UNLOCKING THE GIGABIT DIVIDEND

Using behavioural insights to accelerate FTTP take-up

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EXECUTIVE SUMMARY

Significant socioeconomic benefits are expected to accrue from the widespread availability of gigabit-capable fixed broadband networks in the UK, as broadband users migrate to these networks taking advantage of the advanced capabilities these networks offer. The rollout of gigabit-capable broadband in the UK is progressing rapidly, due to significant private investment supported by government investment in harder to reach areas.

However, it cannot be taken for granted that existing broadband users will promptly and completely migrate to gigabit-capable networks. Based on observed customer behaviour, this report highlights a number of barriers which combine to slow and limit the extent of consumer migration to FTTP networks, which will form the majority of gigabit-capable connections. We also estimate the extent of the gigabit-capable take-up gap: our forecasts suggest that between a sixth and a third of consumers will remain on legacy broadband connections in 2030, even though gigabit-capable connections will be available.

A number of previous reports have discussed the 'rational' barriers consumers face in migrating to FTTP, such as unwillingness to pay a premium for FTTP services or difficulties in physically installing FTTP in homes. We supplement this existing work by showing the importance of 'behavioural' barriers. We expect that if 'rational' barriers are removed, but 'behavioural' barriers are not mitigated, then a significant proportion of customers will not migrate to FTTP. The existence of behavioural barriers will slow down and limit FTTP migration but these can be mitigated by co-ordinated industry, regulatory and government intervention.

We identify four main 'behavioural' barriers:

- **Migration does not create a 'feel good factor'.** Many consumers perceive the short-term benefit of FTTP migration to be low. This is because consumers find it difficult to assess quality for a service they have not experienced and, in general, consumers do not pay attention to broadband quality when it is sufficient for their need and is reliable. In addition, customers migrating from FTTC to FTTP will quickly acclimatise to the improved service, and quickly forget how using FTTC 'felt'. This means there will be a limited psychological 'reward' from FTTP migration, either in anticipation of migration or after migration.

- **Consumers avoid risking what they have.** Many consumers depend highly on their broadband for both work and pleasure. Consumers whose current broadband service is reliable may fear migrating to FTTP because of a perceived risk of an outage or deterioration in service. Loss aversion is a well documented behavioural trait and creates a bias towards conservative options.

- **Consumers avoid thinking about migration.** To minimise effort and to conserve (cognitive) energy, consumers are attracted to 'easy' choices when making a decision, even though this may be at the expense of making complicated but ultimately 'welfare enhancing' choices. The easy or default choice for broadband consumers is to not think about migrating to FTTP, so many will avoid even contemplating migrating to FTTP.

- **Consumers don't see others migrating.** Consumers will look to what others are doing to inform their decision making. It may not be obvious to consumers who else has migrated to

FTTP, and whether that migration was a positive experience. There will be limited 'social proof' that migrating is a good decision.

These behavioural barriers will need to be mitigated to ensure FTTP migration happens as speedily as possible. The risk of a drawn out migration is clear: even now a significant proportion of consumers remain on outdated ADSL connections where FTTC is available and in many cases is cheaper, and European countries with more extensive FTTP rollouts are also experiencing a short fall in FTTP take-up. Slow FTTP migration will cause the UK to miss out on a valuable opportunity to boost productivity, grow the workforce, deliver more 'digitally native' public services, reduce greenhouse gas emissions and to increase digital inclusion. Slow migration may also reduce the future pace and extent of FTTP rollout by undermining the business case for investment.

This report concludes by proposing interventions that could mitigate the barriers we identify. These proposed interventions:

- Increase the psychological reward to FTTP migration. Community based FTTP migration competitions and rewards could incentive adoption, as could a FTTP employee benefit scheme (similar to the cycle to work scheme).

- Reduce any misplaced concerns consumers have about migrating to FTTP. Emphasising the superior reliability of FTTP (relative to FTTC) and communicating local copper switch off dates and could tilt the balance by making sticking with ADSL/FTTC appear riskier than migrating to FTTP.

- Make it easier for all customer to migrate to FTTP, in particular specific customer groups where barriers to migration are particularly high. This could be achieved by providing social tariffs on FTTP by default, and giving renters 'deemed consent' to install FTTP in their rented property.

- Raise the profile of FTTP migration by direct and indirect means. A credible information campaign that highlights the private and public benefits of FTTP could give FTTP positive social proof. Including whether a property has gigabit capable broadband on property listings could also spark greater awareness and appreciation of the broadband technologies of the future.

