The International Communications Market 2017

Telecoms and networks
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4.1 Telecoms and networks: overview and key market developments

A note on the data presented in this chapter

The aim of the ICMR is to benchmark the UK communications sector against a range of comparator countries. In order to allow international comparability, we have sourced and used the most appropriate metrics available for all of our comparator countries, and some of the metrics presented in this chapter differ from those presented in our Connected Nations reports in terms of time periods and definitions.

For example, the data used in this chapter are for the year ended December 2016, while much of the data shown in Connected Nations 2017 report relate to May/June 2017. In terms of definitions, the fixed broadband availability data in this report are based on the network footprints of different technologies within comparator countries, while the coverage data in the Connected Nations reports are based on estimates of the actual connection speeds that can be delivered to individual premises. As such, the UK fixed broadband coverage figures in this report differ from those in the Connected Nations 2017 report.

Similarly, in addition to the timing differences outlined above, the 3G and 4G mobile coverage figures in this report represent outdoor population coverage from at least one operator. However, the Connected Nations report focuses on the percentage of premises that have indoor coverage from all four operators, as well as geographic coverage from all four operators.

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| Key metrics                                      | UK | FRA | GER | ITA | ESP | NED | SWE | USA | AUS | JAP | POR | POL | BRA | RUS | NGA | IND | CHN | NZD |
|------------------------------------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Telecoms service revenues (£bn)                 | 31 | 18  | 25  | 16  | 13  | 6   | 4   | 212 | 15  | 21  | 93  | 3   | 5   | 26  | 12  | 5   | 19  | 129 | 2   |
| Monthly telecoms revenues per capita (£)         | 39 | 23  | 26  | 22  | 23  | 32  | 34  | 55  | 52  | 34  | 61  | 22  | 12  | 10  | 7   | 2   | 1   | 8   | 35  |
| Total fixed telecoms revenues (£bn)              | 9  | 3   | 6   | 4   | 2   | 1   | 1   | 26  | 3   | 2   | 13  | 1   | 0   | 7   | 2   | 0   | 2   | 4   | 0   |
| Total number of fixed voice connections, inc. managed VoIP (millions) | 40 | 39  | 37  | 20  | 19  | 7   | 3   | 122 | 8   | 25  | 56  | 4   | 5   | 42  | 32  | 0   | 25  | 207 | 2   |
| Managed VoIP connections as a % of total fixed voice connections | 17 | 71  | 65  | 22  | 35  | 84  | 54  | 51  | 20  | 38  | 58  | 53  | 28  | 24  | 11  | 33  | 1   | 15  | 29  |
| Fixed voice connections per 100 people, inc. managed VoIP | 61 | 60  | 45  | 34  | 42  | 40  | 32  | 37  | 33  | 50  | 44  | 42  | 13  | 20  | 23  | 0   | 2   | 15  | 37  |
| Monthly outbound fixed voice call minutes per capita (mins) | 106 | 97  | 133 | 63  | 58  | 67  | 71  | 85  | 87  | 87  | 41  | 46  | 17  | 55  | 72  | 0   | 3   | 7   | 118 |
| Superfast fixed broadband coverage (% of households) | 92 | 50  | 81  | 72  | 81  | 98  | 88  | 91  | 34  | 100 | 99  | 94  | 60  | 56  | 70  | 1   | 6   | 60  | 61  |
| Ultrafast fixed broadband coverage (% of households) | 2  | 29  | 32  | 18  | 63  | 58  | 67  | 58  | 0   | 97  | 99  | 47  | 90  | 39  | 0   | 0   | 0   | 44  | 18  |
| Number of fixed broadband connections (millions)   | 25 | 28  | 33  | 15  | 14  | 7   | 4   | 104 | 7   | 20  | 38  | 3   | 7   | 23  | 28  | 0   | 20  | 268 | 2   |
| Fixed broadband connections per 100 people        | 38 | 43  | 40  | 25  | 30  | 43  | 39  | 32  | 30  | 41  | 30  | 32  | 19  | 11  | 19  | 0   | 1   | 19  | 38  |
| Average monthly fixed data use per capita (GB)    | 53 | 21  | 24  | 12  | 22  | 21  | 43  | 27  | 29  | 63  | 33  | 31  | 6   | 4   | 10  | 0.0 | 0.3 | 7   | 26  |
| Total mobile revenues (£bn)                       | 15 | 12  | 16  | 10  | 8   | 4   | 3   | 140 | 8   | 15  | 58  | 2   | 4   | 12  | 9   | 5   | 16  | 93  | 1   |
| Total number of mobile subscriptions, incl. M2M (millions) | 92 | 85  | 117 | 98  | 56  | 26  | 23  | 396 | 32  | 61  | 176 | 17  | 56  | 244 | 254 | 154 | 1127 | 1357 | 6  |
| Mobile subscriptions per 100 people, exc. M2M     | 127 | 113 | 132 | 144 | 112 | 130 | 149 | 98  | 119 | 112 | 130 | 157 | 137 | 110 | 172 | 82  | 84  | 96  | 106 |
| M2M subscriptions per 100 people                  | 12 | 18  | 9   | 20  | 9   | 23  | 88  | 24  | 12  | 9   | 9   | 7   | 6   | 6   | 5   | 0   | 1   | 2   | 29  |
| Monthly outbound mobile call volumes, per capita (mins) | 192 | 208 | 117 | 240 | 165 | 151 | 269 | 404 | 180 | 212 | 174 | 208 | 210 | 154 | 326 | 73  | 140 | 170 | 92  |
| Average monthly mobile data use per capita (GB)   | 1.7 | 1.4 | 1.0 | 1.6 | 1.1 | 1.0 | 5.7 | 3.7 | 2.5 | 3.9 | 3.1 | 1.4 | 2.9 | 0.4 | 2.4 | 0.2 | 0.2 | 0.6 | 1.1 |
| 4G coverage (% of population with coverage from at least one provider) | 100 | 94  | 97  | 98  | 94  | 100 | 100 | 99  | 98  | 100 | 99  | 99  | 98  | 75  | 65  | 24  | 75  | 90  | 95  |
| 4G subscriptions on 4G device per 100 people       | 69 | 49  | 40  | 42  | 47  | 78  | 76  | 81  | 82  | 92  | 86  | 71  | 39  | 29  | 26  | 1   | 8   | 56  | 41  |
| 4G as % of all mobile subscriptions (%)           | 50 | 38  | 28  | 26  | 39  | 51  | 32  | 67  | 62  | 76  | 62  | 43  | 27  | 25  | 15  | 1   | 9   | 57  | 31  |
| 4G as % of total mobile data use (%)              | 90 | 85  | 72  | 70  | 62  | 69  | 70  | 83  | 86  | 95  | 92  | 79  | 72  | 52  | 7   | 4   | 25  | 81  | 31  |

Source: IHS Markit / industry data / Ofcom

Notes: For the purposes of this table most of the figures have been rounded to the nearest whole number; the fixed broadband coverage data in this table refers to the proportion of homes able to receive fixed broadband with an advertised speed ≥30Mbit/s at the end of 2016, while the ultrafast coverage figure refers to the proportion able to receive fixed broadband with an advertised speed ≥300Mbit/s at the end of 2016 – these figures differ from the 92% premises coverage for speeds ≥24Mbit/s or more, 91% for speeds ≥30Mbit/s and 36% for speeds ≥300Mbit/s stated in our Connected Nations 2017 report, which were calculated based on detailed premise-level data inputs provided to Ofcom by UK communications providers relating to estimated connection speeds in May 2017; the mobile coverage figures in this report are based on the proportion of the population in areas with outdoor coverage from at least one MNO, while the 4G coverage figure in the Connected Nations 2017 report (58%) relates to the proportion of UK premises in areas with indoor 4G coverage from all four MNOs in June 2017.
4.1.1 The UK in context

The UK generated £31bn in fixed and mobile voice and data service revenues in 2016, the fourth highest total among our 19 comparator countries after the US, China and Japan. The UK also ranked fourth in terms of average per-capita monthly telecoms spend, after Japan, the US and Australia, at £39 per person.

