UK Broadband Impact Study

Baseline Report

January 2014

SQW

Contents

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1. Introduction

1.1 The roll-out of publicly funded superfast broadband is now well underway, in areas of the UK which would not otherwise be covered through purely commercial investments. At the end of 2013, the Department for Culture, Media & Sport (DCMS) reported[1] that 10,000 premises per week were gaining access to superfast broadband, and that this would increase to 25,000 per week in spring 2014, ramping up to 40,000 per week by summer 2014.

1.2 Back in November 2012, DCMS initiated the UK Broadband Impact Study, to ensure that there is a good understanding of the impacts of publicly funded broadband interventions, in order to inform future funding decisions and to help maximise the value for money of these investments.

1.3 A consortium led by SQW (with Cambridge Econometrics and Dr Pantelis Koutroumpis) was commissioned to undertake the first phase of the work, in which we have developed an integrated model of the projected economic, social and environmental impacts associated with faster broadband, and with publicly funded intervention in improving broadband quality and coverage. Informed by an extensive review of the available literature[2], the results of this modelling were summarised in an Impact Report[3] which was published in November 2013.

1.4 This final report of the first phase of the UK Broadband Impact Study presents a number of **baseline indicators** related to the roll-out and impact of faster broadband in the UK. The second phase of the UK Broadband Impact Study will be able to track these indicators over the next few years, to inform DCMS's assessment of the actual impacts of faster broadband, and of the impacts attributable to publicly funded intervention.

1.5 The report provides selected baseline data for:

- speeds available and the digital divide (section 2)
- take-up and averages speeds used (section 3)
- productivity growth (section 4)
- enterprise and employment growth (section 5)
- teleworking (section 6)
- labour force participation (section 7)
- commuting and business travel (section 8)
- cloud computing (section 9).

[1] https://www.gov.uk/government/news/bumper-day-for-rural-broadband

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/85961/UK_Broadband_Impact_Study_-_Literature_Review_-_Final_-_February_2013.pdf

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/257006/UK_Broadband_Impact_Study_-_Impact_Report_-_Nov_2013_-_Final.pdf

1.6 We have focused here on those areas for which we developed quantified estimates of faster broadband's impacts in our Impact Report. As discussed in that report – and in the previous Literature Review Report - there are various other potential effects (for example, on e-commerce, on house prices, on educational attainment, on the delivery of health and social care services, on end user device carbon emissions etc.) where it is not currently possible to develop robust projections of the future net impacts of faster broadband, in our view – because the current empirical evidence is unconvincing or too sparse, or because it is currently unclear whether the potential negative impacts may outweigh the positives, or because the impacts depend on major changes in public service delivery (beyond the scope of our cost benefit analysis).

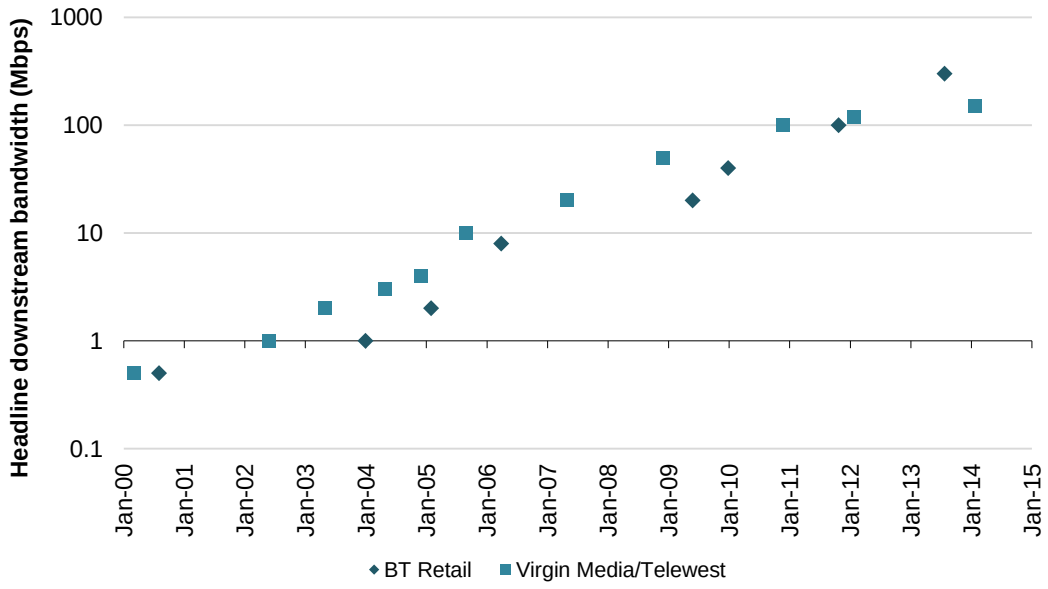
1.7 As the take-up and exploitation of faster broadband develops over the next few years, and as more empirical data becomes available, it should be possible for researchers to assess some of these potential wider impacts, as well as testing the extent to which faster broadband contributes to changes in the indicators covered in this report.

2. Speeds available, and the digital divide

2.1 In the period of about 14 years since they first became available in the UK, mass market broadband services have advanced very substantially in terms of the speeds available. Through a combination of technological innovation, investment and intense infrastructure-level competition (in urban areas), much of the UK now has access to affordable downstream bandwidths in the order of 80Mbps to 100Mbps – at prices substantially lower than those charged for 0.5Mbps services back in the year 2000.

2.2 Figure 2-1 illustrates how the headline downstream bandwidths of the fastest mass market offerings of two major Internet Service Providers (ISPs) – BT Retail and Virgin Media – have increased exponentially over time (giving approximately straight lines on a logarithmic scale). Taking these two operators together, the long term trend in the fastest mass market headline bandwidth is a growth of approximately 48% per annum over this period – remarkably close to the 50% observed by Nielsen's Law[4] since 1983.

Figure 2-1: Headline downstream bandwidth of fastest mass market offerings of BT Retail and Virgin Media/Telewest, by month of first introduction[5] (note logarithmic y-axis)



Source: SQW analysis, drawing on thinkbroadband.com news archive

2.3 Although some commentators have questioned why consumers would ever need bandwidths in the order of 1Gbps and higher, we anticipate that such offerings will become widely available over the next several years, given that:

[4] Nielsen's Law (http://www.nngroup.com/articles/law-of-bandwidth/) suggests that a high-end user's connection speed increases by 50% p.a.

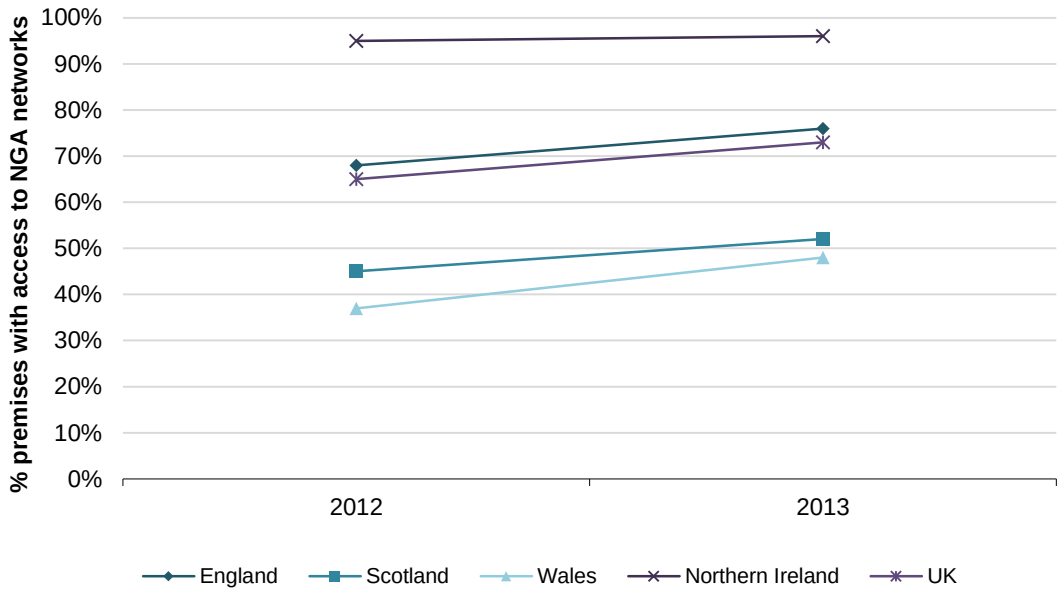
[5] Considers the Telewest offerings prior to the launch of Virgin Media in February 2007. Note that the BT Retail FTTH 100Mbps (November 2011) and 300 Mbps (August 2013) launches were only available to a relatively small proportion of premises. A 76Mbps version of the widely available FTTC service was launched by BT Retail in April 2012, but is not included here, as the 100Mbps FTTH service had previously been launched. Chart includes the 152Mbps service due to be available in February 2014 from Virgin Media.

- infrastructure-level **competition** will continue to incentivise operators to innovate and improve their offerings, relative to their competitors
- **technologies** will continue to advance - bringing down the costs of providing higher bandwidths; BT, for example, is investigating the use of G.Fast and 'Fibre to the Distribution Point' (FTTdp) technology[6], which could potentially provide gigabit services at a much lower cost than a full Fibre to the Premises (FTTP) roll-out; and CableLabs[7] has recently completed the specifications for DOCSIS 3.1, which paves the way for cable operators, such as Virgin Media, to offer speeds of up to 10Gbps in the future
- bandwidth-hungry **applications** (such as high definition video) will become more popular, increasing the perceived advantages of higher speed broadband offerings, notwithstanding improvements in data compression techniques
- **new entrant** FTTP providers, such as Hyperoptic and City Fibre Holdings, are already offering services at 1Gbps, and will continue to make inroads – especially in areas with relatively high population densities
- gigabit FTTP services are already widely available in a number of **other developed countries**.

2.4 Clearly, a major thrust of the Government's intervention has been to ensure that as much as possible of the UK benefits from such increases in broadband speeds and quality. Ofcom's annual Communications Infrastructure Report is a key resource in monitoring the extent to which this is happening. The latest report estimates that 73% of UK premises had access to Next Generation Access[8] (NGA) networks in 2013 – up from 65% in 2012 (Figure 2-2).

[6] https://www.btplc.com/Sharesandperformance/Industryanalysts/Newsletter/Issue32/60secondguide/index.htm
[7] http://www.cablelabs.com/news/pr/2013/13_pr_DOCSIS31_Spec_Release_103013.html
[8] Note that not all connections over NGA networks (such as FTTC) will achieve superfast speeds (30Mbps by Ofcom's definition)

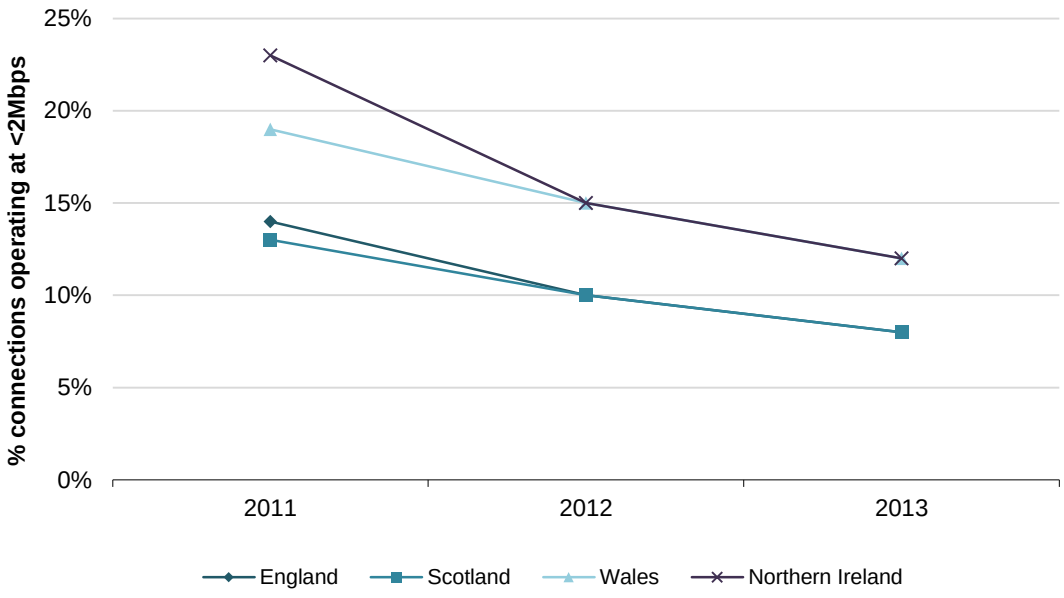
Figure 2-2: Proportion of premises with access to NGA networks, by nation and year



Source: Ofcom 2013 UK Communications Infrastructure Report

2.5 Another important aim has been to ensure that everyone can benefit from at least 'standard' broadband (defined as being at least 2Mbps downstream). Again, the Ofcom Communications Infrastructure report notes improvements in this regard – with the proportion of broadband connections operating at less than 2Mbps downstream falling from 14% in June 2011 to 8% in June 2013.