The interventions proposed are intended to spark future conversation about next steps for stakeholders, and will need further refinement and scrutiny. Given the time that any interventions need to be implemented and to take effect, there is a need for the full range of stakeholders (industry, Government and Ofcom) to now act in concert to ensure the success in gigabit rollout translates into a successful gigabit migration.

1   INTRODUCTION

1.1   GOVERNMENT AND INDUSTRY EFFORTS HAVE ACCELERATED THE ROLLOUT OF GIGABIT BROADBAND

The rollout of broadband networks capable of delivering gigabit speeds is part of the Government's National Infrastructure Strategy. Informed by the forecast socioeconomic benefits of gigabit-capable broadband, the Government has set two gigabit coverage targets: 85% of UK premises should have access to gigabit-capable broadband by 2025,[1] and there should be nationwide coverage of gigabit-capable broadband by 2030.[2]

As the regulator for the sector, Ofcom's objectives align with the government's targets. Ofcom's strategic priorities include supporting investment in (competing) gigabit networks,[3] and its latest package of fixed telecoms regulation is "designed to promote competition and investment in gigabit-capable networks".[4]

Rolling out gigabit technology is a large investment for the UK economy. The National Infrastructure Commission estimated that rolling out a nationwide FTTP network requires an investment of around £30 billion over 30 years.[5]

Box 1: Gigabit capable terminology

The Government's two national broadband targets are based on households having access to "gigabit-capable broadband".

Gigabit-capable broadband means a household would have a broadband connection that is able to access download speeds of at least 1 gigabit-per-second (1 Gbps or 1000 megabits per second). What download speed the household uses will be based on the individual contract they have, but this connection would allow them to have the choice of a connection of at least 1 Gbps if they wanted it.[6]

Gigabit-capable broadband can be delivered by a range of technologies, including full-fibre connections (where the fibre cable runs all the way to an individual house) and high-speed cable broadband.

As full-fibre (also known as Fibre To The Premises or FTTP) is the predominant gigabit-capable broadband we focus on this and this terminology in the report.

Despite the scale of the investment required, and the technical complexity, the UK is on track to meet the Government's rollout targets. The Openreach division of BT is planning to invest £15 billion

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[1] HM Treasury, *National Infrastructure Strategy*, November 2022, p. 31.

[2] 'Nationwide' means 99% coverage of UK premises. DLUHC, Levelling Up the United Kingdom White Paper, February 2022, p. 215.

[3] Ofcom, *Ofcom's plan of work 2022/23*, 2022, p. 34.

[4] Ofcom, *Promoting competition and investment in fibre networks: Wholesale Fixed Telecoms Market Review 2021-26*, 2021, p. 1.

[5] National Infrastructure Commission, *National Infrastructure Assessment*, July 2018, p. 21.

[6] House of Commons Library, *Gigabit-broadband in the UK: Government targets and policy*, February 2022, p. 9

to rollout FTTP (Fibre To The Premises, the predominant gigabit-capable broadband technology) to 25 million UK premises by 2026, and has the 'ambition' to rollout FTTP to all commercially viable premises by 2030.[7] Numerous other companies are investing in FTTP networks, for example CityFibre, the largest of the 'AltNets', plans to invest £4 billion to rollout gigabit broadband to 8 million UK homes by 2025.[8]

These investments are translating into rapidly expanding gigabit-capable coverage. Openreach and AltNets are rolling out FTTP at a rapid pace. Openreach's rollout currently has an annualised run rate of 3 million homes per year (almost double the rate two years earlier).[9] CityFibre's network now covers 1.5 million premises. Virgin Media O2 – the operator of the UK's second largest broadband network – has upgraded its cable based broadband network to be gigabit-capable and has announced an ambition to rollout FTTP to a further 7 million homes.

The UK taxpayer is also investing in gigabit rollout through government partnership with the private sector. The UK government estimates that rolling out gigabit-capable broadband is not commercially viable for 20% of UK premises. The £5 billion 'Project Gigabit' scheme will subsidise rollout in this 'final 20%'.

Private sector investment that translates into tangible engineering progress, combined with UK government support, means the UK appears to be on track to achieve near 100% gigabit-capable coverage.[10]

The undoubted success of the policy to encourage rollout might give the impression that the UK is on track to reap the benefits from this (private and public) investment. After all, the rollout targets have been set in expectation of significant benefits to the economy and society at large. However, there is a necessary second step – beyond rollout – that must be made before the country can reap any benefit from gigabit-capable broadband. Broadband subscribers must fully migrate to gigabit-capable networks for the benefits of the investment in networks to be completely realised as legacy networks can be retired at this point, bringing benefits in terms of reduced costs.