A common trend is the declining use of fixed voice services, evident in most of our comparator countries, including the UK, in 2016. However, the resilience of the UK’s landline market is notable, with the UK ranking first among our 19 countries in terms of the take-up of fixed voice connections (including managed VoIP), at 61 per 100 people, just ahead of France. In the UK, landline take-up has remained high due to the requirement to take a landline in order to receive most fixed broadband services, and while the UK had the highest per-capita landline take-up among our countries, it ranked third (after Germany and New Zealand) in average outgoing fixed-line voice call minutes per person, at 106 minutes per month (an 11% decline since 2015).

Fixed broadband services offering advertised speeds of 10Mbit/s or more were available to 98%\(^{78}\) of UK households at the end of 2016 (the fourth highest among our comparator countries), and the UK ranked fifth in the proportion of homes that could receive superfast fixed broadband products with advertised speeds of 30Mbit/s or more (92%).\(^{79}\) However, the UK continued to trail on the availability of ultrafast products offering advertised speeds of 300Mbit/s or more, ranking nineteenth of our 19 comparator countries (at just under 2% at the end of 2016 – although ultrafast speeds have been much more widely available since Virgin Media launched 300Mbit/s on its cable network in March 2017).\(^{80}\) The UK ranked eighteenth for the proportion of homes that could receive full-fibre services (also less than 2%), a marginal increase since 2015 due to the continuing roll-out of ‘full-fibre’.\(^{81}\)

The proportion of UK fixed broadband connections with an advertised speed of 30Mbit/s or higher increased to 45% in 2016, putting the UK into eleventh place among our countries. VDSL was the most frequently used next-generation access (NGA) technology in the UK, accounting for more than half of all UK NGA connections due to its high availability (85% of UK homes had access to VDSL services at the end of the year, compared to less than 50% for cable). As a consequence of its low availability, less than 1% of all UK connections were full-fibre at the end of 2016, the lowest proportion among our 19 countries. Growing availability and take-up of fixed broadband services, and migration onto higher-bandwidth connections, resulted in an increase in data traffic volumes across all of our comparator countries in 2016.

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\(^{78}\) In the Connected Nations 2017 report, we say that 97% of UK premises could receive an estimated download speed ≥10Mbit/s in May 2017, based on premises-level operator data. See https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017.

\(^{79}\) In the Connected Nations 2017 report, we say that 91% of UK premises could receive an estimated download speed ≥30Mbit/s in May 2017.

\(^{80}\) In the Connected Nations 2017 report, we say that 36% of UK premises could receive an estimated download speed ≥300Mbit/s in May 2017.

\(^{81}\) In the Connected Nations 2017 report, we say that 3% of UK premises could receive ‘full-fibre’ FTTP services in May 2017.
The UK ranked second in per-capita fixed data use, at 53GB per month, twice the 2015 average. South Korea had the highest average per-capita monthly use, at 63GB.

In mobile, outdoor 4G mobile coverage from at least one operator was available to more than 99% of households in four comparator countries, including the UK, by the end of 2016. In contrast to the trend in most other countries, per-capita mobile take-up declined in the UK in 2016, falling from 141 to 139 subscriptions per 100 people, with Poland and Brazil the only other comparator countries to experience falls. The proportion of mobile subscriptions that were post-pay increased in 16 of our 19 countries in 2016, including the UK, which had the eighth highest proportion at 68%, a 4pp increase since 2015, partly due to the growing popularity of low-cost SIM-only pay-monthly deals. By the end of 2016, half of all UK mobile connections (50%) were 4G tariffs used on a 4G device, a 14pp year-on-year increase.

Average per-capita monthly outgoing mobile voice call minutes increased to 192 minutes in the UK in 2016, ranking the UK ninth among our comparator countries, while it was fourth in terms of per-capita outgoing traditional mobile messages, at 116 per month. The average number of monthly messages per person fell in most of our comparator countries during the year, largely due to consumers switching to over-the-top messaging services such as WhatsApp and iMessage. Per-capita mobile data consumption in the UK was 1.7GB per month (90% of which was over 4G mobile networks), a 40% increase since 2015, and the UK ranked eighth among our comparator countries.

4.1.2 Key market development: the transition to ultrafast and gigabit connectivity

Basic fixed broadband services (those offering actual speeds of less than 30Mbit/s) first launched in the 1990s, and by the end of 2016 more than half of households in all but one of our comparator countries (Nigeria) could receive fixed broadband, and in nine of our countries (including the UK) basic broadband was available to more than 99% of homes.

However, the increasing availability of content-rich websites, the popularity of online streaming services such as YouTube, Netflix, Amazon Video and Hulu, and the growing number of devices within the home that connect to a wifi router, have changed the way in which we use broadband services, driving the need for higher-bandwidth connections and the next-generation access (NGA) networks required to deliver superfast (and faster) connectivity.

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82 In the Connected Nations 2017 report, we say that average data use per residential fixed broadband connection was 190GB per month in June 2017, based on premises-level operator data.
83 In the Connected Nations 2017 report, we say that 58% of UK premises were in areas with indoor 4G coverage from all four MNOs in June 2017.
84 In the 2017 Communications Market Report (https://www.ofcom.org.uk/__data/assets/pdf_file/0015/105441/uk-telecoms-networks.pdf) we said that 62% of active UK mobile subscriptions were 4G at the end of 2016.
85 In the Connected Nations 2017 report, we say that average data use per mobile connection was 1.9GB in June 2017, up from 1.3GB in June 2016. See https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017.
86 In the Connected Nations 2017 report, we define basic broadband as being those connections with an actual download speed ≥10Mbit/s and an actual upload speed ≥1Mbit/s.
87 These figures are based on the network footprints of different technologies within comparator countries, and are likely to be overstated as they will include households than can only receive very low speeds or cannot achieve a reliable connection. In the Connected Nations 2017 report we said that 3% of premises cannot provide estimated download speeds of ≥10Mbit/s, based on premises-level operator data.
88 Ofcom defines superfast broadband connections as those offering estimated download speeds ≥30Mbit/s.
The technologies that are used to provide NGA broadband can be split into three main categories: cable, very-high-speed DSL (VDSL) and ‘full-fibre’. Each of these has benefits and drawbacks.

- While it is comparatively inexpensive to upgrade existing cable TV networks to offer superfast and ultrafast broadband services, the cable network topology means that network contention (congestion) occurs in the access network, making it more difficult to deploy the additional capacity required to alleviate network slowdown at busy times.

- VDSL services can be deployed as an upgrade to full-copper networks in countries where the telephone network is laid out with telephone exchanges linking to cabinets, which then link over a ‘sub-loop’ to premises. Fibre can then be laid from the exchange to the cabinet and, if the copper wire in the sub-loop is short enough, VDSL technology can deliver superfast broadband over this copper line. However, as is the case with ADSL connections, VDSL speeds degrade quickly with the length of copper over which data are transmitted, meaning that it delivers faster speeds in countries where the network’s local loop is shorter, and VDSL is typically unable to provide actual speeds higher than 100Mbit/s. G-fast is a technology which has yet to be widely deployed anywhere in the world, but is being trialled in a number of countries including by Openreach in the UK, and has the potential to deliver speeds of 500Mbit/s or more over a copper connection of about 100 metres.

- Full fibre can provide the highest speeds of the three technologies (it is capable of offering actual speeds of over 1Gbit/s) and can be significantly cheaper to maintain than legacy copper networks. However, it is the most expensive technology to deploy.