Figure 2-3: Proportion of connections operating at <2Mbps downstream

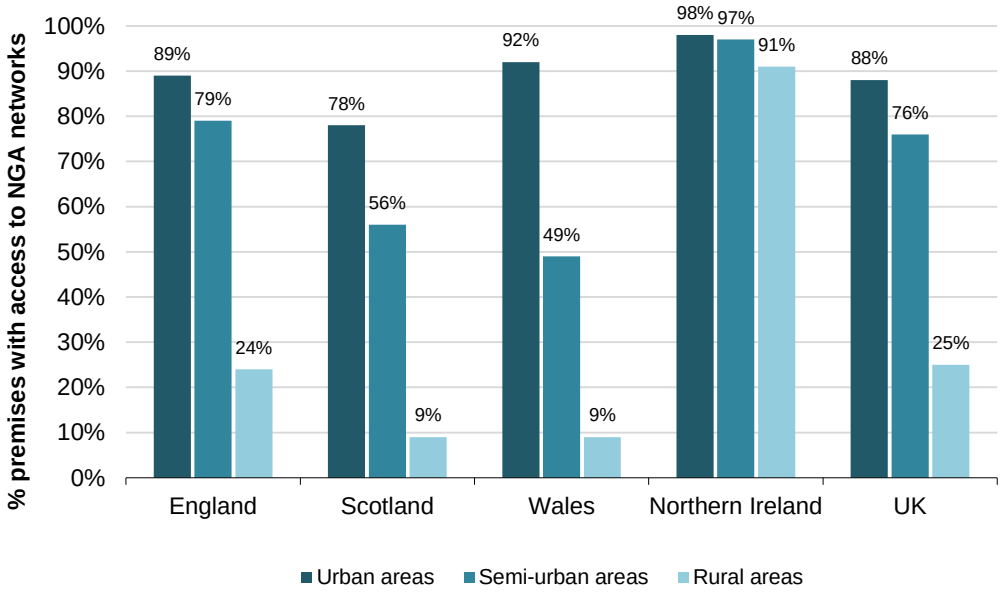


Source: Ofcom 2013 UK Communications Infrastructure Report

2.6 However, there does remain a substantial 'digital divide' as yet between urban and rural areas in the availability of faster broadband services. Ofcom estimates (Figure 2-4) that,

while 88% of premises in urban areas had access to NGA networks in 2013, this was the case for only 25% of rural premises (falling to 9% of rural areas in Scotland and Wales).

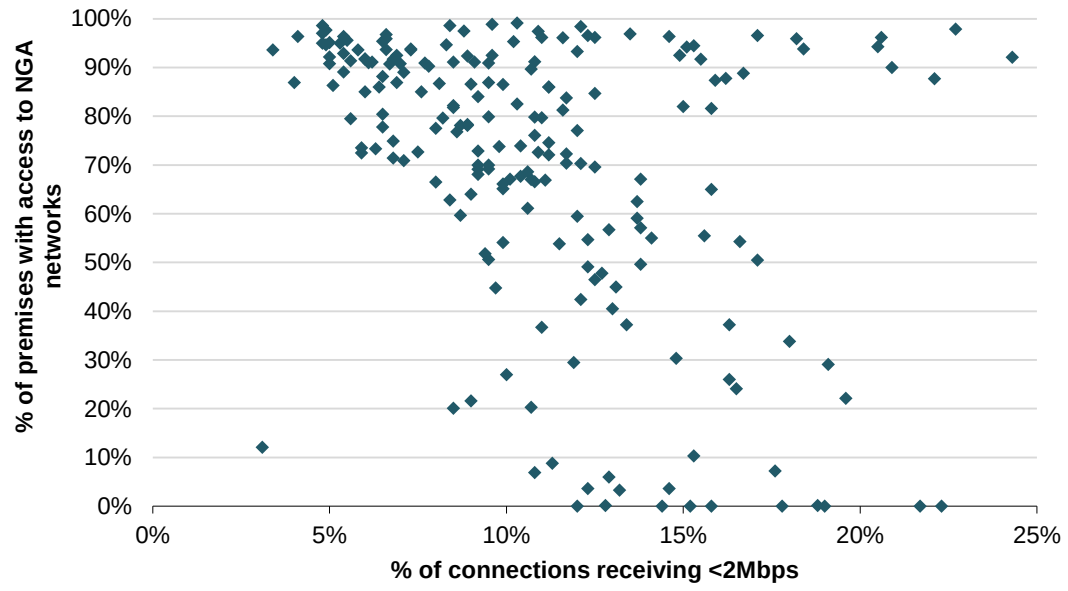
Figure 2-4: Proportion of premises with access to NGA networks, 2013, by nation and urban/rural



Source: Ofcom 2013 UK Communications Infrastructure Report

2.7 The situation currently varies substantially between different local areas (Figure 2-5), with local authorities' proportion of premises with access to NGA networks ranging from 0% (eight authorities) to 99.1% (Derry), and the proportion of broadband connections receiving less than 2Mbps ranging from 3.1% (Kingston upon Hull) to 24.3% (Omagh).

Figure 2-5: Proportion of premises with access to NGA networks vs proportion of connections receiving <2Mbps, for UK local authority areas, 2013

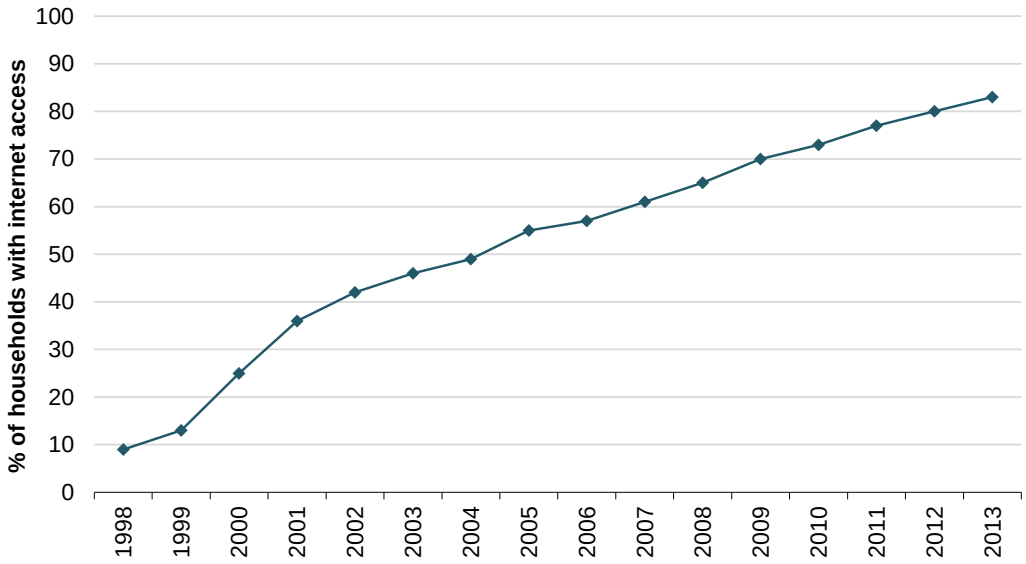


Source: Ofcom, UK Broadband Speed Data 2013

3. Take-up and average speeds used

3.1 As the internet has become an increasingly essential aspect of modern life, the take-up of internet access by households (which is now practically 100% broadband, rather than dial-up) has grown rapidly. Over the last ten years, the proportion of households with internet access has increased by about 3.7 percentage points p.a., according to ONS (Figure 3-1).

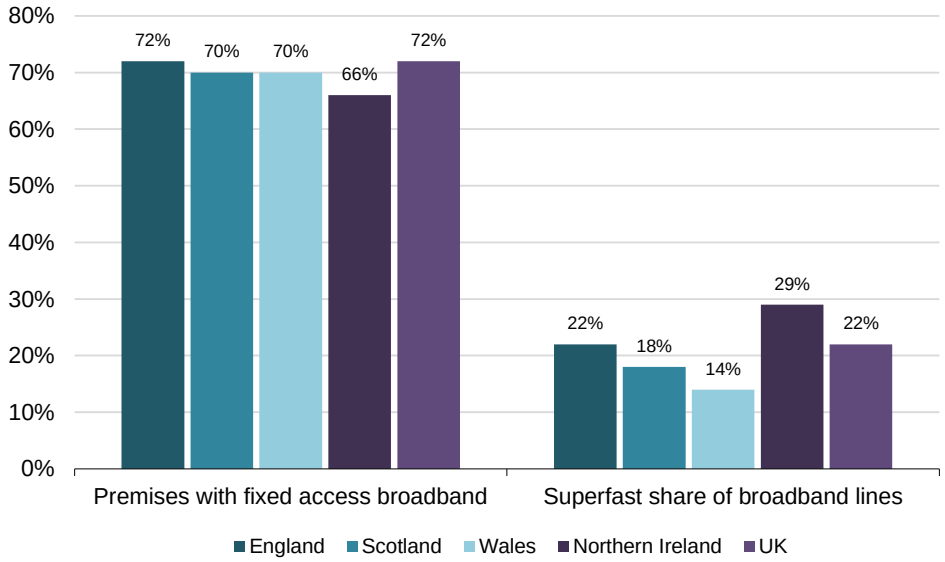
Figure 3-1: Percentage of households with internet access (UK to 2004, GB from 2005)



Source: ONS Internet access – households and individuals, 2013

3.2 While ONS estimates that 83% of GB households now have internet access, Ofcom's figures show only 72% of UK premises having fixed broadband access (Figure 3-2).

Figure 3-2: Fixed broadband take-up and superfast share of broadband lines, by nation, 2013



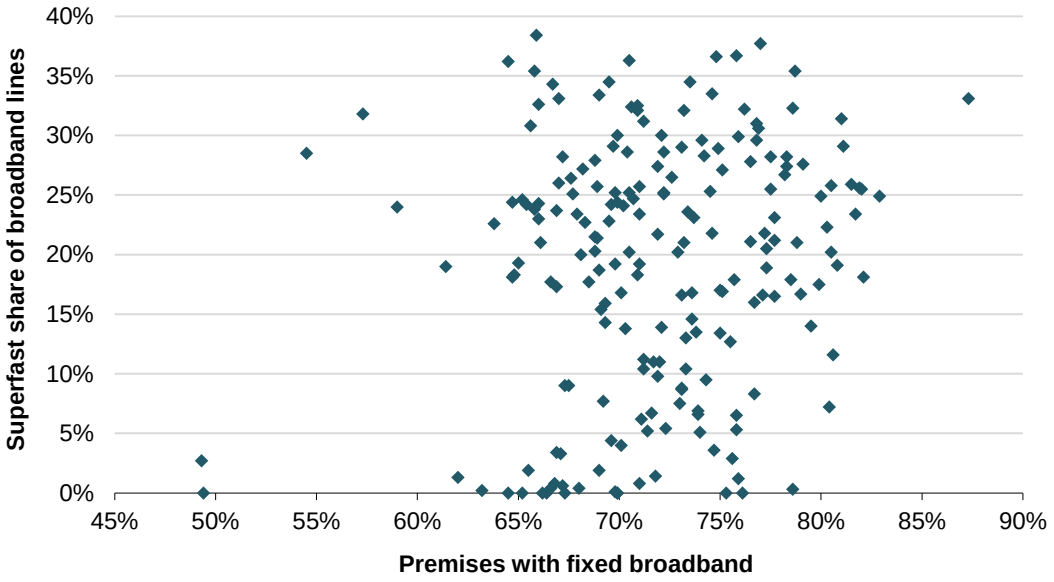
Source: Ofcom 2013 UK Communications Infrastructure Report

3.3 The discrepancy between these two estimates could be down to various factors, such as: some households using only mobile broadband for their internet access; and many medium and large business sites (included in the premises count) using corporate data communications services such as leased lines, rather than mass market 'broadband' offerings.

3.4 In terms of the take-up of *superfast* broadband services (defined by Ofcom as 30Mbps+), Northern Ireland currently leads the way (Figure 3-2), with 29% of broadband connections (19.1% of premises) there now being superfast.

3.5 At local authority level, the take-up figures again vary widely at present. The proportion of local areas' premises with fixed broadband ranges from 49.3% in Kingston upon Hull to 87.3% in Brighton and Hove, according to Ofcom (Figure 3-3). The superfast share of broadband connections ranges from 0% (in ten local authorities) to 38.4% in Belfast.