The rollout of gigabit-capable broadband has so far been the result of both FTTP investment and upgrades to the existing cable network.[11] However, the remainder of this report focuses on migration from copper to FTTP, as future migration to gigabit-capable broadband will primarily be a result of copper to FTTP migrations.[12]

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[7] BT, https://newsroom.bt.com/bt-to-increase-and-accelerate-fttp-build-to-25m-premises-by-the-end-of-2026/, Accessed 27 May 2022.

[8] CityFibre, https://cityfibre.com/about-us/rollout, Accessed 30 May 2022.

[9] ISP Review, https://www.ispreview.co.uk/index.php/2022/05/bt-results-see-fttp-broadband-surge-to-7-2million-uk-premises.html, Accessed 27 May 2022.

[10] Ultimately achieving the government's gigabit rollout targets depends on a range of factors including the successful delivery of the Project Gigabit programme; workforce availability and reforms to the process to agreeing wayleaves among other dependencies.

[11] Virgin Media 02's fixed broadband network is capable of gigabit speeds as it has been upgraded to support the DOCSIS 3.1 standard providing existing subscribers with access to a gigabit-capable network (https://news.virginmediao2.co.uk/virgin-media-o2-completes-gigabit-upgrade-in-boost-for-britains-broadband-target/ Accessed 23 May 2022)

[12] The majority of fixed broadband services are currently delivered over BT Openreach's copper network (ADSL and VDSL) and the majority of gigabit-capable connections are expected to be delivered over FTTP as Virgin Media O2's cable network has limited coverage and Virgin Media 02 also plans to overbuild its cable network with a FTTP network (https://news.virginmediao2.co.uk/virgin-media-o2-bolsters-future-network-with-fibre-upgrade-plan/ Accessed 23 May 2022.)

1.2   FTTP ROLLOUT IS COSTLY, BUT THE BENEFITS COME FROM FTTP TAKE-UP

The initial policy focus on investment in FTTP networks reflects the fact that rolling out FTTP networks is both costly and time consuming. However, rollout is a necessary but not sufficient condition for the long term benefits of Gigabit networks to be delivered. Rather, FTTP rollout makes FTTP usage possible, and it is this usage that offers a mix of significant long-term economic and societal benefits.

FTTP brings users improvements across a range of dimensions of service quality compared with legacy broadband. End users will benefit from broadband connections that have greater bandwidth ('faster speeds') and are more reliable, both in terms of consistency of experience and also significantly reduced outages due to network faults. This will improve the experience of end users, but can also be expected to translate into wider economic benefits.

Research commissioned by Ofcom found clear evidence of a significant relationship between broadband speeds and economic growth.[13] In particular, the UK economy is estimated to have grown by an additional 6.7% (between 2002 and 2016) as a result of improvements in broadband speeds. In addition, forward-looking research into the possible impact of FTTP migration finds there are likely to be significant productivity improvements. Research carried out by CEBR, commissioned by Openreach, finds that a nationwide rollout of (and migration to) FTTP broadband will boost UK GVA by £59 billion by 2025.[14] Nationwide FTTP migration is expected to improve productivity due to a combination of: time savings; greater scope for innovation; and increased competition among businesses.

FTTP migration could also provide a benefit to wider society through an expansion of the workforce. The pandemic has created more opportunities to work from home, and high speed, reliable FTTP broadband could bring an additional one million people back into the workforce.[15]

Beyond economic impacts, there are also environmental benefits from migration to FTTP. FTTP broadband networks are more energy efficient than copper broadband networks. Academic research has found that greenhouse gas emissions are 87% lower on FTTP broadband access networks compared to the FTTC equivalent (per Gbit of data transferred).[16] Full FTTP migration could also support two million workers to transition to working from home, which is estimated to reduced CO_2 emissions by 700,000 tonnes.[17]

Mass adoption of FTTP broadband will create further scope for public services to be provided digitally, and thus more effectively. For example, the mass adoption of reliable, high-speed broadband create ideal conditions for innovation in telehealth, remote symptom monitoring and remote specialist consultations. To the extent that virtual and augmented reality experiences are

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[13] Ofcom, *The economic impact of broadband: evidence from OECD countries*, April 2018.