![Diagram of fixed broadband technologies](source: Ofcom)

Figure 9  Overview of fixed broadband technologies

In most comparator countries, the widespread roll-out of NGA networks started with cable operators upgrading their networks to DOCSIS 3.0 technology, and ADSL providers deploying VDSL and/or full fibre to future-proof their networks and as a defensive move against cable competitors. The reasons behind

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89 These services are typically delivered using fibre-to-the-premises (FTTP), fibre-to-the-home (FTTH) or fibre-to-the-building (FTTB) technology. In FTTH and FTTP networks, a fibre connection is in place all the way from the exchange to the end-user. In FTTB deployments, fibre is laid to the building with in-building copper wiring (typically gigabit Ethernet) being used for the final connectivity.

90 Ofcom defines ultrafast broadband connections as being those offering estimated download speeds ≥300Mbit/s.
variations in the timings and technologies used in initial fibre deployments are complex, but there are a number of factors that contribute to broadband infrastructure investment decisions:

- **Population distribution**: the per-premises cost is lower in countries with high population density or a large proportion of people living in urban areas, such as Japan, South Korea, the Netherlands and Sweden.

- **Housing patterns**: nationwide roll-out is cheaper in countries where a large proportion of the population live in multiple dwelling units (flats and apartments); in Germany, Italy and Spain, this accounts for more than half the population. In the UK this proportion is less than 20%, making NGA deployment more expensive.\(^1\)

- **Topography**: existing telecoms networks and other environmental factors also determine the cost of NGA roll-out. For example, full-fibre deployment in Paris was comparatively inexpensive as it was possible to lay cables in the city’s sewers, but this has not been possible for much of the rest of France. The structure of France’s copper telephone network has also constrained the deployment of VDSL due to the long average copper line lengths from cabinets to premises. In the UK and Germany, shorter line lengths have led to widespread VDSL deployment by running fibre-to-the-cabinet (FTTC).

- **Regulatory approaches and government intervention**: in some countries, governments have incentivised NGA investment, taken steps to reduce the cost of NGA deployment, and/or subsidised NGA roll-out with public funding (such as that delivered by BDUK in the UK). And duct and pole access (DPA) has been used to reduce the cost of full-fibre roll-out in countries including Spain, Portugal, France and New Zealand.

Together, these factors present a varied picture of the mix of fibre technologies in our comparator countries.

South Korea is the only comparator country in which a large proportion of the population has access to both VDSL and full-fibre services. Full fibre was the prevalent fibre technology in about half of our countries (including Japan, Portugal, Spain and Sweden) at the end of 2016, while in other countries (including the UK, which had the second-lowest availability of full-fibre services, after Nigeria), VDSL availability was higher than that of full fibre.

Italy made the most progress in terms of fibre network availability among our comparator countries in 2016, up 36pp to 85%, as the incumbent provider (Telecom Italia) and utility companies Enel and Fastweb expanded their (mainly VDSL) fibre networks. The vast majority of these network developments were privately funded by the operators, although in January 2017 Enel won the first government tender to deploy fibre in some areas that were not included in the commercial fibre roll-out under Italy’s National Broadband Plan. A second tender yet to be awarded.

These differing mixes of NGA technologies have resulted in significant variations in the availability of superfast and ultrafast fixed broadband products in our comparator countries.

At the end of 2016, 98% of UK homes could receive fixed broadband with an advertised speed of 10Mbit/s or higher. The UK ranked fifth in terms of overall superfast (or higher) fixed broadband product availability (services with advertised speeds ≥30Mbit/s) among our 19 comparator countries; these services were available to 92% of homes. However the UK ranked only fifteenth for ultrafast product availability (services with advertised speeds ≥300Mbit/s), due to the low proportion of households able to receive full-fibre services (less than 2%).

South Korea ranked first for superfast product availability (over 99% of households), while Japan was top for ultrafast availability, with 99% of homes able to receive these services, and 68% having access to advertised speeds of 1Gbit/s or higher. Among our European comparator countries, Sweden had the highest coverage of ultrafast services (67%) followed by Spain (63%) and the Netherlands (58%).

As the data shown here is based on advertised speeds rather than actual speeds, it should be noted that they will partly be determined by the way in which services are marketed. In our Connected Nations 2017 report, we state that while 91% of UK premises were able to receive superfast broadband with an estimated download speed of 30Mbit/s or higher by June 2017, 3% were unable to receive an actual

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92 Note that this is advertised speed – not all households are able to receive these speeds. In the Connected Nations 2017 report, we say that 97% of UK premises could receive an estimated download speed ≥10Mbit/s in May 2017, 91% could receive ≥30Mbit/s and 36% ≥300Mbit/s, based on premises-level operator data. See https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017.

93 Ofcom defines ultrafast broadband connections as those offering estimated download speeds ≥300Mbit/s.

94 In the Connected Nations 2017 report, we say that 3% of UK premises could receive ‘full-fibre’ FTTP services in May 2017, based on premises-level operator data.

connection speed of 10Mbit/s, the minimum that Ofcom believes is required to deliver a decent user experience to the average household.

Since the end of 2016, Virgin Media has launched ultrafast services over most of its cable/FTTP network, which covers just under half of all UK premises, and Openreach has started to pilot an ‘up to’ 330Mbit/s G.fast service. Openreach plans to make full-fibre and G.fast available to 12 million UK premises by the end of 2020 (two million using full-fibre and ten million G.fast).96

![Figure 11 Fixed broadband availability, by advertised service speed (%): end 2016](source)

Source: IHS Markit

The differing levels of availability of broadband services result in wide variations in service take-up across our countries. In 2016, the proportion of fixed broadband connections with an advertised speed of ‘up to’ 30Mbit/s or higher ranged from just under 1% in Nigeria to 95% in Japan (in seven of our countries more than half of all lines fall into this category). In the UK, 45% of fixed broadband lines were superfast products at the end of the year, while less than 1% were classed as ultrafast products (services with an advertised speed ≥300Mbit/s). There were three comparator countries, Japan, South Korea and Portugal, where more than 10% of connections had an advertised speed of ‘up to’ 300Mbit/s or higher.

As consumers’ use of online services continues to evolve, superfast services may no longer be sufficient to provide a good quality of experience for many consumers, furthering the need for ultrafast full-fibre connectivity. For example, Netflix recommends a bandwidth requirement of 25Mbit/s to stream its ultra-high-definition (UHD/4K) content, meaning that many current superfast services will not be able to support concurrent 4K streams. And the growing use of cloud-based services is also likely to fuel consumers’ appetite for faster connection speeds.

Ofcom has sought to stimulate the roll-out of full-fibre services and support ultrafast network investment through its *Digital Communications Review*. Our interventions to help deliver this objective include:

- improving the availability and use of ducts and poles infrastructure and working with Government to reduce planning barriers;
- consulting on setting wholesale regulated prices that protect investment incentives for both BT and other network investors; and
- creating a more independent Openreach that takes network investment decisions in the interests of all its downstream customers.

### 4.1.3 Broadband Scorecard

In this section, we benchmark the UK against 18 other European and global peers using a number of fixed and mobile broadband metrics, as summarised in the table below. The UK’s position is assessed using a range of broadband metrics including coverage, take-up, use and price. As in previous reports, we also compare metrics for the EU5 and EU28, which are provided as appendices to this report.