Figure 3-3: Superfast share of broadband lines vs fixed broadband take-up, by local authority, 2013



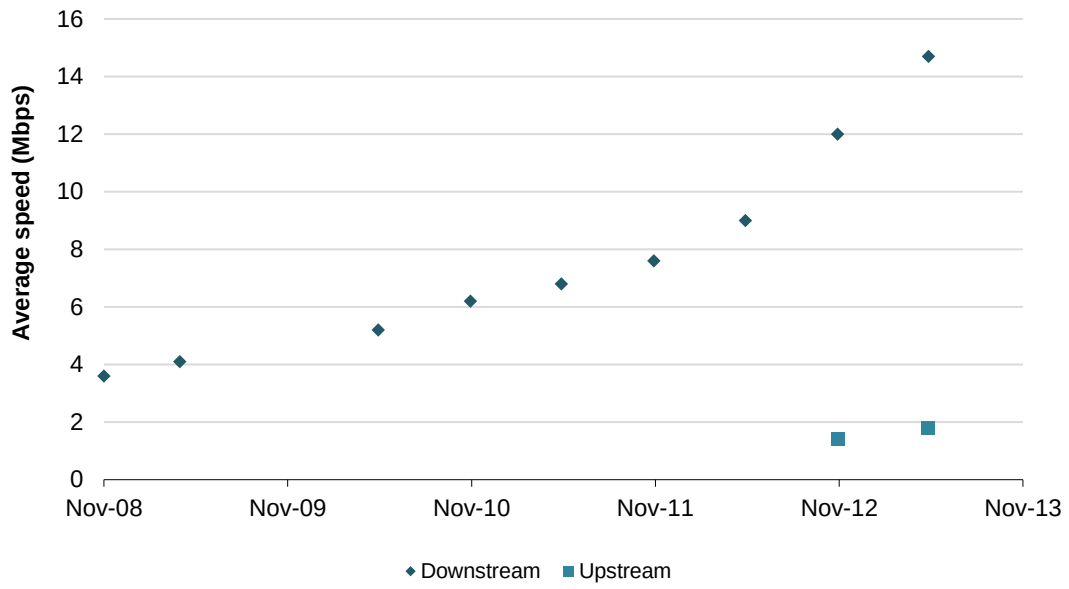
Source: Ofcom, UK Broadband Speed Data 2013

3.6 Measuring the average speed of broadband connections raises a number of methodological challenges, including defining exactly what is meant by 'average' and what is meant by 'speed'. As will be discussed below, there are various metrics for average speed, on which we can draw.

3.7 One key measure is provided by the six-monthly fixed line broadband performance reports from Ofcom, which reports test findings from a panel of about 2,200 households across the UK. These tests use hardware, provided by SamKnows, which is connected directly to the household's broadband line (and hence is not subject to the potential performance degradation associated with in-home wiring or WiFi connections etc.).

3.8 As illustrated in Figure 3-4, the average downstream speeds reported by Ofcom/ SamKnows have increased from 3.6Mbps in November 2008 to 14.7Mbps in May 2013. The latest average upstream speed was 1.8Mbps in May 2013 – up from 1.4Mbps in November 2012.

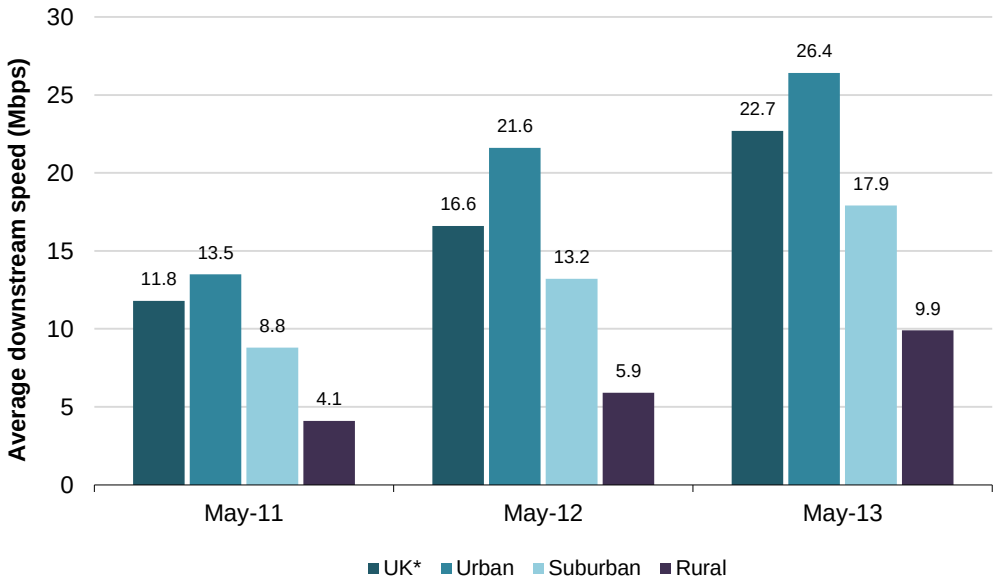
Figure 3-4: Average UK residential broadband speeds over time



Source: Ofcom/SamKnows Fixed-line Broadband Performance Reports

3.9 Looking at the difference in average used speeds between urban and rural areas, the Ofcom/SamKnows data suggest c. 16.5Mbps difference in May 2013, compared with a difference of 9.4Mbps in 2011 (Figure 3-5). Note that the UK averages in this chart (e.g. 22.7Mbps in May 2013) do not match the averages shown above (14.7Mbps in May 2013), as different weightings have been used in the analysis to show the urban/rural variations.

Figure 3-5: Average UK residential broadband speeds over time, by urban/suburban/rural



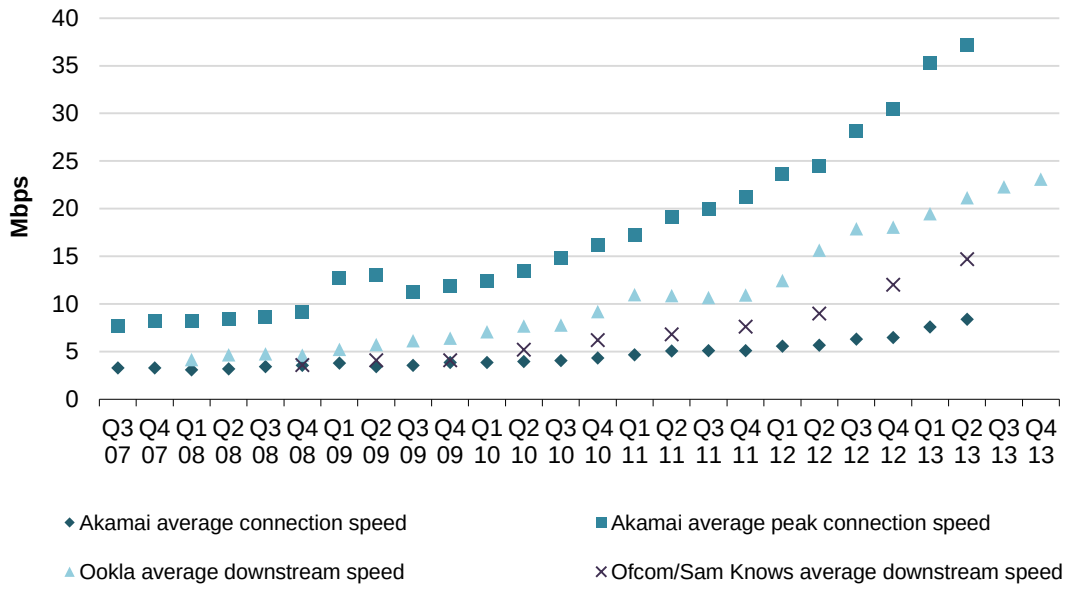
Source: Ofcom/SamKnows Fixed-line Broadband Performance Report May 2013

3.10 The above caveat re different weightings giving different averages illustrates the point that varying methodologies give alternative results for 'average speed'. Other useful public domain metrics include:

- Akamai's State of the Internet reports, which include:
  - the 'average connection speed' of requests for website content from Akamai's servers[9] - which will tend to understate the total speed available over users' broadband connections
  - the 'average *peak* connection speed' – which is a more representative measure of the maximum capacity of users' broadband connections, though it does not take account of the lower performance that users will typically experience during the busiest times of the day
- Ookla's Net Index data, which provides averages for the downstream and upstream speeds as recorded through user-initiated speed tests at Speedtest.net.

3.11 Figure 3-6 shows how these different metrics compare with the Ofcom/SamKnows averages for the UK. It should be stressed that none of the measures is 'wrong'; they are simply measuring different things. We suggest that it would be helpful to keep track of each of these different metrics over the next few years, to inform the assessment of the impact of publicly funded broadband interventions.

Figure 3-6: Comparison of different downstream speed metrics for the UK, over time



Sources: Akamai State of the Internet Report Q2 2013; Ookla Net Index; Ofcom/SamKnows Fixed-line Broadband Performance Report May 2013

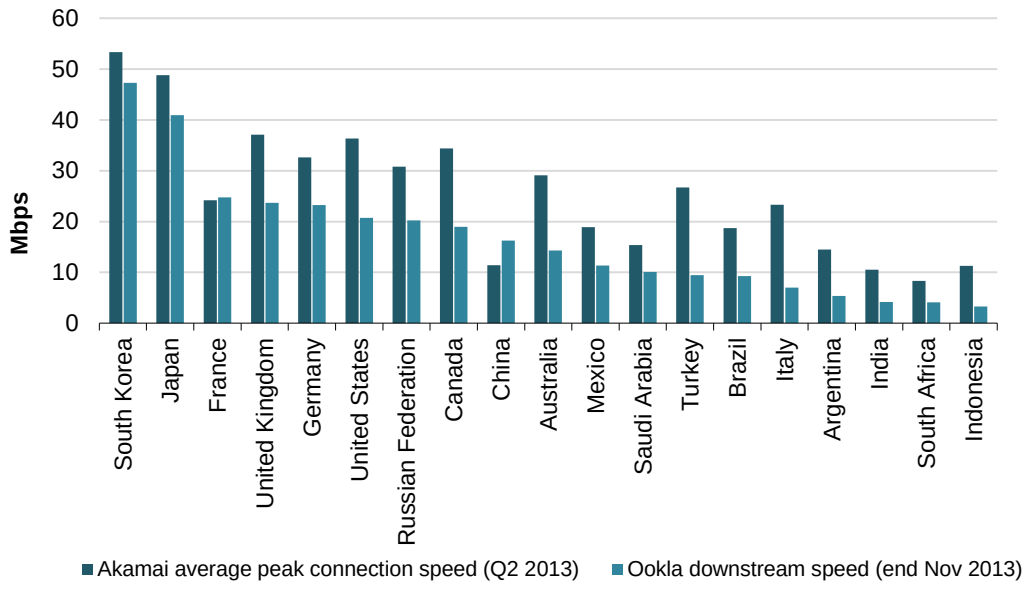
3.12 A particularly useful feature of the Akamai and Ookla datasets is that both are available for numerous different countries, and they also have helpful online visualisation tools[10]

[9] This is for HTTP or HTTPS website content, and excludes streaming media content. Note that this will tend to give a result lower than the total speed available to a user, as browsers will open multiple connections to Akamai for various pieces of content (parallel requests), and other applications using the user's connection at the same time will slow down the speed as perceived by the content request to Akamai.

(including animation showing changes over time, for the Ookla data) which help in understanding the UK's changing relative position over time.

3.13 Using the Akamai (average peak connection speed) and Ookla (average downstream speed) data for G-20 member countries, for example, we can see that the UK currently sits in third or fourth place by these measures (Figure 3-7). As would be expected, there is a strong correlation between the Akamai and Ookla results[11]: countries ranking highly on one measure tend to rank highly on the other.

Figure 3-7: Average broadband speeds for G-20 member countries[12], 2013



Sources: Akamai State of the Internet Report Q2 2013; Ookla Net Index

3.14 The Ofcom/SamKnows data refers to residential connection speeds in the UK, and the Akamai and Ookla data reflect a combination of residential and business usage, which in practice is dominated by the residential lines. There is something of a gap in understanding the average speeds actually experienced by UK *businesses*.