[14] Openreach, *Full fibre broadband: A platform for growth*, October 2019.

[15] Openreach, *Ultrafast full fibre broadband: a platform for growth*, April 2021.

[16] Aleksix, S and A. Lovric (2014), *Energy Consumption and Environment Implications of Wired Access Networks*, American Journal of Engineering and Applied Sciences.

[17] Openreach, *Ultrafast full fibre broadband: a platform for growth*, April 2021, p. 29.

applied in the education sector, FTTP migration will allow households to benefit from these rich digital experiences.

These 'wider society' impacts will be accompanied by benefits specific to infrastructure providers, Internet Service Providers (ISPs), and the UK government. Returns on FTTP investment are a function of take-up and so rapid full FTTP migration will improve the returns on investment, allowing providers to recoup their investment more rapidly. Faster migration in 'Project Gigabit' areas will also reduce the cost to the tax payer through the 'claw back' mechanism[18]. Openreach and ISPs which use the Openreach copper network will additionally benefit from significant fixed cost savings once the process of decommissioning the copper network can begin and the supporting assets can be retired. Retailers will also benefit from the reduced fault rate on FTTP connections, which will reduce the cost of serving customers and increase customer satisfaction.

There is also a 'positive feedback loop' between speed of rollout and speed of migration. The more quickly FTTP migration happens, the lower the uncertainty over returns on FTTP rollout and the greater the business case for maintaining or accelerating FTTP rollout plans. In short, faster migration implies faster rollout, which in turn may lead to even faster migration (and the associated benefits).

The benefits from FTTP take-up will be realised if residential consumers and other broadband users (e.g. small businesses) migrate to FTTP. As the largest, and perhaps most diverse, group of end-users, this report focuses on residential consumer migration. However, there are also migration challenges common to broadband network users more generally and some specific use cases currently reliant on specific characteristics of the copper network.[19] These will also need to be addressed in order to achieve full FTTP migration.

1.3   WITHOUT CO-ORDINATED ACTION, FTTP TAKE-UP WILL FALL SHORT OF FTTP COVERAGE

A wide set of stakeholders are set to benefit from full migration to FTTP, with some stakeholders (infrastructure providers, ISPs, and society at large) set to experience the most significant immediate benefits. However, control over when, or even if, full FTTP migration happens rests primarily with consumers. Currently, individual consumers must *choose* to migrate to FTTP rather than stick with their current copper based connection.

Consumers can, to an extent, be 'nudged' or encouraged to make an active choice to migrate to FTTP. Indeed ISPs are incentivised to migrate customers quickly and efficiently:

- Vertically integrated ISPs are directly incentivised to encourage their retail customers to migrate rapidly, as they will enjoy increased profits that can pay off their investment in FTTP.
- Infrastructure providers that offer wholesale access also have an incentive to encourage migration to their FTTP networks, and have structured commercial offers (such as

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[18] Building Digital UK, https://www.gov.uk/government/publications/project-gigabit-uk-subsidy-advice/gigabit-infrastructure-subsidy-scheme-gis-guidance-clawback, Accessed 23 May 2022.

[19] Some older intruder and telecare alarm systems only function with analogue landline connections (delivered over copper), and will not work with digital landline connections. Similarly, older emergency phone systems in lifts are not compatible with digital landline connections.

Openreach's Equinox offer) to ensure the retail ISPs who deliver service over their networks are incentivised to migrate customers to their FTTP networks.

While industry has strong incentives to migrate customers, consumers face substantial barriers – both practical and 'behavioural' – to migration. These barriers mean that a significant proportion of consumers cannot be easily persuaded to migrate.

In particular, consumers may perceive the benefits of migration to be relatively low in the short term as current broadband use cases (e.g. streaming video, gaming) can be delivered adequately over a FTTC connection with no appreciable increase in quality following migration to FTTP. On the other hand, as we will explain, consumers will perceive there to be material costs, inconveniences or risks associated with the act of migration. In other words, if consumers perceive the overall benefit to them (i.e. the 'private benefit') of migration as limited, this will limit the pace and extent of FTTP migration. Consumers will not consider the benefits to society at large from FTTP migration when deciding whether to migrate. FTTP migration will procced more slowly, and to a more limited extent, than is best for society at large.