98 Mobile broadband includes all data connections made via 3G or 4G cellular networks, including those made via mobile handsets and using dedicated mobile data dongles and SIMs.
99 The EU5 and EU28 scorecards are provided as appendices to this report, and can be found at: [https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017](https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017).
**Figure 13** Broadband Scorecard summary: the UK’s position relative to 18 other comparator countries: 2016

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<td>ADSL</td>
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<td>100%</td>
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<td>Cable</td>
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<tr>
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<td>99%</td>
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<td>4G mobile population coverage by at least one MNO</td>
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<td>4%</td>
</tr>
<tr>
<td>Fixed broadband with advertised speed ≥10Mbit/s and &lt;30Mbit/s</td>
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<td>51%</td>
</tr>
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<td>Fixed broadband with advertised speed ≥30Mbit/s and &lt;100Mbit/s</td>
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<td>34%</td>
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<td>11%</td>
</tr>
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<td>Fixed broadband with advertised speed ≥300Mbit/s and &lt;1Gbit/s</td>
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<td>0.3%</td>
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<tr>
<td>% subs 3G mobile service being used on a 3G-enabled device</td>
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<td>41%</td>
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<tr>
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<tbody>
<tr>
<td>Fixed data per capita per month (GB)</td>
<td>2</td>
<td>53</td>
</tr>
<tr>
<td>Mobile data per capita per month (GB)</td>
<td>8</td>
<td>1.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prices</th>
<th>2016</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average price to receive ‘unlimited’ broadband with advertised speed &lt;30Mbit/s</td>
<td>2/6</td>
<td>£29</td>
</tr>
<tr>
<td>Average price to receive ‘unlimited’ broadband with advertised speed ≥30Mbit/s and &lt;300Mbit/s</td>
<td>4/6</td>
<td>£35</td>
</tr>
<tr>
<td>Average price to receive ‘unlimited’ broadband with advertised speed ≥300Mbit/s</td>
<td>3/6</td>
<td>£46</td>
</tr>
<tr>
<td>Average price to receive ‘unlimited’ broadband with advertised speed ≥30Mbit/s in a dual-play bundle</td>
<td>3/6</td>
<td>£32</td>
</tr>
<tr>
<td>Average price to receive ‘unlimited’ broadband with advertised speed ≥300Mbit/s and &lt;300Mbit/s in a dual-play bundle</td>
<td>3/6</td>
<td>£40</td>
</tr>
<tr>
<td>Average price to receive ‘unlimited’ broadband with advertised speed ≥300Mbit/s in a dual-play bundle</td>
<td>3/6</td>
<td>£50</td>
</tr>
</tbody>
</table>

**Source:** IHS Markit

**Notes:**

1. For the purposes of this table most of the figures have been rounded to the nearest whole number.
2. Coverage and connections data are for the year-end 2016.
3. The fixed broadband coverage data in this table refer to the proportion of homes able to receive fixed broadband with the stated advertised speeds. These figures differ from the 97% premises coverage for speeds ≥10Mbit/s or more, 91% for speeds ≥30Mbit/s, and 36% for speeds ≥300Mbit/s stated in our Connected Nations 2017 report, which are based on operator-provided premises-level data inputs relating to estimated connection speeds in May 2017. The report can be found at: https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017

4. ‘Advertised speed’ refers to the speeds that are used to market a particular service, for example ‘up to’ xMbit/s.

5. Mobile broadband includes all data connections made via 3G or 4G cellular networks, including those made via mobile handsets and using dedicated mobile data dongles and SIMs.

6. In order to provide a comparative benchmark across all 19 countries, UK 4G (100%) and 3G (99%) mobile coverage encompasses outdoor population coverage from at least one operator. This differs from the 4G (58%) coverage stated in our Connected Nations 2017 report, which focuses on the percentage of premises that have indoor coverage from all four MNOs.

7. 4G mobile take-up figures refer to customers with access to a 4G enabled device and tariff with 4G data; this differs from the figures used in the 2017 Communications Market Report (www.ofcom.org.uk/research-and-data/multi-sector-research/cmr/cmrcmr-2017), which is based on the proportion of mobile subscriptions that are 4G-enabled.

The key findings from the Broadband Scorecard 2017 are as follows:

- Basic fixed broadband services offering advertised speeds of ‘up to’ 10Mbit/s or higher were available to 98% of homes in the UK100, the fourth highest proportion among our 19 countries after South Korea, Japan and the Netherlands. These services were available to over 90% of homes in 13 of our countries.

- The UK compared favourably to most countries in terms of the availability of superfast broadband products (i.e. services with advertised speeds of 30Mbit/s or higher) ranking fifth at 92%101 of homes. The highest household superfast product availability was in South Korea, at over 99%, while the Netherlands had the highest superfast availability among our European comparator countries, at 98%.

- The UK also had comparatively high overall availability of fibre broadband networks, with 87% of homes being able to receive fibre services, ranking fourth after the Netherlands, South Korea and Japan.

- The UK, however, lagged behind in the availability of FTTP (fibre-to-the-premises) ‘full fibre’ services, which were available to less than 2%102 of UK households at the end of 2016. As a result, the UK ranked eighteenth of our 19 countries for full-fibre availability, with South Korea and Japan (where full fibre is available to more than 95% of homes) taking the top two positions.

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100 In the Connected Nations 2017 report, we say that 97% of UK premises could receive an estimated download speed ≥10Mbit/s in May 2017, based on premises-level operator data. See https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017.

101 In the Connected Nations 2017 report, we say that 91% of UK premises could receive an estimated download speed ≥30Mbit/s in May 2017.

102 In the Connected Nations 2017 report, we say that 3% of UK premises could receive ‘full-fibre’ services in May 2017.
The low UK availability of full-fibre broadband services in the UK is partly due to BT’s decision to deploy VDSL for most of its fibre broadband network. Largely as a result of this decision, the UK ranked second for the availability of VDSL services (after South Korea) with 85% of UK homes having access to these services.

The availability of fibre broadband technologies in the UK is reflected in the relative levels of take-up of fibre services. While the UK ranked first for the proportion of broadband lines that were provided using VDSL (at 26%) it ranked last for the proportion of connections that were ‘full-fibre’ (at less than 1%) The highest ‘full-fibre’ take-up was in Japan, where 75% of connections were provided using these technologies.

At the end of 2016, 45% of fixed broadband connections in the UK were superfast or higher products, ranking the UK eleventh among our countries. In seven comparator countries, more than half of fixed broadband connections were superfast, with Japan having the highest proportion, at 95%.

In five of our comparator countries at least 99% of the population was in areas with outdoor mobile 4G coverage from at least one provider, while 11 had a similar level of 3G mobile coverage. The UK ranked fourth on household availability of 4G networks (at over 99%103, up from 89% in 2015), and tenth for 3G coverage (99%, unchanged year on year).

Half of UK mobile subscriptions (50%) were 4G tariffs at the end of 2016104, a 14pp increase since 2015 and the seventh highest proportion among our 19 countries. South Korea had the highest proportion of connections that were 4G, at 76%.

Average UK per-capita fixed and mobile data use both increased significantly in 2016. During the year, average per-capita monthly fixed data use doubled to 53GB, the second highest volume among our countries, while average mobile data use increased by 40% to 1.7GB per month, ranking the UK eighth among our countries105. The highest level of fixed data use per head was in South Korea at 63GB per month, while for mobile services it was in Sweden at 5.7GB per month.

In terms of the price required to receive residential fixed broadband services using the largest providers’ tariffs (which includes bundles where standalone services are not available), the UK ranked fourth among the EU5 countries and US overall, with UK superfast and ultrafast broadband prices tending to compare less favourably than those of basic broadband services. Italy had the least expensive fixed broadband services in terms of average prices.

Consumers in many countries typically buy fixed broadband services bundled with voice services. The UK ranked third in average prices and fourth for lowest available prices among the same six countries across the basic, superfast and ultrafast dual-play landline and fixed broadband bundles

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103 In the Connected Nations 2017 report, we say that 58% of UK premises were in areas with outdoor 4G mobile coverage from all four MNOs in June 2017, based on premises-level operator data. See https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017.