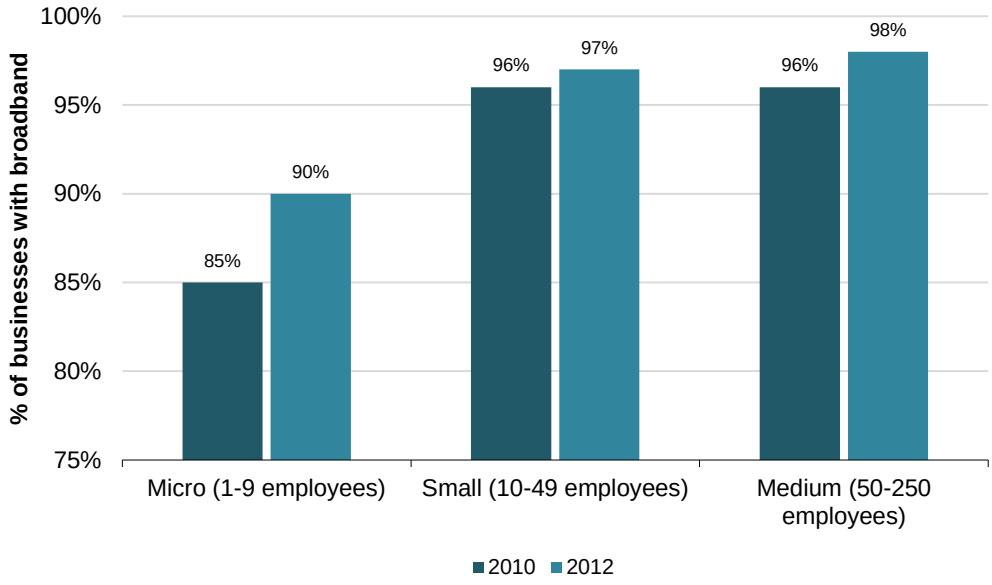
3.15 Information on business *take-up* of broadband is available from the Small Business Survey, which found that 90% of micro-businesses had broadband in 2012 (up from 85% in 2010), versus 97% of small businesses and 98% of medium sized businesses (Figure 3-8). The overall proportions of SMEs with broadband in 2012 were somewhat higher in Northern Ireland (95%) and Scotland (94%) than in England (91%) and Wales (88%).

[10] See http://www.akamai.com/stateoftheinternet/soti-visualizations.html#stoi-map and http://www.google.co.uk/publicdata/explore?ds=z8ii06k9csels2_#!ctype=l&strail=false&bcs=d&nselm=h&met_y=avg_download_speed&scale_y=lin&ind_y=false&rdim=country&idim=country:GB&ifdim=country&tstart=1199491200000&tend=1383609600000&hl=en_US&dl=en_US&ind=false

[11] R-squared of 0.88 for the Akamai peak connection speed Q2 2013 vs the Ookla average downstream speed in mid May 2013, for the G-20 countries

[12] Note that there are 19 member countries – plus the European Union – in the G-20

Figure 3-8: Proportion of SMEs with broadband by sizeband, 2010 and 2012



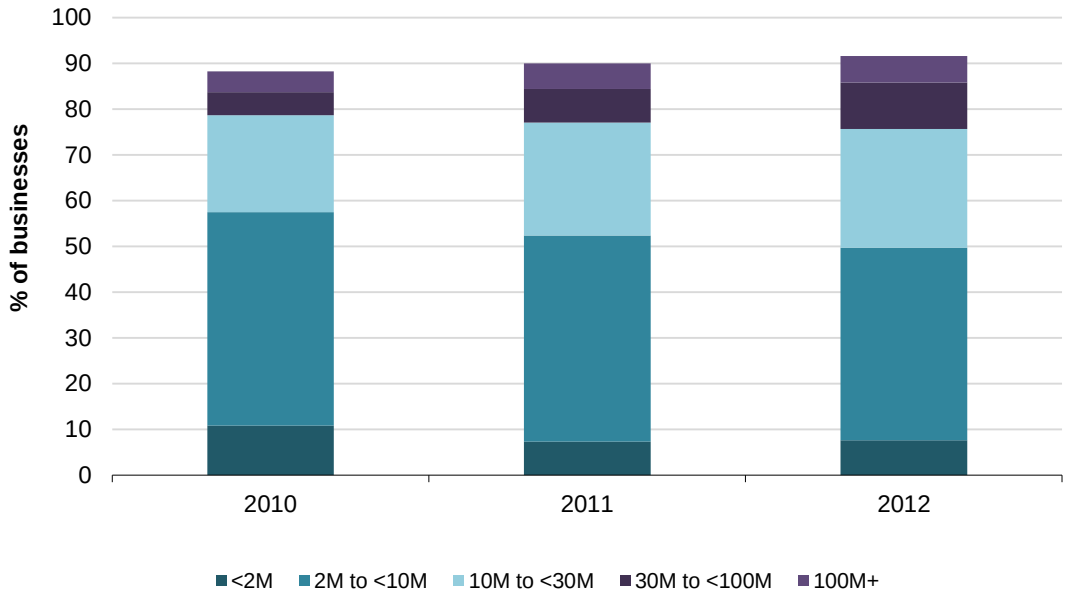
Source: BIS Small Business Survey 2012

3.16 The ONS's e-commerce survey does provide some information on business connectivity speeds. However, it is on the maximum *contracted* speed of businesses' connections (if known) rather than the speed actually received, and provides the data in terms of the proportion of respondents in a certain speed range rather than an average. Furthermore, the information is only available for firms with ten or more employees.

3.17 Nonetheless, we can see that Figure 3-9 confirms that UK businesses have indeed been upgrading their bandwidths over the 2010 to 2012 period (with a marked increase in the proportion of businesses with 10Mbps to 100Mbps services), and that Figure 3-10 confirms that larger businesses tend to use higher bandwidths[13]: approximately 61% of 1,000+ employee firms used 30Mbps+ in 2012, versus 14% of 10-to-49 employee firms.

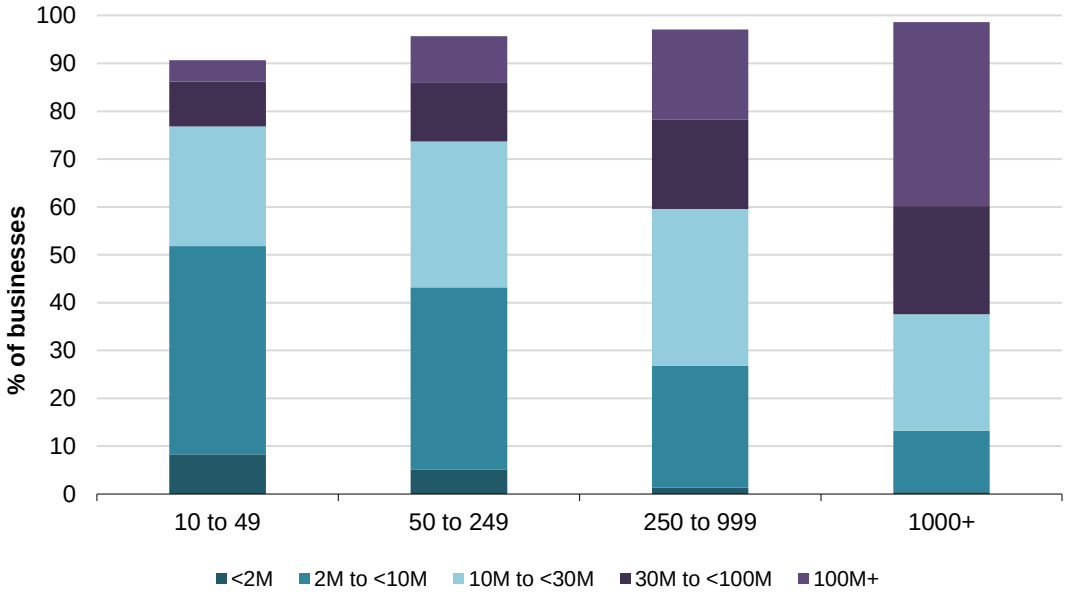
[13] The total proportions of businesses are less than 100% in the charts as these ONS figures exclude those respondents who don't know their connection speed – more likely to be the case in small businesses than in large businesses.

Figure 3-9: UK businesses' maximum contracted connection speeds, over time (for firms with 10+ employees)



Source: ONS ICT Activity of UK Businesses 2012, December 2013

Figure 3-10: UK businesses' maximum contracted connection speeds in 2012, by sizeband



Source: ONS ICT Activity of UK Businesses 2012, December 2013

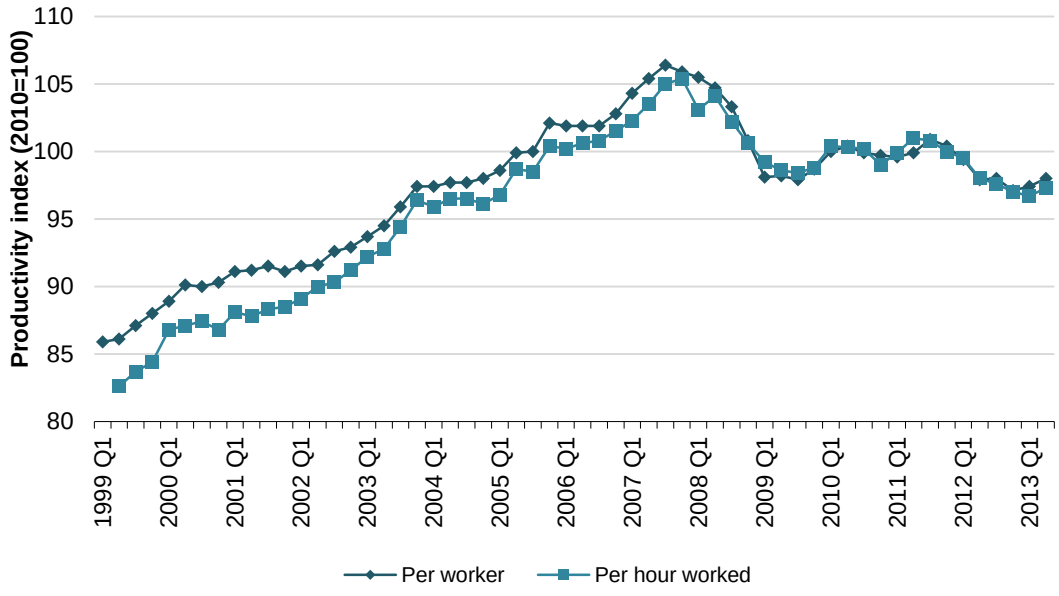
4. Productivity growth

4.1 The projections in our impact report suggest that the bulk of the economic impacts associated with the shift to faster broadband will be generated through the productivity benefits for broadband-using firms.

4.2 This is in the context, however, of the UK's labour productivity falling off in the wake of the 2008 financial crisis, and having remained weak (see the labour productivity indices for the market sector in Figure 4-1). The reasons for this recent 'productivity puzzle' have been much analysed[14] and widely debated, and are beyond the scope of this report.

4.3 We note, though, that the latest Economic and Fiscal Outlook report from the Office for Budget Responsibility (December 2013) anticipates that productivity (per hour worked) growth will start to pick up after a relatively sluggish growth in 2013 (productivity per hour grew by just 0.2% over the first three quarters of 2013, weaker than the modest 0.4% rise the OBR expected in March). Regarding the OBR's projections for the future performance of the UK economy, the report notes that *"This recovery in productivity growth is perhaps the most important judgement in our economy forecast."*

Figure 4-1: Market sector productivity indices (seasonally adjusted, 2010=100)

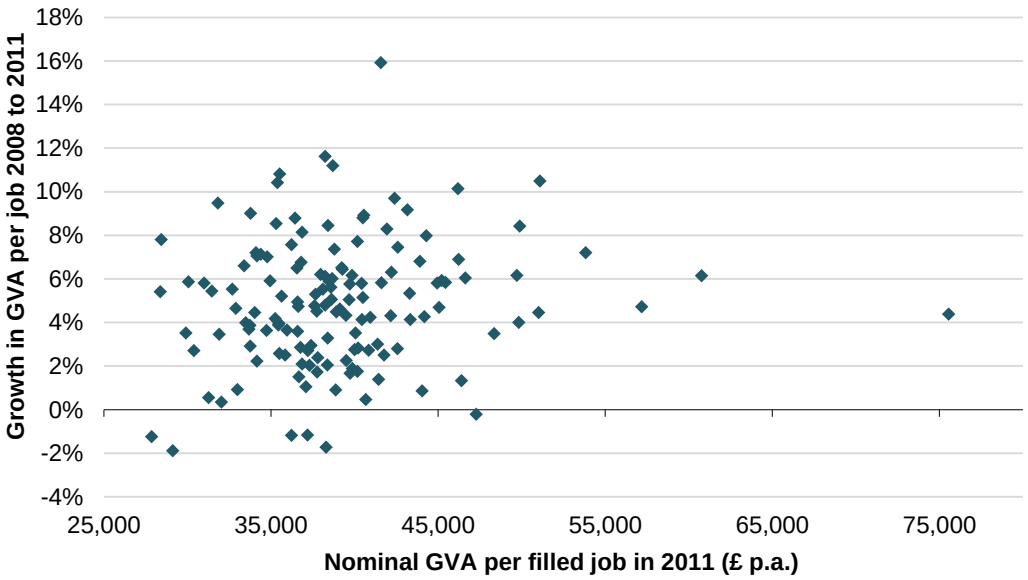


Source: ONS labour productivity statistics for Q2 2013

4.4 There are significant geographic variations in productivity performance. Figure 4-2 plots the UK's 133 'NUTS3' geographic areas by the growth in nominal GVA per filled job between 2008 and 2011, versus the nominal GVA per filled job in 2011. As would be expected, there is a particularly wide range on productivity per filled job, from £29k in Powys to £76k in Inner London West. However, there is also a wide variation in the *growth* in this nominal productivity measure – from -2% in Gwynedd over that period to +16% in Sandwell.