Based on reasonable assumptions and FTTP rollout and migration rates achieved internationally, we forecast that under the status-quo there will be a gigabit-capable migration 'gap' of one sixth to one third by 2030. In other words, we forecast that these UK broadband subscribers will not use a gigabit-capable connection even though one is available (unless additional interventions are made).

While a slower FTTP migration will prevent the UK from enjoying the full extent of FTTP benefits, lower uptake also introduces its own costs. If migration is slow, then reduced revenues from FTTP and delay to cost savings from closing legacy networks could cause investors to slow down or scale back the investments they make in fibre networks, delaying FTTP rollout. The UK could fall further behind other countries and forfeit any claim to be a digital leader on the global stage. It would be a big, missed opportunity to boost productivity.

There is also a risk that slow FTTP migration will worsen the UK's digital divide. Three in ten people have very low digital engagement in the UK, meaning they are excluded from participating in, and benefiting from, the 'digital world'.[20] As the digital world expands to include new use cases that cannot be supported using copper connections, there is a risk that the digital divide will grow as some consumers remain on antiquated broadband technologies.

1.4 GOVERNMENT INTERVENTION IS NEEDED TO ENSURE EFFICIENT MIGRATION TO GIGABIT NETWORKS

As set out above, while consumers may perceive the short-term benefits to migration as relatively limited, there is a much broader and significant set of public benefits from swift progress towards complete migration, and substantial costs from slow/delayed migration.

The evidence we will present from other countries, as well as our review of the prevalence of behavioural barriers to migration, indicate there is a real risk of a migration gap.

The total public benefits of migration exceed the private benefits to consumers (the FTTP decision makers), which in turn exceed the *perceived* private benefits to consumers. This means the outturn level and pace of FTTP migration will be lower than the socially optimal level and pace of migration.

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[20] Good Things Foundation, *A Blueprint to Fix the Digital Divide*, 2021, p. 4.

This creates a strong case for government to pivot its focus from FTTP rollout to FTTP migration (while maintaining its pro-FTTP rollout policies). On this basis government, (and Ofcom) may have a role to intervene to further support and encourage consumer migration where industry efforts alone would not be effective.

This report, commissioned by TalkTalk in this context, explores these issues in more detail and is structured as follows:

- Section 2 sets out the barriers faced by consumers when it comes to gigabit migration.
- Section 3 forecasts the gap in take-up these barriers could translate into.
- Section 4 sets out initial recommendations for industry, Ofcom and government.

2 THE BARRIERS TO FTTP TAKE-UP HAVE BEEN UNDERESTIMATED

The extent and speed of migration to FTTP broadband mostly depends on the behaviour and decisions of consumers. To understand the barriers to swift and full FTTP migration, we need to consider all barriers that may prevent consumers from migrating to FTTP.

Previous reports in this area offer their own assessment of the relevant barriers. However, this section begins by explaining why, in our view, the extent and nature of the actual barriers faced by consumers has so far been underestimated.

2.1 EXISTING REPORTS ON FTTP MIGRATION FOCUS ON 'RATIONAL' BARRIERS

The Gigabit Take-up Advisory Group (GigaTAG) published its final report in June 2021, identifying barriers to and solutions for stimulating demand among consumers and businesses for gigabit-capable broadband.[21] The GigaTAG report follows earlier reports published by Which? and Ofcom.[22] A key input to these reports, which ultimately shaped their conclusions and findings, is evidence from consumer surveys.

In general, these reports tend to focus on 'rational' barriers which emerged from consumer responses to surveys. GigaTAG's final report identified the following three broad types of barriers:

- **Lack of awareness.** Consumers may be unaware of the existence of FTTP, or they may be unaware that FTTP broadband is available at their home. Some consumers will be aware that FTTP broadband 'exists', but they may not know how it differs to other types of broadband, partly because of confusion surrounding terminology.

- **Low willingness to pay**. Customers say that they do not want to pay more for FTTP, either because they do not recognise the superiority of the FTTP experience, do not want a superior broadband experience, or are not willing to pay more than they do for their current package.[23]

- **Practical barriers to migration**. For example, this includes the hassle involved with switching and installation. GigaTAG considers this group of barriers to be less important than the first two groups.

We recognise that these barriers are significant, and that addressing them will be an indispensable part of achieving rapid and full FTTP migration. For society at large, it is encouraging that work is already underway to address some of the barriers identified so far. As an example, Ofcom's intention to establish industry standards for terminology used in broadband marketing could help avoid consumer confusion and improve awareness of FTTP.