104 In the 2017 Communications Market Report (https://www.ofcom.org.uk/__data/assets/pdf_file/0015/105441/uk-telecoms-networks.pdf) we said that 62% of active UK mobile subscriptions were 4G at the end of 2016.

105 In the Connected Nations 2017 report we say that, in June 2017, average data use per UK residential fixed broadband connection was 190GB, while average data use per mobile connection was 1.9GB.
that were included in our analysis. Germany and Italy were the least expensive for average and lowest available prices respectively, while the US was the most expensive for both metrics.

4.2 Telecommunications Overview

4.2.1 Mobile accounted for the largest share of revenues in most comparator countries

The US, China and Japan had the highest retail telecoms service revenues among our countries in 2016, between them generating 66% of the £656bn total for our 19 countries during the year.

A key global trend in telecoms markets over the last two decades has been the growth in the use of mobile voice and data services, and Brazil was the only one of our 19 comparator countries where fixed voice and data services accounted for more than half of total telecoms revenues in 2016 (53%). In all other comparator countries, mobile voice and data services generated higher revenues than fixed voice and data services, although in the UK and Australia (which ranked fourth and eleventh in terms of total telecoms revenues respectively), there were near 50:50 revenue splits between fixed and mobile services.

Figure 14 Telecommunications service retail revenues, by country and sector (£bn): 2016

Source: IHS Markit / industry data / Ofcom
Note: Fixed voice revenues include managed VoIP revenues; exclude narrowband internet revenues; all figures have been rounded to the nearest whole number.

4.2.2 The UK ranked fourth for average telecoms revenues per head

Average monthly telecoms revenues per person ranged from £1 in Nigeria to £61 in Japan among our comparator countries in 2016. The average per-capita UK spend was £39 per month during the year, and the UK ranked fourth behind Japan (£61), the US (£55), and Australia (£52). Average spend per head in the other EU5 countries ranged from £22 per month in Italy to £26 in Germany, with the higher spend in the UK partly due to comparatively high levels of take-up and use of fixed and mobile broadband.
4.2.3  Per-capita voice call minutes increased in most comparator countries in 2016

The UK ranked seventh of our 19 countries in 2016 in total per-capita outgoing fixed and mobile minutes, at just under five hours (298 minutes per month). The number of monthly fixed-line voice call minutes per head decreased in every country in 2016, although in almost all of them this was partially offset by an increase in average mobile voice call use, and combined per-capita fixed and mobile outgoing voice call volumes increased in 13 of our 19 countries during the year.

Mobile calls accounted for more than half the total voice call minutes in all countries except Germany and New Zealand in 2016, where fixed voice represented 53% and 56% of total outgoing call minutes respectively. In Germany this was partly because a high proportion of landline users are on flat-rate tariffs. At 64%, the UK had the third-lowest proportion of outgoing voice call minutes originating on mobile networks, due to comparatively high levels of landline use and the popularity of text and data-based OTT messaging services on mobile phones, used in preference to traditional mobile calls.
4.2.4 Less than half of UK respondents regularly use a home landline

Among the nine countries we surveyed, the UK ranked higher for regular use of a home landline (fifth) than for regular use of a mobile phone for either calls, messages or data (eighth) in 2017, with 47% of UK respondents saying they used a home landline at least once a week, compared to 80% for a mobile phone. In all comparator countries, a higher proportion of respondents said they used a mobile phone than said they used a home landline, with the largest difference between the two figures in Sweden, where 86% of respondents regularly used a mobile but only 20% used a home fixed line. The low take-up of landlines in Sweden is also shown in the fixed voice services section of this chapter.

Figure 16 Average per-capita monthly outgoing voice call minutes: 2016

Source: IHS Markit / industry data / Ofcom
Note: All figures have been rounded to the nearest whole number.

4.2.4.1 Weekly phone activities: 2017

Proportion of all respondents (%)

Source: Ofcom research 2017
Base: All respondents UK=1006, FRA=1038, GER=1012, ITA=1020, USA=1000, JPN=1019, AUS=1008, ESP=1010, SWE=1000

Q5. Which of the following do you regularly do (at least once a week)?
4.2.5 The UK ranked third for the proportion of respondents who regularly used VoIP

Among the countries we surveyed, the US and Italy had the highest overall proportions of respondents who said that they regularly used VoIP services (43% and 42% respectively), while the US was the only country where the reported level of VoIP use increased in 2017. The split between voice call and video call VoIP use was fairly even across the nine countries; 29% of respondents in the UK said they used VoIP to make voice calls while 31% said that they used it to make video calls.

It should be noted that, across all comparator countries, many consumers who use managed VoIP may not realise that they are doing so, and consequently, the figures shown here may be understated as they mainly represent the use of ‘unmanaged’ over-the-top (OTT) VoIP services.

Figure 18 Weekly use of VoIP services: 2017
Proportion of all respondents (%)

Source: Ofcom research 2017
Base: All respondents UK=1006, FRA=1038, GER=1012, ITA=1020, USA=1000, JPN=1019, AUS=1008, ESP=1010, SWE=1000

Q.9 How often do you use the internet on any of your devices for each of the following activities? Any VoIP, making voice calls (not video) through VoIP services, making video calls through VoIP services: at least once a week

4.3 Fixed telecoms services

4.3.1 Fixed voice services

The UK had the highest number of fixed voice connections per 100 people among our comparator countries in 2016.

In most comparator countries, use of fixed voice services is falling due to fixed-to-mobile substitution and the growing use of OTT voice and messaging services.

There were 61 fixed voice connections (including managed VoIP) per 100 people in the UK at the end of 2016; the highest number among our comparator countries despite a small decline since 2015. The comparatively high use of landline services in the UK is partly due to the requirement to have a landline in order to use most fixed broadband services, while in France, which was just behind the UK at 60 connections per 100 people, it is due to the popularity of low-cost triple-play services that are delivered
over naked-DSL/fibre and include a managed VoIP connection. Take-up of fixed voice services was considerably lower in the other EU comparator countries, ranging from 13 connections per 100 people in Poland to 45 in Germany.

Landline take-up fell in most of our comparator countries in 2016, the exceptions being Germany, Japan, India and Nigeria (where it was unchanged), Spain and Portugal. The latter two countries were the only comparators where there was growth in per-capita landline take-up during the year, partly due to the growing take-up of triple- and quad-play bundles that include a landline service. The sharpest declines in the number of fixed voice connections per 100 people were in Australia and Sweden, each down by five connections per 100 people. In Australia, this was partly due to consumers stopping services when upgrading to fixed broadband services provided over the National Broadband Network (NBN), while in Sweden, consumers are dropping landlines from service bundles and the incumbent operator (Telia)’s push towards mobile broadband, particularly in remote locations, has resulted in increasing fixed to mobile substitution.

**Figure 19  Fixed voice connections per 100 people: end 2016**

![Fixed voice connections per 100 people: end 2016](image)

Source: IHS Markit / industry data / Ofcom

*Note: Includes managed VoIP connections; all figures have been rounded to the nearest whole number.*

A comparatively low proportion of UK fixed voice connections are provided using managed VoIP

Although the UK was the highest-ranking country in terms of the number of fixed voice connections per person, the proportion of these that were provided using managed VoIP was relatively low (17%), putting the UK sixteenth of our 19 countries at the end of 2016. In the UK managed VoIP is commonly used in the business market, but is not frequently used for residential services.

