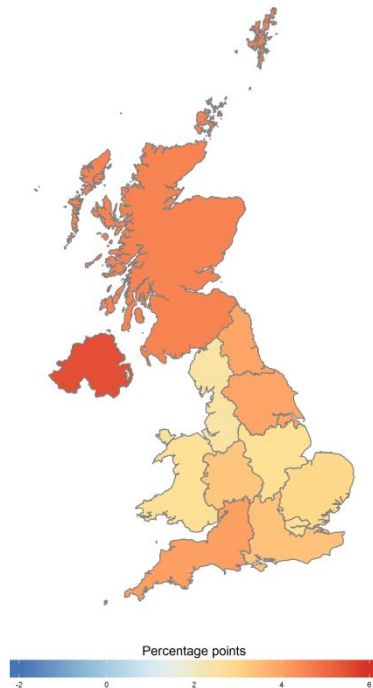
Source: ONS; Bank calculations. Notes: See footnote 16.

Chart 12a: Change in unemployment rates (2008 to 2016)



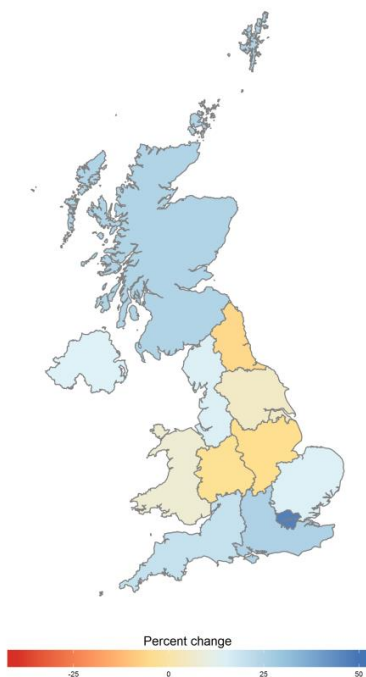
Source: ONS Labour Market Statistics; Bank calculations.

Chart 12b: Scenario – Change in unemployment (2008 to 2016), without monetary stimulus



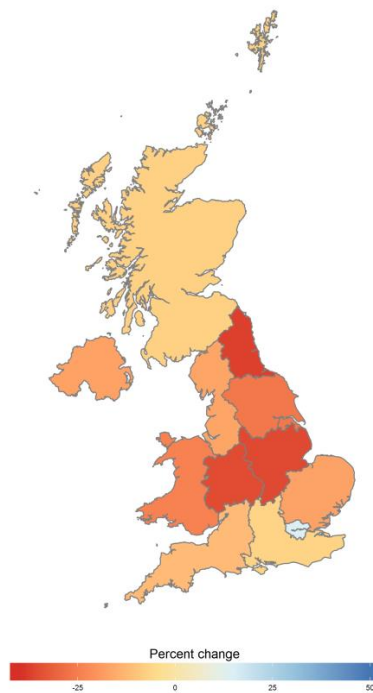
Source: ONS Labour Market Statistics; Bank calculations. Notes: See footnote 16.

Chart 13a: Growth in median net wealth (2006/8 to 2012/4)



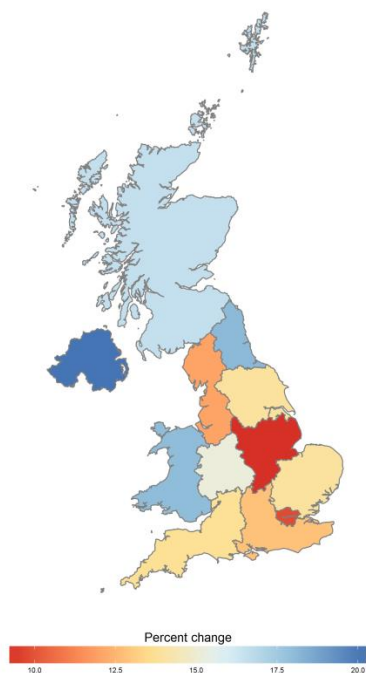
Source: ONS Wealth and Asset Survey; Bank calculations.