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[21] Gigabit Take-up Advisory Group, *Final* Report, June 2021.

[22] Ofcom, *Consumer engagement in fixed broadband*, September 2019; Which?, *Consumer attitudes towards gigabit-capable broadband*, December 2020; Which?, *Consumer barriers to adopting gigabit-capable broadband*, June 2021.

[23] The wider economic landscape may also influence decision making. At the time of writing, May 2022, inflation in the UK is running at once in a generation levels.

However, the diagnosis of these barriers is largely based on consumers' stated preferences in response to surveys. Consumer surveys clearly have some value, however, the results of consumer surveys should be interpreted with caution.

- Behavioural science tells us that it is unlikely that consumers will be able to accurately evaluate a product they have never experienced, in a market within which they engage infrequently. In essence, how can consumers know the value they place on FTTP broadband if they have not experienced it?

- The framing of a question can also be influential. If a consumer is directly asked how much more they are willing to pay for FTTP broadband, then why would they not indicate a very low price?

- Consumers may also use survey responses to rationalise decisions which were made 'unconsciously' or 'automatically', for example their current choice of broadband service. Psychologists generally accept there are two modes of thought: System 1 thinking is a near-instantaneous process; it happens automatically, intuitively, and with little effort. It's driven by instinct and our experiences. System 2 thinking is slower and requires more effort. It is conscious and logical.[24] By definition, consumers do not have access to their System 1 thought process. But consumers may still want to be helpful and 'explain' behaviour driven by System 1 thinking to researchers anyway.

While the 'rational' or 'conscious' barriers identified are important, a reliance on consumer surveys could lead to a blind spot. There are important 'behavioural' or 'unconscious' barriers at play, which consumer surveys will not uncover. We expect that behavioural barriers are substantial in the context of FTTP migration and warrant further discussion.

In the remainder of this section, we will:

- Outline how the context of FTTP migration differs from the previous migration from ADSL to FTTC, and explain how this will affect how consumers think about FTTP migration; and
- Discuss the behavioural barriers that consumers are likely to face when considering migration.

2.2 THE CONTEXT FOR FTTP MIGRATION IS DIFFERENT TO THE CONTEXT FOR FTTC MIGRATION

The migration from ADSL to FTTC provides an obvious benchmark to contextualise the challenges involved in achieving a swift migration from FTTC to FTTP. The ADSL to FTTC migration is still incomplete, for instance 27% of UK households are covered by a superfast capable broadband connection but continue to receive a standard broadband product.[25] Comparing the relative ease of migration will indicate whether migration to FTTP will tend to be faster or slower than the migration to FTTC.

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[24] The specific dichotomy between the two (System 1 and System 2) modes of thought is attributed to Daniel Kahneman, a psychologist and winner of the Nobel prize in Economic Sciences.

[25] Ofcom, *Connected Nations 2021*. The Ofcom report highlights that 96% of the UK can access a superfast connection (the majority of which are provided by FTTC connections), but only 69% of households use a superfast capable connection in September 2021, leaving 27% still receiving a standard broadband connection. Further information in Section 3.

There are four important qualitative differences between the migrations:

- **Perception of the "status quo" technology** – ADSL was the dominant technology from which consumers were migrating to FTTC. ADSL speeds were highly variable between households because the service quality deteriorated significantly as the distance between a premises and the local telephone exchange increased. This meant that, for a large group of customers, FTTC offered a step-change in user experience compared to their experience of ADSL, particularly for consumers that made use of the most demanding broadband use cases.

  FTTC is now the dominant technology. Unlike ADSL, FTTC provides a more consistent quality of service and largely works well to support the *current* needs of broadband consumers – as demonstrated even in the midst of the pandemic and lockdown restrictions. For instance, FTTC supports two-way video calls and 4K video streaming.[26] So, until the broadband use cases of the future are developed which FTTC would not be able to support, the speeds available with FTTC are adequate for many consumers.

  This means that many consumers will not be driven to migrate to FTTP simply in order to benefit from faster broadband speeds. Along with price, speed is among the most salient characteristics of broadband packages that consumers consider. The most immediate benefit from migrating to FTTP is an improvement in reliability which is largely a 'hygiene factor' (in other words, good reliability largely goes unnoticed, as do reliability improvements, whereas poor reliability is readily noticed).