[14] See, for example, http://www.ons.gov.uk/ons/dcp171766_277262.pdf

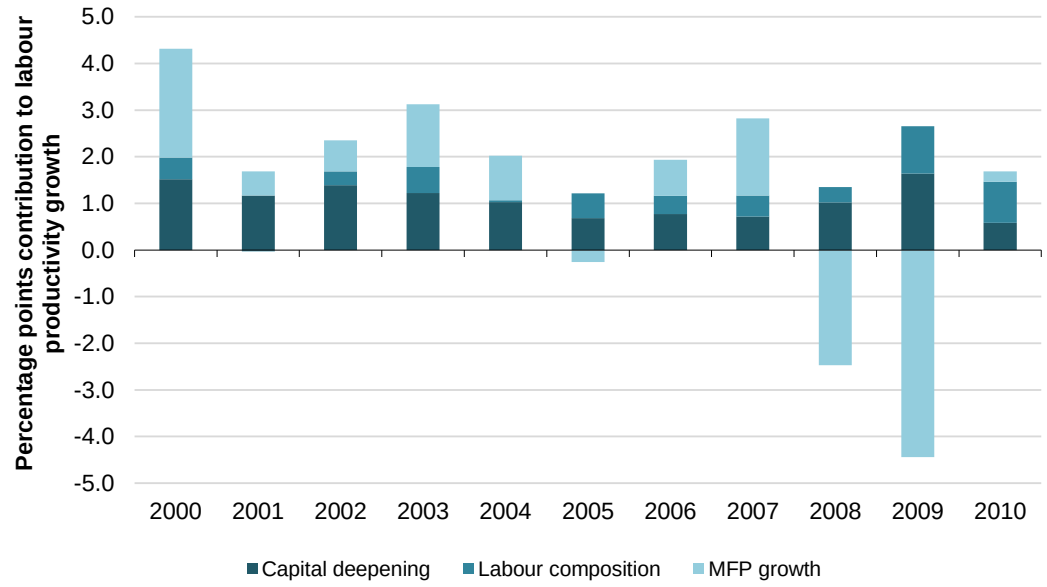
Figure 4-2: Growth in nominal GVA per filled job 2008 to 2011 vs nominal GVA per filled job in 2011, by NUTS3 area



Source: ONS Sub-regional productivity, April 2013

4.5 Analysing the UK's recent productivity performance by the contributions of capital deepening, labour composition and multi-factor productivity[15] (MFP) growth, the ONS estimates that there was a small positive contribution to UK labour productivity growth from MFP in 2010, following sharply negative contributions in 2008 and 2009 (Figure 4-3).

Figure 4-3: Decomposition of the UK's annual labour productivity (per hour) growth



Source: ONS Multi-factor Productivity – Indicative Estimates, 2010, September 2012

[15] Capital deepening refers to an increase in capital intensity (e.g. of capital stock available per hour worked). Labour composition refers to changes in the experience and education of the workforce. MFP is the residual output growth that cannot be accounted for by growth in labour and capital inputs. This term is sometimes referred to as the 'Solow residual' or total factor productivity (TFP).

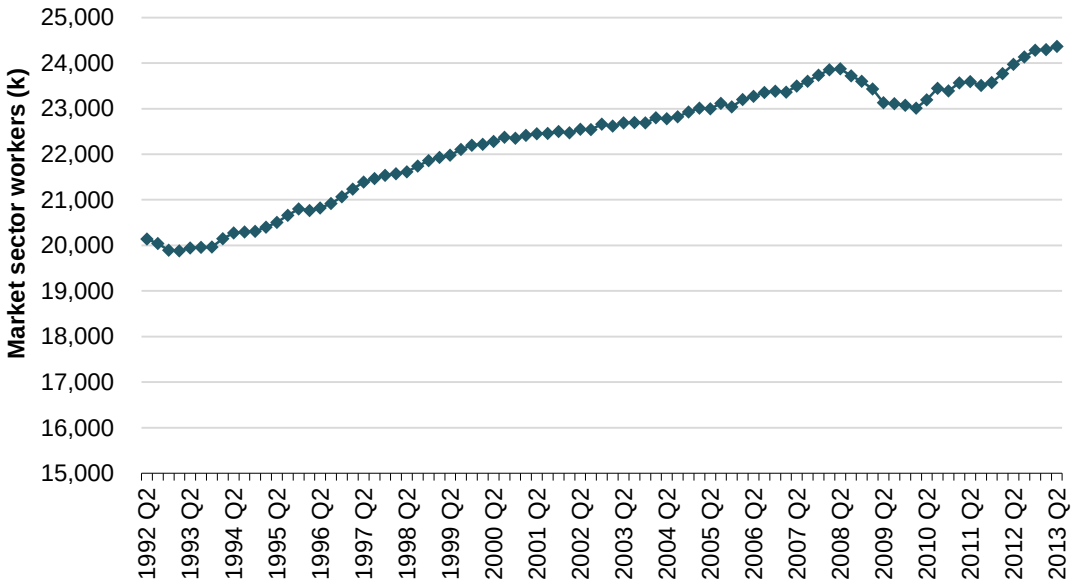
4.6 As the ONS source for this data explains: *"Conceptually the MFP residual can be thought of as capturing technological progress, including the effect of changes in management techniques and business processes or more efficient use of factor inputs. ... MFP is linked, therefore, not to an increase in the quantity or quality of measured factor inputs but rather to how they are employed."* In terms of assessing the future economic impact of faster broadband, it is this MFP component of labour productivity growth which will be particularly important to be tracked.

5. Enterprise and employment growth

5.1 Our impact report predicted only very modest net impacts from faster broadband on employment at a *national* level: primarily through telework enabling increased participation in the labour market by carers (e.g. those with dependent children) and disabled people.

5.2 Figure 5-1 plots the number of market sector workers in the UK over time, and shows that this employment measure has now recovered to beyond its pre-financial crisis level. The absence of any marked uplift in employment growth in the years following 2000 (when first generation broadband services became widely available in the UK) would appear to be consistent with the assumptions underpinning our estimates of the future impacts associated with faster broadband.

Figure 5-1: Number of UK market sector workers (thousands)



Source: ONS labour productivity statistics for Q2 2013

5.3 At *local* levels, however, we predicted that the relative quality of broadband would be important for the growth in the number of enterprises and their associated employment: areas with relatively poor broadband would lose out to areas with relatively good broadband – at least in terms of the smallest businesses (1 to 9 employment).

5.4 As the economy picks up, and as superfast broadband services are rolled out across the rest of the UK, it will be possible to assess empirically what, if any, impact faster broadband has on the distribution of enterprises and employment – for example, by looking at time series trends in the numbers of enterprises in different sectors and sizebands in rural versus urban areas.

5.5 As a baseline, Table 5-1 and Table 5-2 indicate that there were approximately 1.83 million private sector 'local units' in urban[16] areas of the UK and 0.67 million in rural areas in 2012 – with these numbers dominated by the smallest size band (1 to 9 employment).

Table 5-1: Count of urban private sector 'local units' in the UK as of 2012, by employment sizeband and broad industry grouping[17]

	1 to 9	10 to 49	50 to 199	200+	Total
A	19,229	838	70	12	**20,149**
BDE	6,228	2,130	637	195	**9,190**
CF	246,532	33,022	7,747	1,806	**289,107**
GHI	446,708	107,359	14,859	3,328	**572,254**
JKLMN	589,030	62,954	12,852	3,960	**668,796**
PQRS	204,880	51,691	8,984	1,153	**266,708**
Total	**1,512,607**	**257,994**	**45,149**	**10,454**	**1,826,204**

Source: SQW analysis of IDBR data from ONS, 2013

Table 5-2: Count of rural private sector 'local units' in the UK as of 2012, by employment sizeband and broad industry grouping

	1 to 9	10 to 49	50 to 199	200+	Total
A	116,922	3,367	242	44	**120,575**
BDE	3,753	1,007	213	33	**5,006**
CF	106,352	10,526	1,952	405	**119,235**
GHI	137,026	24,777	2,626	404	**164,833**
JKLMN	174,664	9,476	1,303	286	**185,729**
PQRS	57,312	11,566	2,011	195	**71,084**
Total	**596,029**	**60,719**	**8,347**	**1,367**	**666,462**

Source: SQW analysis of IDBR data from ONS, 2013

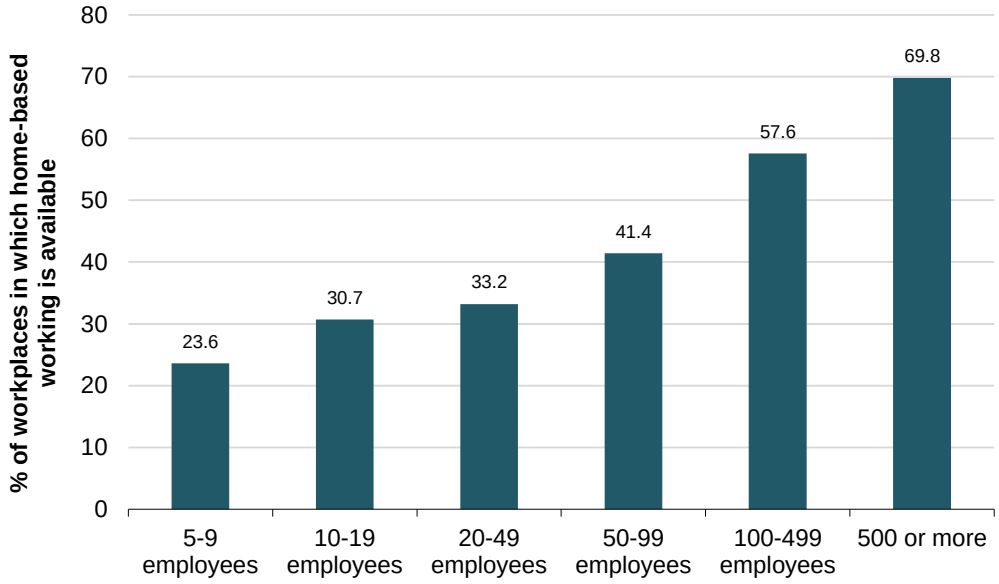
[16] For the purposes of this analysis we have taken the 'urban >10k population' classification as 'urban', and other geographies as 'rural'.