Chart 13b: Scenario - Growth in median net wealth (2006/8 to 2012/4), without monetary stimulus



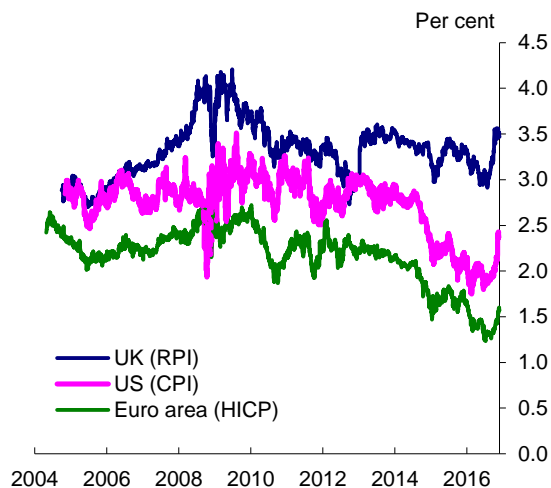
Source: ONS Wealth and Asset Survey; Bank calculations. Notes: See footnote 16.

Chart 15: Growth in average weekly pay (2008 to 2016)



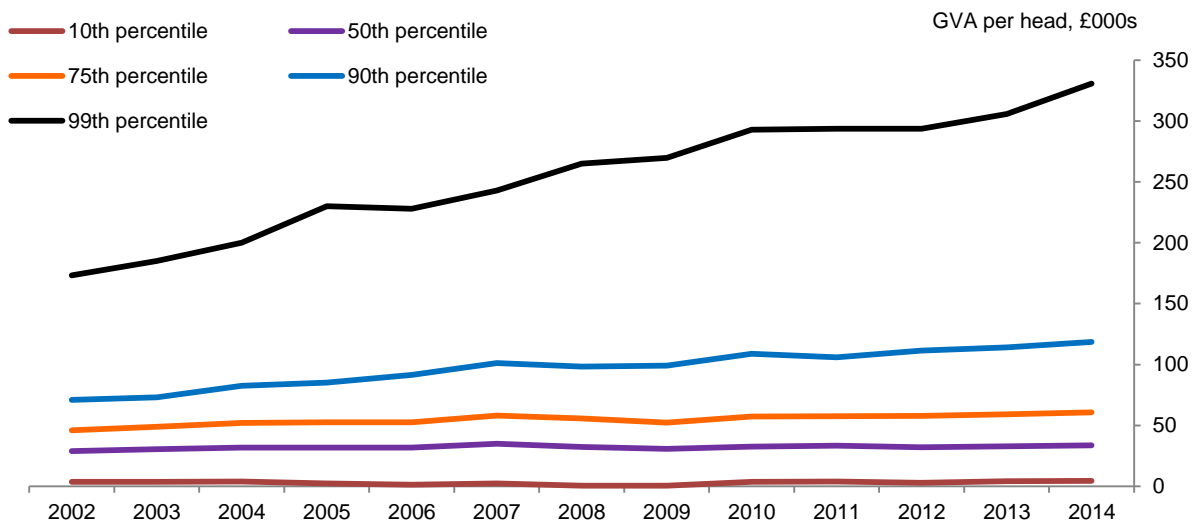
Source: ONS Annual Survey of Hours and Earnings (ASHE); Bank calculations. Pay is measured as median gross weekly earnings of full-time employees.

Chart 16: UK, US and Euro area 5-year, 5-year forward inflation swaps



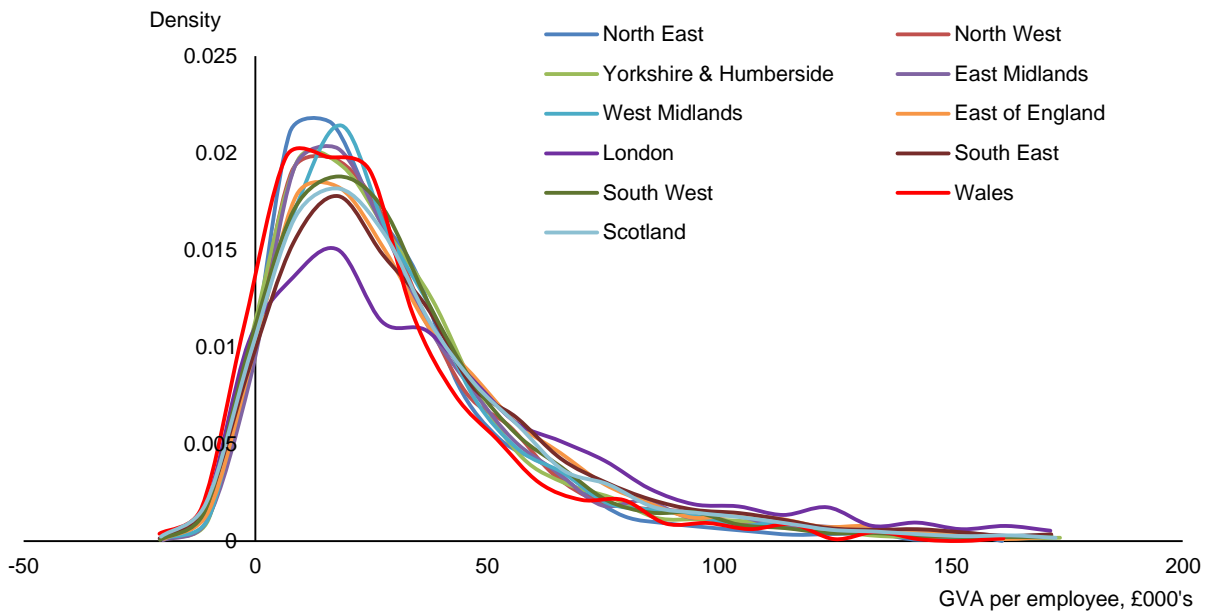
Source: Datastream; Bank calculations.