- **Upgrade process** – The rollout of FTTC did not involve any changes in the connection into customers' homes. This meant that migrating from ADSL to FTTC only involved, from the consumer's perspective, a like-for-like router swap which could be done by the customer. This was no different to the consumer experience of switching retail provider on the Openreach network, so the incremental inconvenience of migrating between technologies was no different to the inconvenience of switching between ISPs.[27] As FTTP involves replacing the connection in the customer's home, migrating to FTTP will require an engineer visit; physical work on the property, and a requirement to install (and provide power to) new terminating equipment.

- **Language** – The upgrade to FTTC was branded as a move to "fibre". Having already established FTTC as "fibre" in the minds of consumers, it makes it more difficult to "brand" the improvement which FTTP represents.

- **Impact on landline** – When consumers migrated from ADSL to FTTC there was no impact on the consumers' landline service. However, a requirement of moving to FTTP is that the household uses a digital landline connection rather than an analogue landline connection.[28] The impact of FTTP on a household's landline connection is a potential barrier for consumers who rely on their landline service. It is also a barrier for consumers who use third-party devices (such as older intruder alarm systems) that only work with analogue landline connections.

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[26] Microsoft Teams minimum requirements: https://docs.microsoft.com/en-us/microsoftteams/prepare-network , Netflix minimum requirements: https://help.netflix.com/en/node/306 (Both accessed 30 May 2022)

[27] With the exception for switches between Virgin Media and ISPs on the Openreach network.

[28] The analogue landline network will eventually be turned off across the country. As such, migrating to FTTP merely brings forward the impact of the transition to digital landline services.

These factors collectively mean that 'behavioural' barriers are likely to be a more significant impediment to FTTP migration than they were to FTTC migration. In short, these factors mean that migrating to FTTP, compared to migrating to FTTC:

- offers a smaller immediate 'reward' to the consumer;
- creates a perceived risk of losing an adequate or acceptable broadband service; and
- requires more effort on the part of the consumer.

The prominent role we expect behavioural barriers to play in slowing down FTTP migration makes the case for further immediate action to stimulate FTTP take-up. Otherwise, the speed and extent of FTTP migration is likely to be slower than was the case for FTTC migration, even though the investment in FTTP is an order of magnitude greater than the investment in FTTC. As we will show in Section 3, we forecast that there is likely to be a significant gap between FTTP rollout and migration without intervention.

2.3   "BEHAVIOURAL" BARRIERS HAVE RECEIVED LESS EXPLICIT CONSIDERATION

As discussed in Section 2.1, earlier reports on the barriers to FTTP migration tend to focus on "rational" barriers, with less discussion of "behavioural" barriers. But a large part of consumers' decision making is not based on rational thought. Instead, unconscious thought drives much of our behaviour, and we generally act according to certain 'traits' or rules of thumb. In an evolutionary context, these are an essential means to conserve effort and energy. So, an absence of diagnosis of these barriers could create a significant blind-spot for industry and government.

In the context of engagement in the broadband market, consumers are unlikely to accurately describe the true process that drives their own behaviour and decision making. Consumer can rationalise their choices after the fact, or in surveys and research settings. However, *ex-post* rationalisation does not truly describe the thought process consumers follow.

Broadband is a complex, technical product, and consumers do not need to be (and are not) actively engaged in the market on a regular basis. That is, consumers only need to make irregular decisions about broadband. Even the most engaged consumers are likely to only evaluate their broadband service towards the end of their existing contract, which may be once every two years. Behavioural barriers are likely to play a significant role in shaping consumer decision making in the broadband market. Indeed, Ofcom acknowledges these general behavioural barriers to switching in this market[29].

Behavioural traits and 'unconscious' decision making affects all markets, but to emphasise why 'unconscious' decision making is *particularly prominent* in markets such as broadband, consider the difference to the grocery market. Consumers purchase groceries very frequently. Repeated interactions, the fact that groceries are consumed shortly after purchase, and the fact that supermarkets stock 'Brand X' next to 'Brand Y', allow consumers to figure out which products they enjoy the most. It is far harder for consumers to objectively evaluate which broadband package they prefer the most, this complexity creates even more scope for consumers to rely on 'unconscious' decision making.

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[29] Ofcom, *Consumer engagement in fixed broadband*, September 2019.

As we will explain, the behavioural traits at play in the context of FTTP migration point towards consumers having a tendency to stick with the status quo, e.g. their FTTC connections, and in some cases their ADSL connections.