[17] The six broad industry groupings, using SIC2007 sections, are: A (Agriculture, forestry and fishing); B,D&E (Mining and quarrying; Electricity, gas, steam and air conditioning supply; Water supply; sewerage, waste management and remediation activities); C&F (Manufacturing; Construction); G,H&I (Wholesale and retail trade, repair of motor vehicles and motor cycles; Transport and storage; Accommodation and food service activities); J,K,L,M&N (Information and communication; Financial and insurance activities; Real estate activities; Professional, scientific and technical activities; Administrative and support service activities); P,Q,R&S (Education; Human health and social work activities; Arts, entertainment and recreation; Other service activities)

6. Teleworking

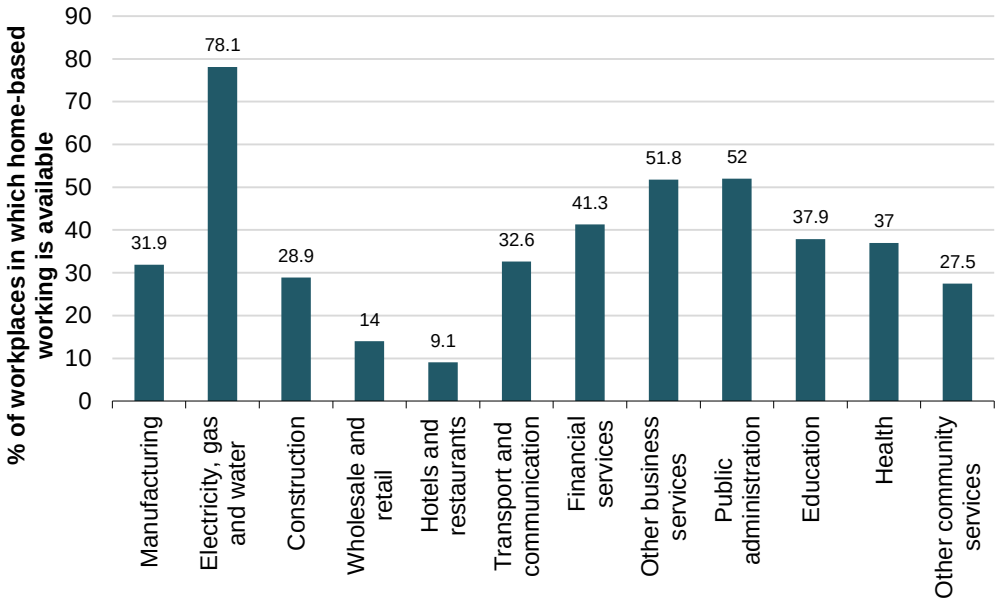
6.1 Some baseline data on teleworking comes from the Workplace Employment Relations Survey, which confirmed that the likelihood of a firm offering home-based working is strongly dependent on the size of the workplace (23.6% in 5 to 9 employee workplaces versus 69.8% in 500+ employee workplaces - Figure 6-1) and the firm's sector (9.1% in hotels & restaurants versus 78.1% in electricity, gas and water - Figure 6-2).

Figure 6-1: Availability of home-based working, by size of workplace



Source: DWP Workplace Employment Relations Survey 2011

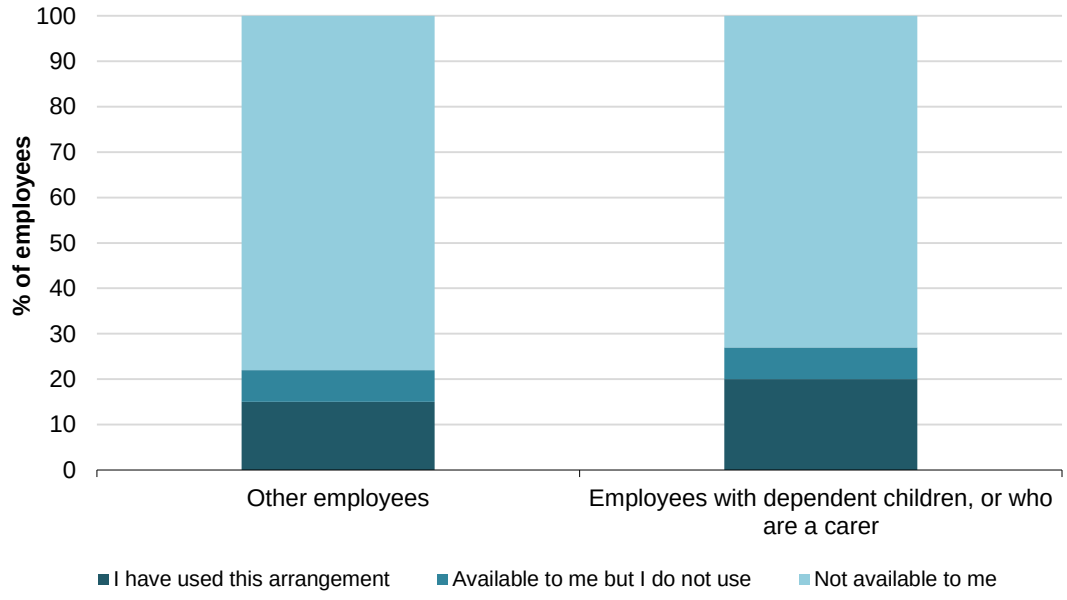
Figure 6-2: Availability of home-based working, by industry sector



Source: DWP Workplace Employment Relations Survey 2011

6.2 As shown in Figure 6-3, employees who have dependent children, or who are carers of dependent adults, are more likely to have used a home-based working arrangement (20%) than other employees (15%).

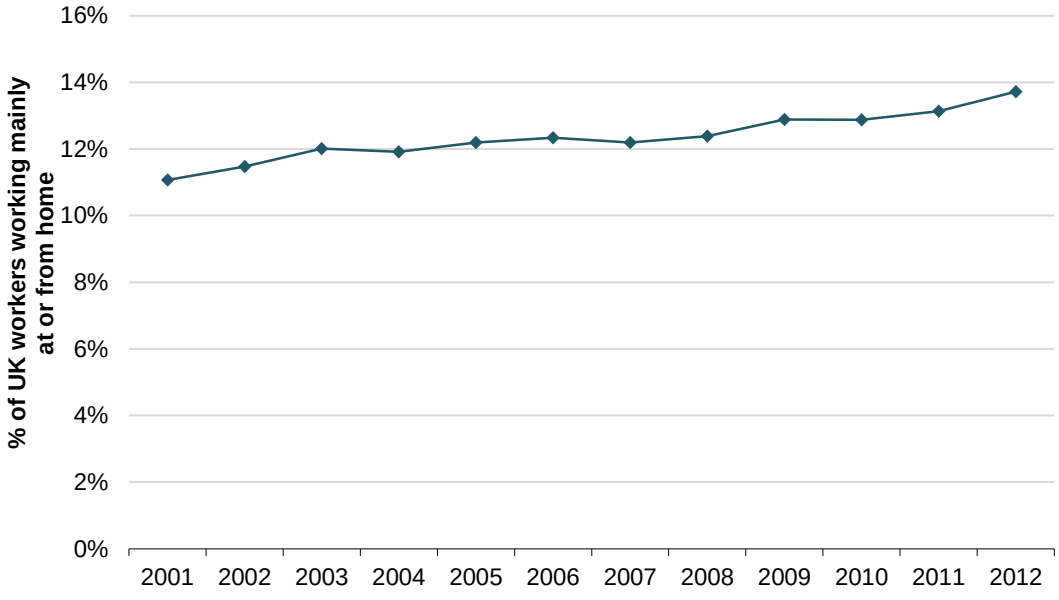
Figure 6-3: Proportion of employees who have used home-based working, by whether the employee is a carer



Source: DWP Workplace Employment Relations Survey 2011

6.3 Statistics from the Labour Force Survey suggest that the proportion of workers who work *mainly* at or from home has grown from 11.1% in 2001 to 13.7% in 2012 (Figure 6-4).

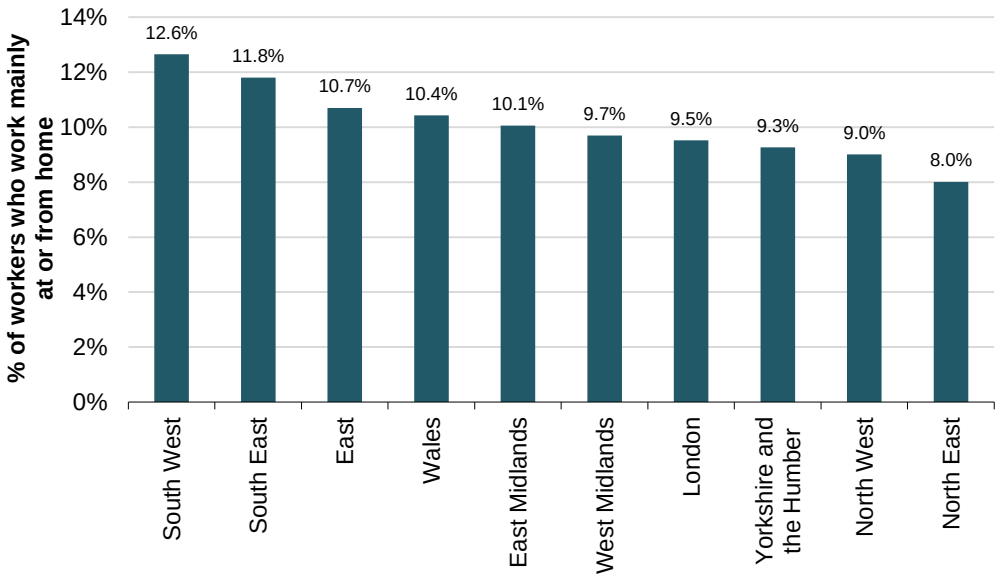
Figure 6-4: Proportion of UK workers working mainly at or from home, over time



Source: ONS Labour Force Survey

6.4 Analysis of the equivalent statistics[18] from Census 2011 for England & Wales (Figure 6-5) shows that this sort of home-working is most prevalent in the South West (12.6%) and least popular in the North East (8.0%).

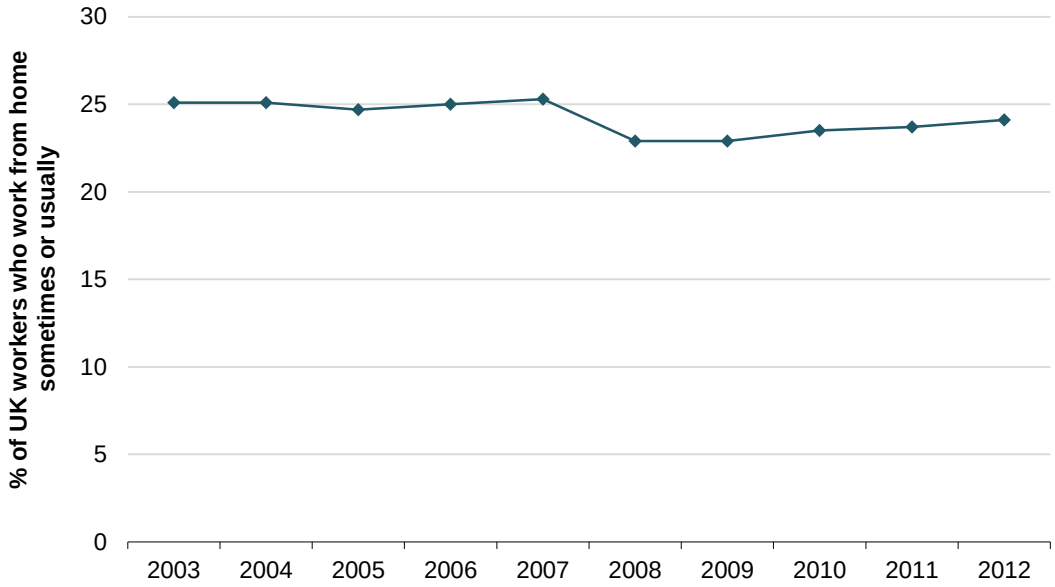
Figure 6-5: Proportion of workers in England and Wales working mainly at or from home



Source: SQW analysis of census 2011

6.5 Widening the definition of home-working, about 24% of UK workers work at home either *sometimes* or *usually*, according to Eurostat (Figure 6-6) – with a marked drop in home-based working seen during the financial crisis in 2008 and 2009.

Figure 6-6: Proportion of UK workers who work at home sometimes or usually, over time

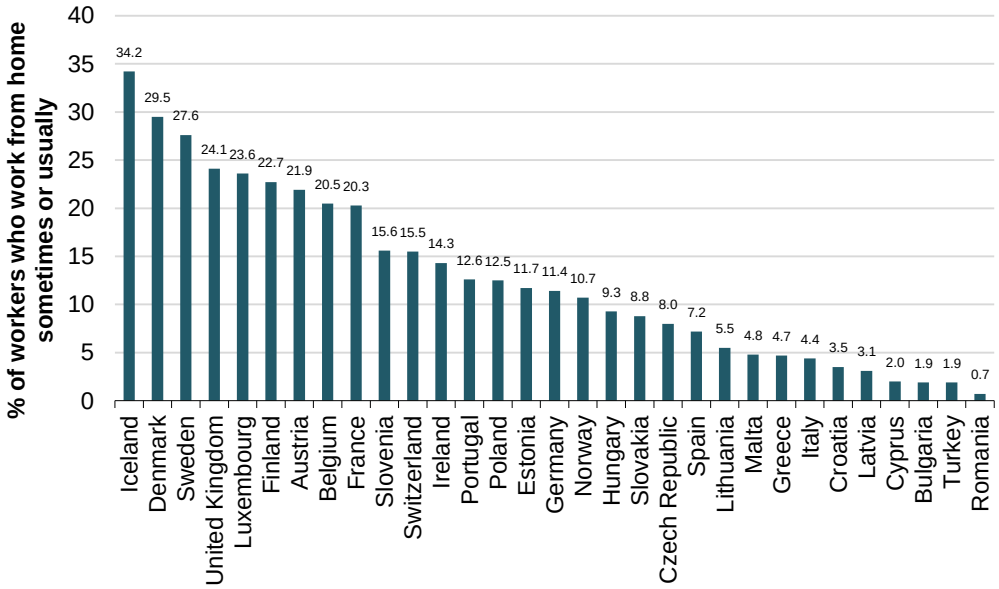


Source: Eurostat LFS

[18] Note that the statistics from the Labour Force Survey and the census are not directly comparable, as they use slightly different questions.