Chart 17: Firm level productivity percentiles



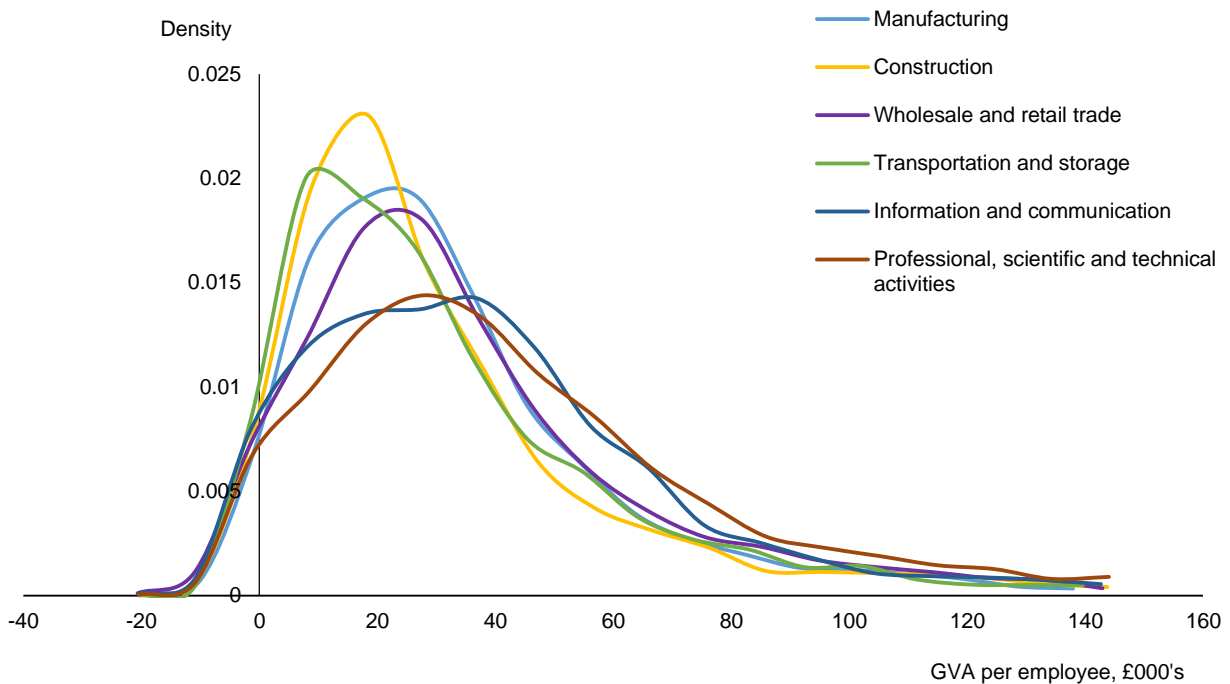
Source: ONS; Bank calculations. Notes: This chart plots various percentiles of the distribution of labour productivity (real GVA per employee) across Great Britain. This work contains statistical data from ONS which is Crown Copyright. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

Chart 18: Distribution of firm level labour productivity across regions in 2013/4



Source: ONS; Bank calculations. Please see footnote under Chart 19.

Chart 19: Distribution of firm level labour productivity across industries in 2013/4



Source: ONS; Bank calculations. Notes: This chart plots the kernel density distribution of labour productivity (real GVA per employee) across Great Britain. This work contains statistical data from ONS which is Crown Copyright. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

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