At 84%, the Netherlands had the highest percentage of fixed voice connections that were provided using managed VoIP, nearly five times the proportion in the UK. This can partly be attributed to the incumbent provider, KPN, migrating its customers from PSTN to VoIP services (which it has been doing since 2013)

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106 ‘Managed VoIP’ refers to the provision of a packet-switched voice over internet protocol (VoIP) service over a fixed broadband network such as xDSL, FTTP and cable. Managed VoIP includes VoIP as a primary service (such as VoIP over FTTP or naked xDSL) and as a secondary service (such as VoIP over xDSL, where the subscriber also pays a monthly fee for a PSTN line). OTT VoIP services consumed over fixed broadband connections, such as Skype, are not included within the definition of managed VoIP because they do not support emergency calling and are therefore not marketed as landline replacement services.
and also using VoIP to provide fixed voice services to its FTTx subscribers (around a quarter of its customer base). Nigeria had the largest increase in the proportion of fixed voice connections provided using managed VoIP during the year (although this growth was from a small base), followed by New Zealand, where the number of naked DSL and fibre lines has risen steadily in recent years. South Korea and India were the only comparator countries where managed VoIP use was unchanged during the year.

**Figure 20  Proportion of fixed voice connections that are managed VoIP (%): end 2016**

![Proportion of fixed voice connections that are managed VoIP (%): end 2016](image)

Source: IHS Markit / industry data / Ofcom

*Note: All figures have been rounded to the nearest whole number.*

Despite having the highest number of fixed voice connections per 100 people, the UK ranked third for outgoing fixed call minutes per person.

Average fixed call use per head decreased in all comparator countries in 2016, including the UK, where it fell by 11% to 106 minutes per month. Despite having the highest per-capita number of fixed voice connections, the UK only ranked third in per-capita fixed voice calls behind Germany (where flat rate tariffs are popular) and New Zealand. Again, this is likely to be partly because some UK landlines are used only for fixed broadband services and not to make calls; naked-DSL and fibre services are being offered by more than one telecoms provider in both Germany and New Zealand.

**Figure 21  Per-capita outgoing monthly fixed voice call minutes: 2016**

![Per-capita outgoing monthly fixed voice call minutes: 2016](image)

Source: IHS Markit / industry data / Ofcom

*Note: All figures have been rounded to the nearest whole number.*
Twelve per cent of UK respondents have a landline but do not use landline services

Our survey found that the proportion of respondents who indicated that they had a landline in their home ranged from 28% in Sweden to 80% in Germany. As this research was undertaken online, the reported levels of service take-up and use may differ from those among the wider population.

Regardless of the level of home landline take-up, the proportion of respondents who said they personally used a landline was lower than the proportion who said they had a landline at home in all comparator countries. In the UK, 68% of respondents said they had a landline at home, but only 56% personally used a landline, either at home or elsewhere.

There were similar differences between reported home landline ownership and landline use in Italy (16pp) and Spain (11pp), but this was less pronounced in France (9pp) and Germany (6pp). The highest percentage point difference was in Japan, where more than two-thirds of respondents reported having a home landline (68%) but less than half (46%) said they used a landline. In some countries, including the UK, the difference between home landline access and use may be driven by the fact that a landline is often required to buy fixed broadband services, and consumers may subscribe to a fixed voice service even if they do not use it.

**Figure 22  Household take-up and personal use of landline services: 2017**

Proportion of all respondents (%)

<table>
<thead>
<tr>
<th>Country</th>
<th>Landline at home</th>
<th>Personally use a landline</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>68</td>
<td>56</td>
</tr>
<tr>
<td>FRA</td>
<td>69</td>
<td>60</td>
</tr>
<tr>
<td>GER</td>
<td>80</td>
<td>74</td>
</tr>
<tr>
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<td>USA</td>
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<tr>
<td>ESP</td>
<td>77</td>
<td>66</td>
</tr>
<tr>
<td>SWE</td>
<td>28</td>
<td>23</td>
</tr>
</tbody>
</table>

Source: Ofcom research 2017

Base: All respondents UK=1006, FRA=1038, GER=1012, ITA=1020, USA=1000, JPN=1019, AUS=1008, ESP=1010, SWE=1000

Q4bi. Which of the following SERVICES do you have in your home, whether or not you use it personally?; Q4bii. Which of the following services do you personally use either at home or elsewhere?

**4.3.2  Fixed broadband services**

Overall fixed broadband availability was unchanged in all comparator countries in 2016

In nine comparator countries, including the UK, household fixed broadband availability (i.e. the proportion of homes that were served by at least one fixed broadband network) was greater than 99% at
the end of 2016. Nigeria was the only country where less than half of households had access to fixed broadband (8%), due to the limited availability of fixed telecoms network infrastructure.

As the figures above are based on the availability of different broadband technologies, they will include homes that are unable to receive a reliable broadband service, or may only be able to do so at low speeds. Based on premises-level estimates of actual connection speeds, we reported in the 2017 Connected Nations report that about 3% of UK premises in June 2017 were unable to receive an actual download speed greater than 10Mbit/s. We do not have comparable data for our other countries.

**Figure 23  Proportion of households in areas served by fixed broadband (%): end 2016**

![Proportion of households in areas served by fixed broadband (%): end 2016](image)

*Source: IHS Markit*

*Note: All figures have been rounded to the nearest whole percentage.*

**ADSL fixed broadband was available to over 99% of households in seven comparator countries**

The UK was one of seven comparator countries where ADSL fixed broadband networks were available to more than 99% of households at the end of 2016. Only four countries had ADSL coverage of less than 90%, of which Nigeria ranked last. As noted above, these figures are based on network availability and, particularly in the case of ADSL, will include homes that may not be able to receive broadband services, or may only be able to access very low speeds due to reasons such as the long length, or poor quality, of the copper telephone line from the premises to the local exchange.

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107 In the Connected Nations 2017 report, we say that 97% of UK premises could receive an estimated download speed ≥10Mbit/s in May 2017, based on premises-level operator data (see [https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017](https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017)).

Proportion of households in areas served by ADSL broadband (%): end 2016

Source: IHS Markit

Note: All figures have been rounded to the nearest whole percentage.

Cable broadband has highest availability in the Netherlands and the US

Among our comparator countries, the Netherlands had the highest household cable broadband availability at the end of 2016, at 95%, followed by the US (90%). The UK ranked eighth with 48% coverage\(^\text{109}\), an increase of one percentage point (pp) since 2015, due to Virgin Media’s Project Lightning network expansion scheme, with which it plans to extend its network to cover an additional four million premises using a mixture of cable and full-fibre\(^\text{110}\).

Proportion of households in areas served by cable broadband (%): end 2016

Source: IHS Markit

Note: All figures have been rounded to the nearest whole percentage.

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\(^{109}\) In the Connected Nations 2017 report, we say that 45% of UK premises could receive cable broadband services in May 2017, based on premises-level operator data (see https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017).

\(^{110}\) http://www.virginmedia.com/corporate/about-us/our-key-projects.html
The UK had the fourth-highest availability of fibre broadband among our countries at the end of 2016. The UK ranked fourth among our countries in terms of fibre broadband availability at the end of 2016; these services were available to 87% of premises. More information on fibre broadband availability, including the VDSL/full-fibre split, can be found in section 4.1.2 of this report.

**Figure 26** Proportion of households in areas served by fibre broadband (%): end 2016

Source: IHS Markit

Note: All figures have been rounded to the nearest whole percentage.

The UK had the sixth highest fixed broadband take-up per head among our 19 countries. At the end of 2016 there were 38 fixed broadband connections per 100 people in the UK, the sixth highest level of take-up among our 19 countries and the third highest among the EU5, after France (43) and Germany (40). The Netherlands had the highest take-up (43 connections per 100 people), while Nigeria had the lowest (less than one connection per 100 people) as a result of the limited footprint of the fixed telecoms networks.

**Figure 27** Fixed broadband connections per 100 people: end 2016

Source: IHS Markit / industry data / Ofcom

Note: All figures have been rounded to the nearest whole number.
The UK had the highest share of superfast VDSL connections among our comparator countries.

The share of ADSL connections declined across all of our comparator countries in 2016, as consumers migrated to higher-speed (mostly fibre) services.