6.6 The Eurostat data also provides useful international comparisons. The UK had the fourth highest incidence of home-working (sometimes or usually) in 2012, of the 30 countries reported (Figure 6-7) – after the other ICT-intensive economies of Iceland, Denmark and Sweden.

Figure 6-7: Proportion of workers who work at home sometimes or usually, by country, 2012



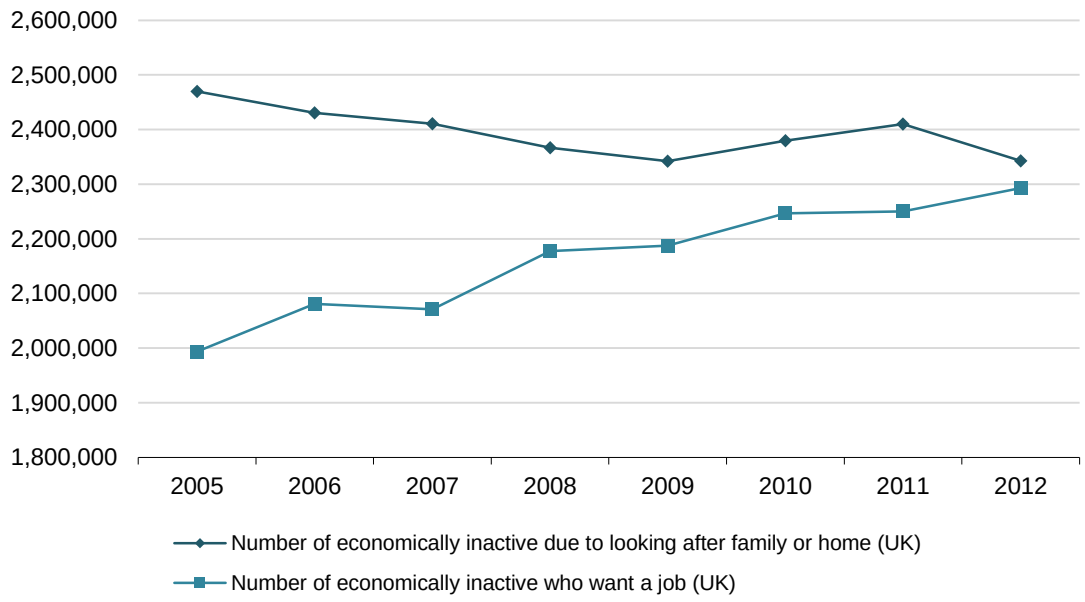
Source: Eurostat LFS

7. Labour force participation

7.1 There does not currently appear to be any public domain data on the numbers of people enabled to participate in the labour force due to teleworking arrangements. However, there are various other relevant indicators.

7.2 For example, Figure 7-1 shows that the number of people who are economically inactive due to looking after family or home fell from 2.5 million in 2005 to 2.3 million in 2012. Over the same period, the total number of economically inactive people[19] who want a job rose substantially (from 2.0 million in 2005 to 2.3 million in 2012).

Figure 7-1: Numbers of economically inactive people in the UK: those economically inactive due to looking after family or home; and those who want a job



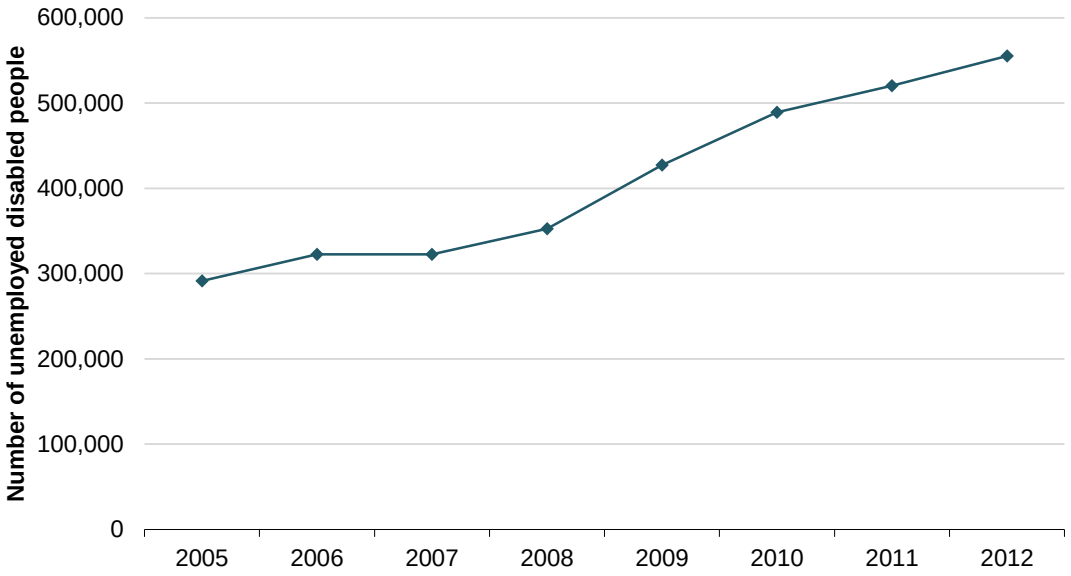
Source: ONS Annual Population Survey

7.3 Participation of disabled people in the labour force remains a challenge, as illustrated in Figure 7-2 which shows that the number of unemployed disabled people, aged 16 to 64, reached 555,000 in 2012.

7.4 Unemployment rates for disabled people have been persistently higher than for those without disabilities: Figure 7-3 shows that the gap between the unemployment rates was 4.7 percentage points in 2012 (12.0% for disabled people, and 7.3% for non-disabled people).

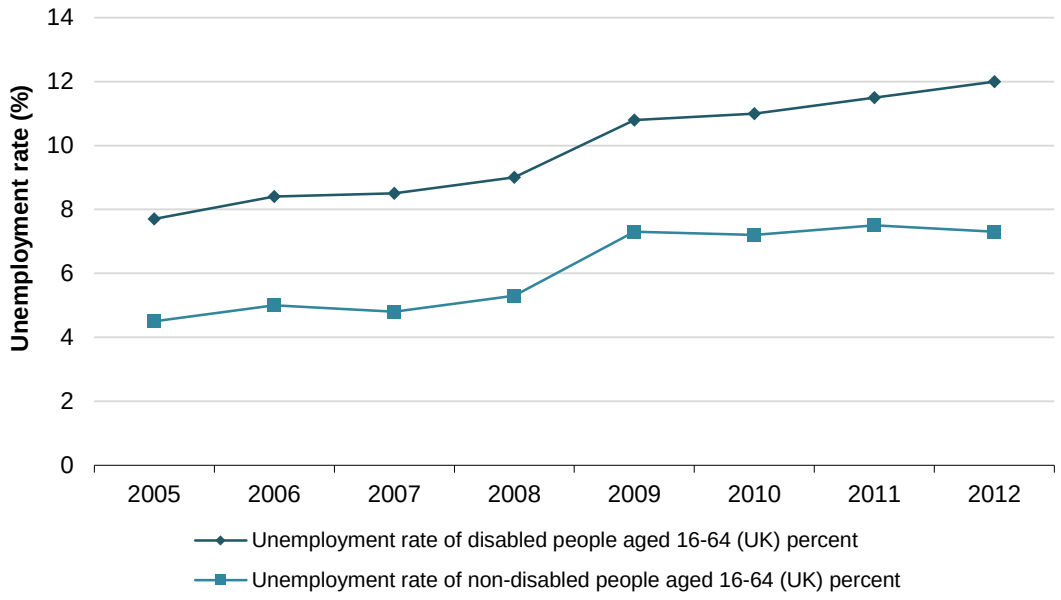
[19] Inactive for any reason: not just those looking after family or home.

Figure 7-2: Number of unemployed disabled people in the UK



Source: ONS Annual Population Survey

Figure 7-3: Unemployment rates in the UK for disabled and non-disabled people aged 16-64



Source: ONS Annual Population Survey

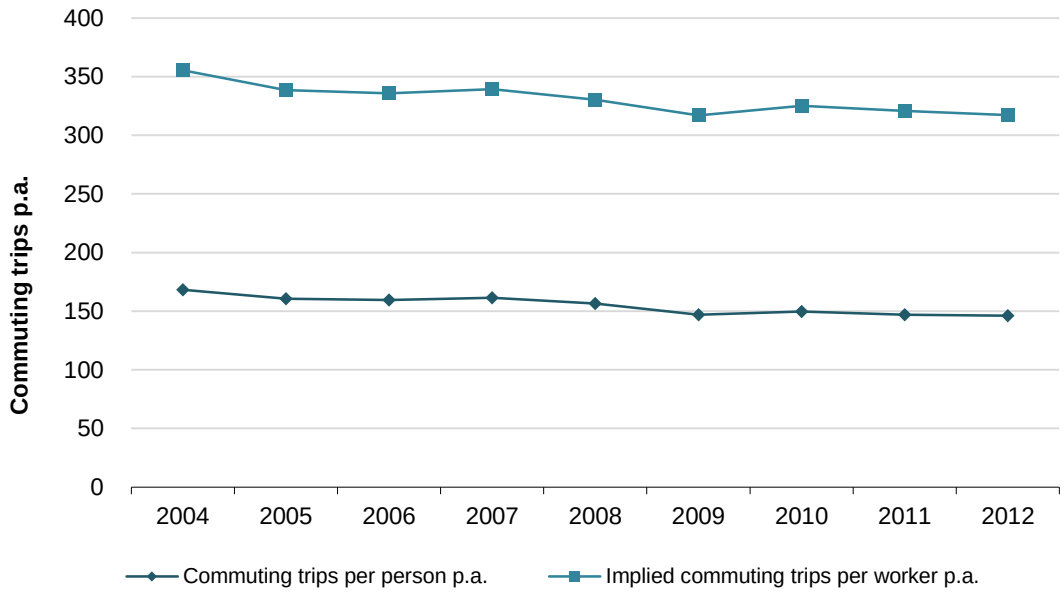
8. Commuting and business travel

8.1 Some of the most important environmental impacts associated with faster broadband are likely to come from reductions in the extent to which people commute (thanks to increased levels of teleworking), and in business travel (due to broadband-using firms' increased use of videoconferencing and online collaboration tools).

8.2 Figure 8-1 shows that there have already been substantial drops in commuting over the last several years – with 13.1% fewer commuting trips per person[20] p.a. in 2012 than in 2004 (which translates to 10.7% fewer commuting trips per worker, as the number of workers has grown more slowly than the population).

8.3 Almost all of this reduction was seen over the period 2004 to 2009, though: the commuting trip rate has been broadly flat since then. As teleworking tends to be more prevalent in rural areas (which are only now starting to obtain superfast broadband services) than in urban areas, this chart is not inconsistent with the hypothesis that faster broadband will lead to reduced commuting in the future.

Figure 8-1: Commuting trips per person and per worker p.a. in Great Britain

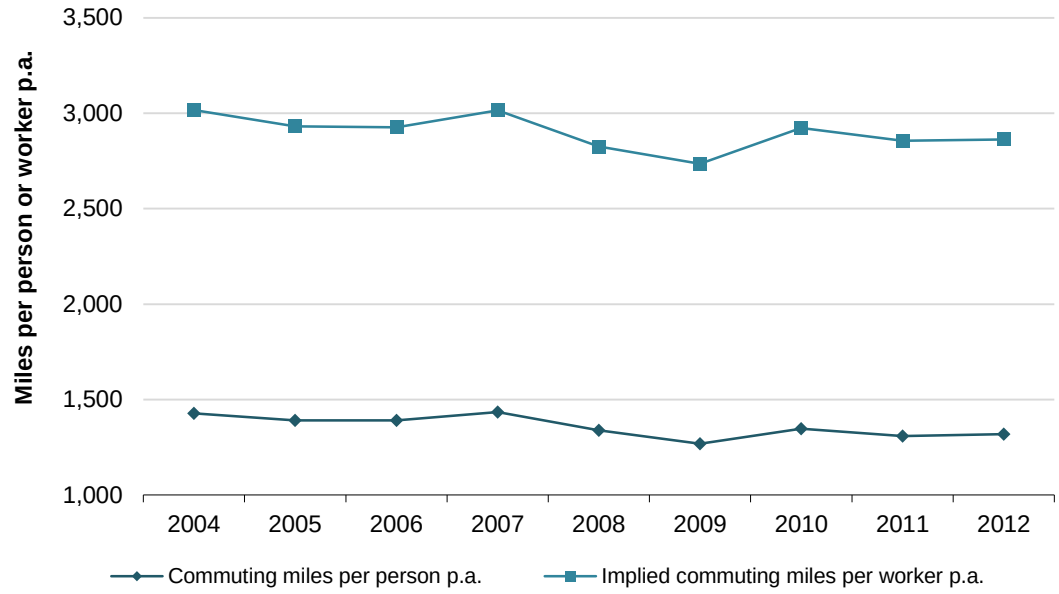


Sources: DfT National Travel Survey; ONS mid year population estimates; and Labour Force Survey

8.4 However, as the average length of commutes has increased over time, (from 8.5 miles per trip in 2004 to 9.0 miles in 2012), the average commuting miles per person and per worker have not reduced as dramatically as the trip rate. Figure 8-2 shows that the commuting miles per person p.a. reduced by 7.6% between 2004 and 2012, while the commuting miles per worker p.a. reduced by 5.1%.