The largest increase in the proportion of fixed broadband connections provided using fibre technologies was in Nigeria (up 27pp, albeit from a very small base of fixed broadband connections). The UK ranked fourteenth in terms of the proportion of connections that were provided over either VDSL, full fibre or cable (46%), while Sweden was the only European country where more than three-quarters of connections were provided using these next-generation access (NGA) technologies.

The UK had the highest proportion of fixed broadband connections provided using superfast VDSL among our comparator countries at the end of 2016 (26%, up 4pp since 2015), owing to the widespread availability of Openreach’s fibre-to-the-cabinet (FTTC) network. However, the UK ranked last among our comparator countries for the share of full-fibre FTTP connections, at less than 1%, primarily due to the limited availability of these services. Full fibre accounted for more than half of the fixed broadband connections in four comparator countries at the end of 2016: Japan (75%), South Korea (74%), China (62%) and Sweden (53%), while Spain had the highest share of full-fibre connections among the EU5 countries, at 35%.

**Figure 28  Fixed broadband connections, by technology (%): end 2016**

Source: IHS Markit / industry data / Ofcom

Note: All figures have been rounded to the nearest whole percentage. The countries are ranked according to percentage of non-ADSL fixed broadband connections.

Monthly per-capita fixed data consumption doubled in the UK in 2016

With the increasing take-up of superfast broadband and the growing popularity of video streaming services such as Netflix and Amazon Video, average per-capita UK fixed data consumption more than doubled, to 53GB per month, in 2016\(^\text{111}\), second among our comparator countries after South Korea.
(63GB). Russia had the largest YoY increase in per-capita consumption in 2016, up by 107% to 10GB per month.

**Figure 29  Per-capita monthly fixed data volumes: 2016**

![Figure 29 Per-capita monthly fixed data volumes: 2016](image)

Source: IHS Markit

Note: All figures have been rounded to the nearest whole number.

The proportion of retail fixed broadband lines operated by the incumbent increased in the UK

The share of fixed broadband lines operated by BT, the incumbent provider in the UK, increased by four percentage points to 37% in 2016, largely due to BT completing its acquisition of EE early in the year\(^{112}\). Despite this increase, which was the largest recorded among our countries during the year, BT had the smallest market share of all the EU5 countries’ incumbent providers at the end of 2016.

The incumbent fixed telecoms provider in Japan (NTT) had the highest proportion of fixed broadband lines (54%), followed by the Indian incumbent (BSNL) with 51%. Brazil was the only comparator country where the incumbent provider accounted for less than a quarter of fixed broadband lines, because the incumbent provider, Oi Brasil, is only the third largest ISP in terms of broadband lines, after cable operator Net Servicos and Telefonica’s Vivo.

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Figure 30  Incumbent share of fixed broadband lines (%): end 2016

Source: IHS Markit / operator data / Ofcom

Note: Data for Nigeria are not included in the comparison; the US, where there is typically a duopoly between a local incumbent telecoms provider and a cable provider, is excluded from this analysis; all figures have been rounded to the nearest whole percentage.

More than eight in ten UK fixed broadband users are satisfied with their overall service

Eighty-one per cent of fixed broadband customers in the UK were 'very' or 'fairly' satisfied with their overall fixed broadband service in 2017, and was among the highest proportion among our comparator countries. Consumers in the UK and the US also had comparatively high levels of satisfaction with fixed broadband download speeds, upload speeds, and quality of connection when more than one device in the home is connected.
4.4 Mobile telecoms services

4.4.1 Availability

Mobile availability data

The mobile coverage data used in this section has been compiled from a number of sources by IHS Markit. It should therefore be noted that there may be differences in the way that these data have been derived, and that the mobile availability figures in this section of the report may not always be like-for-like comparisons.

2G household coverage was 95% or higher in all comparator countries

In this report, where we refer to ‘mobile coverage’, we mean the proportion of people living in an area where at least one mobile network has outdoor coverage.

IHS data show that 2G mobile services (the minimum required to be able to make a voice call) were available to at least 95% of the people in all of our comparator countries at the end of 2016, with the exception of Japan, where 2G networks were decommissioned in 2016. Of the remaining comparator countries where 2G was still in use in 2016, only New Zealand, India, Nigeria and Russia had coverage levels below 99%.
Figure 32 2G mobile network population coverage (%): end 2016

Source: IHS Markit / operator data / Ofcom
Note: All figures have been rounded to the nearest whole percentage.

4G mobile networks were available to over 99% of the population in four countries, including the UK

Once again, it should be noted that the coverage data in this report relates to the proportion of the population in areas with outdoor coverage from at least one mobile network at the end of 2016. In the Connected Nations 2017 report we use June 2017 data showing 4G mobile coverage as the proportion of the population in areas with indoor coverage from all four MNOs (58%), and 4G geographic coverage from all four MNOs (43%).

IHS data show that, among our comparator countries, 11 had at least 95% population coverage from at least one 4G mobile network at the end of 2016. This included the UK, which ranked fourth on 4G outdoor network coverage by at least one provider, at over 99%, a 10pp increase since the previous year. 4G network coverage from at least one provider was lower in rural areas of the UK than the overall 4G figure, at 95% of population. UK mobile providers are due to meet the 4G coverage obligations outlined in their spectrum licence conditions by the end of 2017.

During the year, 4G coverage in India reached 75% of the population, up by 69pp, the highest increase among our comparator countries. This was primarily due to the launch of nationwide 4G services by new entrant Reliance Jio. 3G mobile networks covered at least 95% of the population in 13 countries, including the UK (99%). As with 4G, the availability of 3G networks in rural areas of the UK was lower than the overall figure, at 89% of the rural population.
In 2017, seven in ten UK respondents said that they always had a mobile signal

Seventy per cent of survey respondents in the UK said that they always had a mobile signal when they wanted to make a call, up from 65% in 2016. In the UK, the largest year-on-year increase related to the reliability of mobile data connections, with 74% of people saying that they could always connect to the internet when they wanted to, up from 67% in 2016, potentially due to the migration to 4G services.

Of our comparator countries, Japan had the highest proportion of respondents who stated that they could always connect to the internet when they wanted to, at 81%.
Figure 34  Satisfaction with aspects of mobile phone connectivity: 2017

Proportion of those with a mobile phone (%)

Source: Ofcom research 2017
Base (mobile signal): All respondents who use a smartphone or mobile phone, UK=828, FRA=859, GER=868, ITA=907, USA=763, JPN=764, AUS=836, ESP=908, SWE=834.
Base (internet connection): All respondents who use a smartphone, UK=736, FRA=790, GER=783, ITA=855, USA=685, JPN=560, AUS=774, ESP=874, SWE=777.

Q.24 Thinking about when you use your mobile phone, please select an answer to each of the following...

4.4.2  Mobile overview

The UK ranked seventh for monthly mobile spend per head, at £20

The UK ranked seventh among our 19 countries in average per-capita retail mobile revenue, at £20 per month. On this measure, the UK ranked highest among the EUS countries, partly due to comparatively high average mobile data use (among the EUS countries, the UK had the highest per capita mobile data use and the third highest per-capita level of outgoing call minutes).

Figure 35  Average per-capita monthly retail mobile revenue (£): 2016

Source: IHS Markit / industry data / Ofcom
Note: All figures have been rounded to the nearest whole number.
Most comparator countries had more mobile subscriptions than people in 2016

The UK ranked ninth among our comparator countries, with 127 subscriptions per 100 people (excluding machine-to-machine) at the end of 2016, down from 131 in the previous year. This decline was due to people giving up dedicated mobile data connections (e.g. dongles) as they increasingly use their smartphones to access the internet, and a fall in the number of mobile voice connections, partly due to multiple-SIM pre-pay users migrating onto pay-monthly contracts, including low-cost SIM-only services.

The comparator country which experienced the largest decrease in the number of per-capita mobile subscriptions in 2016 was Brazil, where take-up fell by eight connections per 100 people. This was due to declining multiple-SIM use, largely a result of falling interconnection rates which have made it less advantageous for consumers in Brazil to use more than one SIM.

A higher proportion of mobile connections were 4G\textsuperscript{113} in the UK than in the other EU5 countries

Including M2M services, half of total UK mobile connections (50%) were 4G at the end of 2016, a year-on-year increase of 14pp as customers migrated to 4G plans. South Korea had the largest proportion of mobile connections that were 4G (76%) followed by the US (67%), while the UK ranked seventh among our comparator countries. Sweden’s relatively low aggregate percentage for 3G and 4G connections was, to a large degree, due to it having a comparatively high number of 2G M2M connections, while lower levels of smartphone penetration in France and the Netherlands, in comparison to other Western European markets, mean that more people continue to use 2G services.

South Korea and Japan were the only comparator countries where all mobile connections were provided over 3G or 4G networks. In Japan, this was due to the decommissioning of 2G networks, while in South Korea some 2G networks were still active in 2016, but there were no 2G-only subscriptions.

\textsuperscript{113} 4G connections are defined as being tariffs with 4G data being used on a 4G-enabled device.
Figure 37  3G and 4G as a proportion of all mobile subscriptions (%): end 2016

Source: IHS Markit
Note: Includes M2M subscriptions; all figures have been rounded to the nearest whole number. The countries are ranked by 4G connections as a proportion of total mobile connections.

Just over two-thirds of UK mobile subscriptions were post-pay at the end of 2016

The UK ranked eighth among our comparator countries for the proportion of mobile subscriptions that were post-pay, at 68% at the end of 2016, up 4pp from 2015, primarily due to the increasing popularity of low-cost, SIM-only pay-monthly services. Pre-pay plans tend to be favoured by consumers in developing countries as they offer increased financial flexibility compared to post-pay, and because post-pay packages tend not to include a subsidised handset in these markets. M2M is also a factor in some developed countries; M2M connections are typically post-pay, and high levels of M2M use (such as in Sweden and France) are reflected in higher proportions of connections that are post-pay.

Figure 38  Mobile subscriptions, by type (%): end 2016

Source: IHS Markit / industry data / Ofcom
Note: Includes M2M figures. All figures have been rounded to the nearest whole number. The countries are ranked by the percentage of post-pay mobile subscriptions.
China had the most concentrated mobile market among our comparator countries

In order to gain insight into the levels of competition in mobile markets we use the Herfindahl-Hirschman index of market concentration (HHI). The HHI is calculated by summing the squares of the market shares of firms competing in a market, and can range from close to zero for a market with a large number of firms of equal size, to 10,000 for a monopoly. As the calculation is based on market shares for a specific period, even small changes of a few percentage points in market share can impact HHIs, thereby affecting the overall rankings.

The UK mobile market has a comparatively low level of concentration, based on operator subscription shares, compared to most other comparator countries, ranking sixth with an HHI of 2,845 (the lowest among the EU5 countries). China was the most concentrated MNO market with an HHI of 4,746, due to the large market share of its leading MNO, China Mobile. India’s mobile market was the least concentrated because it has a large number of providers, including region-specific operators.

**Figure 39  Mobile market HHI, MNOs (including wholesale and hosted MVNOs): end 2016**

Source: IHS Markit
Note: All figures have been rounded to the nearest whole number.

### 4.4.3 Mobile voice and messaging

Average per-capita monthly mobile voice call minutes increased in most of our comparator countries, including the UK

Average per-capita monthly outgoing mobile voice call minutes increased in all comparator countries except China and Germany in 2016, with UK consumers, on average, making 192 minutes of outgoing calls per month, an eight-minute increase since 2015. This was the third highest average use across the EU5 countries, after Italy (240) and France (208).
Average monthly mobile messages per person fell in most comparator countries

Almost all comparator countries experienced a decline in the monthly average number of SMS and MMS messages sent per person, apart from France, Nigeria and Spain, where average use was unchanged. In the UK, people sent an average of 116 SMS and MMS messages per month in 2016, 14 fewer than in the previous year. This decline can be attributed to the increasing popularity of OTT data-based messaging services, such as WhatsApp, Apple iMessage and Facebook Messenger. Japan was the only comparator country without any use of traditional mobile messaging services, as consumers there tend to use email and instant messaging.

Source: IHS Markit / industry data / Ofcom
Note: All figures have been rounded to the nearest whole number.
### 4.4.4 Mobile broadband services

The UK had 69 4G mobile connections per 100 people, ranking eighth among our comparator countries. The number of per-capita 4G mobile connections (defined as tariffs with 4G data being used on a 4G-enabled device) increased in all of our comparator countries in 2016. In the UK, there were 69 4G connections per 100 people at the end of the year, the eighth-highest number among our countries and an increase of 18 since 2015. South Korea ranked first among our comparator countries, with 92 4G connections per 100 people, while Nigeria was last, with 16. The Netherlands had the largest increase in per-capita 4G connections during the year, up by 34 connections to 78 per 100 people.

**Figure 42 4G mobile connections per 100 people: end 2016**

![Bar chart showing 4G mobile connections per 100 people for various countries, with South Korea at 92 and Nigeria at 16.]

**Source:** IHS Markit

**Notes:** Mobile broadband includes all data connections made on mobile handsets and using dedicated mobile data dongles and SIMs; all figures have been rounded to the nearest whole number.

The UK had the highest proportion of 4G mobile revenues among the EU5 countries. At 74%, the UK had the joint fifth highest (with Japan) percentage of revenue generated by 4G, out of the 19 comparator countries, and the highest of the EU5 countries. The factors contributing to this include the UK having the highest 4G availability, the highest proportion of 4G connections and the highest 4G data volumes among the EU5 countries.
Figure 43  4G as a proportion of total mobile revenue (%): 2016

Source: IHS Markit
Note: All figures have been rounded to the nearest whole percentage.

Monthly mobile data volume per person reached 1.7GB in the UK

In the UK, average mobile data volume per head increased by 40% to 1.7GB per month in 2016. This was the highest among the EU5 countries, and 4G data accounted for 90% of this. In the Communications Market Report 2017, we published findings from the Ofcom mobile research app which showed that among Android users with a 4G mobile handset and contract, 69% of application data sessions were over a wifi connection.

Overall, average mobile data volumes per person were highest in Sweden in 2016, at 5.7GB per month, in part due to the relatively high proportion of dedicated mobile broadband connections, early adoption of 4G services and bundled access to streaming media services like Spotify. Poland and Russia also ranked higher than the UK in terms of average mobile data (fifth and seventh respectively), probably due to their comparatively generous and low-cost mobile data plans.

114 In the Connected Nations 2017 report, we say that average data use per mobile connection was 1.9GB in June 2017, up from 1.3GB in June 2016. See https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2017.
Satisfaction with the price of 4G services is comparatively high in the UK

In all our comparator countries, a higher proportion of respondents with 4G services were satisfied with their overall mobile service than they were with the price paid. At least eight in ten respondents said they were satisfied with their overall service in all countries except Sweden (72%), Japan (77%) and Italy (79%). In the UK, more than eight in ten respondents were satisfied with their overall service (87%), reliability of connection (82%) and speed of connection (81%), while more than seven in ten were satisfied with the price paid (76%).

Source: Ofcom consumer research, 2017

Base: All respondents who personally use ‘internet access on a mobile phone through a 4G mobile/cellular network connection’ either at home or elsewhere, UK=345, FRA=290, GER=256, ITA=436, USA=293, JPN=114, AUS=344, ESP=398, SWE=369
Q27 [Q4]. To what extent are you satisfied or dissatisfied with the following aspects of your mobile phone service?