[20] The National Travel Survey reports averages across the whole population for various travel purposes – i.e. per *person* (including children and other non-workers, as well as workers). We have converted these per person statistics to show per *worker* averages for commuting and business travel.

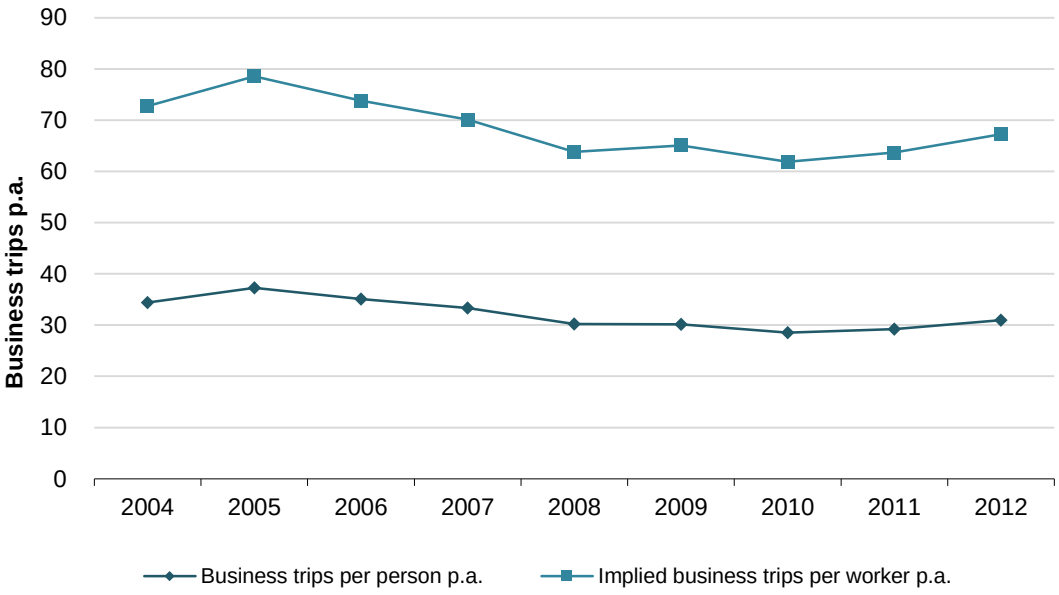
Figure 8-2: Commuting miles per person and per worker p.a. in Great Britain



Sources: DfT National Travel Survey; ONS mid year population estimates; and Labour Force Survey

8.5 Figure 8-3 shows that there have also been substantial drops in business trip rates over the last several years – with 10.0% fewer business trips per person p.a. in 2012 than in 2004 (7.5% fewer business trips per worker).

Figure 8-3: Business trips per person and per worker p.a. in Great Britain

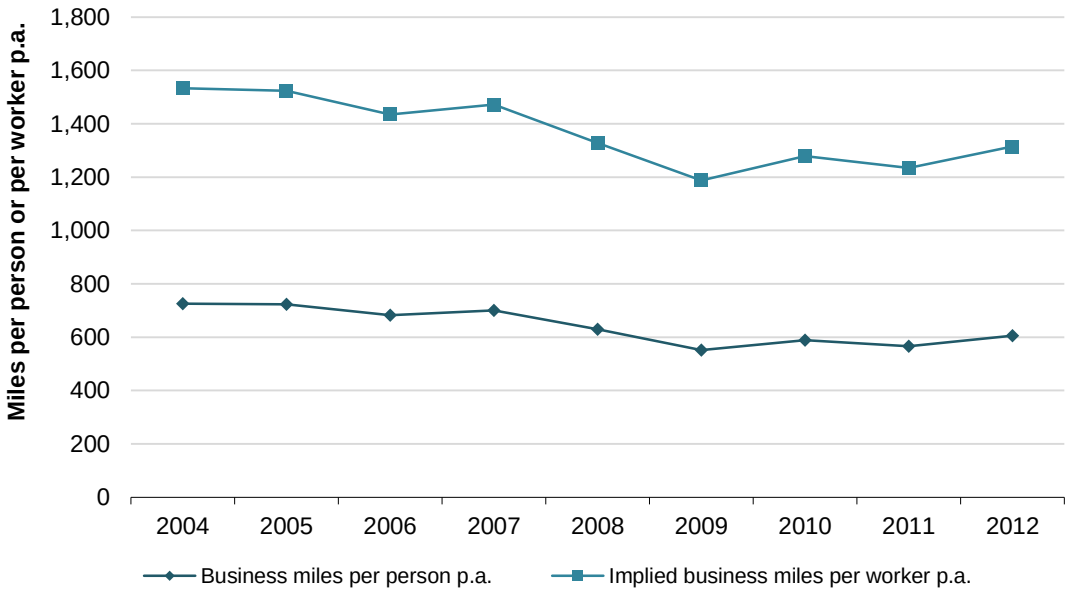


Sources: DfT National Travel Survey; ONS mid year population estimates; and Labour Force Survey

8.6 As the average business trip length has also reduced (19.6 miles in 2012, versus 21.1 miles in 2004), the total business miles per person p.a. have fallen by 16.5% over the period, while the business miles per worker p.a. have fallen by 14.2% (Figure 8-4). Many large firms have cut back on their travel costs recently through increased exploitation of 'unified

communications' (including video) and online collaboration tools. For example, Vodafone UK reportedly reduced its business flights by 26% in one year through its use of unified communications[21]. As smaller firms upgrade to faster, more reliable, low latency broadband services over the coming years, we expect business travel to fall further in the UK, as these firms will increasingly be able to exploit the technology solutions now in widespread use within large corporations.

Figure 8-4: Business travel miles per person and per worker p.a. in Great Britain



Sources: DfT National Travel Survey; ONS mid year population estimates; and Labour Force Survey

[21] https://www.vodafone.co.uk/cs/groups/public/documents/webcontent/16_11_10_pr.pdf

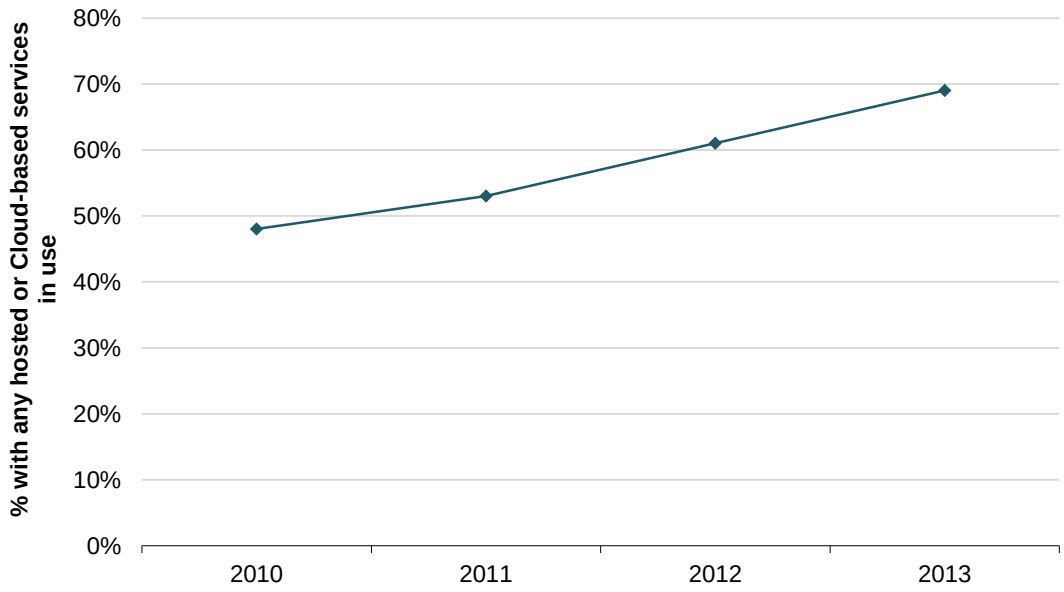
9. Cloud computing

9.1 A further contribution to environmental impact of faster broadband is that small businesses will be enabled to shift a proportion of their computing capacity needs away from standalone 'on-premises' arrangements towards cloud computing solutions, which are much more energy efficient.

9.2 In terms of baseline data, there is very little robust information to be had in this area, however. There are various business surveys, typically funded by cloud computing service providers, but these tend to have relatively small samples for the UK, and are not necessarily weighted in such a way as to be representative of the UK's overall business base.

9.3 One interesting UK time series is provided by Cloud Industry Forum surveys, which found that the proportion of survey respondents with any hosted or cloud-based services in use had risen from 48% in 2010 to 69% in 2013 (Figure 9-1). It should be noted, however, that the survey uses a relatively small sample of 250, and the results are not weighted to be representative of the UK's business base.

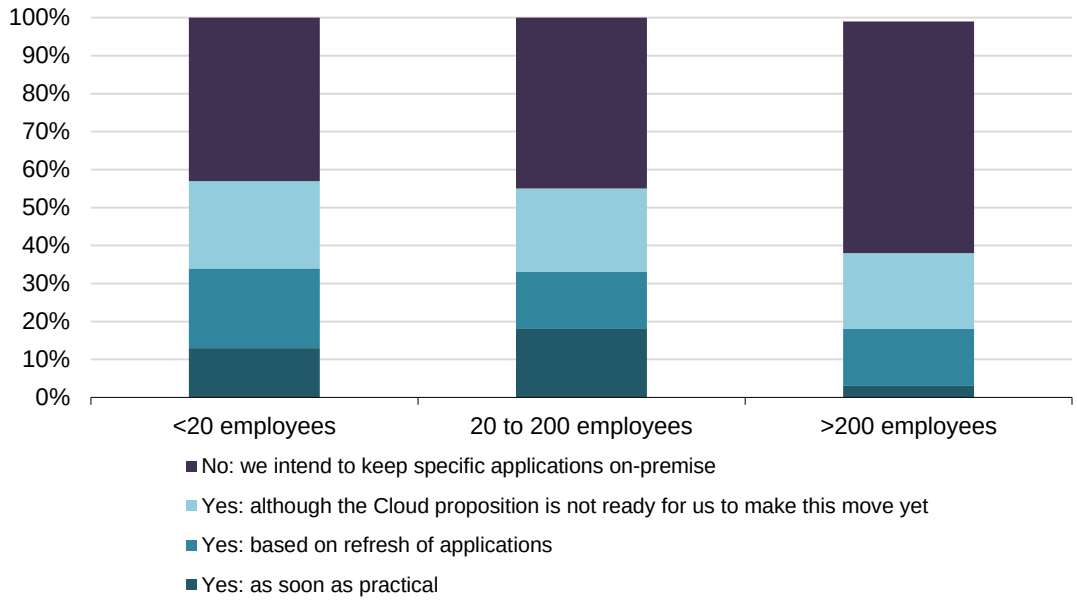
Figure 9-1: Proportion of organisations with any hosted or cloud-based services in use



Source: UK Cloud trends and the rise of hybrid IT, Cloud Industry Forum white paper, 2013

9.4 In terms of businesses' future intentions the same survey found that a high proportion of respondents envisaged moving their *entire* IT infrastructure into the cloud or third-party hosted solutions in the future (Figure 9-2) – and that this was more frequently the case for small businesses than for large businesses (57% for <20 employee businesses versus 39% for >200 employee businesses).

Figure 9-2: Do you foresee that you will ever move your entire IT estate to Cloud-based or third party hosted services? - by employment sizeband



Source: UK Cloud trends and the rise of hybrid IT, Cloud Industry Forum white paper, 2013