2.3.1 THESE BARRIERS AFFECT A BROAD SET OF CUSTOMERS

Forecasts of product take-up typically consider three types of consumer:

- "Early adopters" – those who are most open to new technologies, and may switch with little or no encouragement.
- "Followers" – those who are only likely to switch once the technology is tried and tested. This group is the largest.
- "Reticent" consumers – those who are the last and least likely to switch. This group is reluctant to leave their current product, even if others have already done so.

However, the behavioural barriers identified in this section affect all consumer groups. The extent to which particular groups are affected by particular behavioural traits will vary depending on their circumstances.

The size and shape of these groups could be quite different to the FTTC migration. The reticent group may be larger for FTTP as it could include both 'traditionally' less-engaged customers as well as:

- Single/small households with few devices (who do not foresee a need for faster broadband speeds);
- Renters (who need landlord permission for installation); and
- Groups with limited time/attention (which could be vulnerable groups but also more affluent consumers who are time poor).

Many consumers may fall into the reticent category, meaning many consumers may only migrate if: interventions support or encourage them to do so, or, in the extreme, if they are forced to migrate by removal of their existing service (potentially causing harm). ISPs will have to invest significant amounts to encourage migration to FTTP and will need to be creative in inducing consumers to switch. This is because, given the influence of behavioural barriers, straightforward informational and engagement-based remedies alone may not be sufficient for these customers to switch.

> **Box 2: Our use of the term "vulnerability"**
>
> Government, and other stakeholders, will want to ensure vulnerable customers do not become digitally excluded by avoiding FTTP. We address this group where relevant in this report. "Vulnerability" is a broad term which applies to a range of circumstances. While different definitions are used, Ofcom considers that vulnerability may reflect:
>
> > "*physical or mental health problems, specific characteristics such as age or literacy skills, or changes in personal circumstances such as bereavement, job loss or changes in household income.*"[30]
>
> This list is not exhaustive. We use 'vulnerable' to refer to consumers for whom engagement is likely to be more difficult. We refer to specific groups of vulnerable customers where relevant. These are intended to highlight specific groups which may be affected, but they are not comprehensive and do not imply that other groups will not face the same problems.

2.3.2 WE SUGGEST FOUR SPECIFIC BEHAVIOURAL TRAITS THAT ARE LIKELY TO BE AT PLAY

To diagnose which behavioural traits are likely to influence consumers' decision making, we reviewed numerous sources, including:

- Qualitative customer research;
- the customer journeys for those migrating to FTTP today;
- Behavioural data on take-up rates of FTTP products; and
- the wider behavioural literature around behavioural drivers of decision making.

This section discusses four key behavioural barriers to migration (shown in Figure 1 below). These are neither mutually exclusive nor exhaustive, and are likely to interact with and reinforce each other. They will also affect different consumer groups to varying degrees, although all consumers are likely to be affected by each barrier to some extent.

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[30] Ofcom, *Treating vulnerable customers fairly*, July 2020.

FIGURE 1   BEHAVIOURAL TRAITS THAT INFLUENCE FTTP MIGRATION

2.3.3   REWARD

From a 'rational' perspective, consumers will buy a product if the private economic benefit outweighs the economic costs. However, in reality, psychological rewards can be particularly important, meaning consumers are more likely to favour choices which lead to the release of "feel good" hormones (even though those options may not include the optimal option in a strictly economic sense). Equally, customers are likely to lack motivation to act in the absence of such reward.

People also tend to prioritise short-term rewards, which may come at the expense of gains in the long run. That focus on the present can tilt marginal decisions towards the status quo (do nothing).

Consumers may treat broadband as a 'hygiene factor'. That is, fast and reliable broadband may go largely unnoticed, while slow or unreliable broadband is likely to trigger negative emotions. In essence, good broadband is 'taken for granted' and there may be a limited psychological reward from moving to superior broadband. Without this reward, there is little incentive for customers to move away from their current broadband service.

Any reward that is associated with switching to better broadband is also likely to be delayed. There is a delay between purchase and installation. Many consumers may not immediately detect faster speeds in their day to day usage, and the full set of reliability benefits only become clear over time. The reliability benefits of FTTP include actual speeds being closer to the quoted speeds; speeds being more consistent over time, and fewer instances of line faults. It is difficult for consumers to synthesise these specific reliability improvements into an overall perception of improved reliability. These factors diminish the anticipation of reward during the decision-making process.

We consider consumers' perception of the reward to FTTP migration to be a key factor, to the extent that other barriers would become much less prohibitive if the perceived reward were high. (For

example, the hassle of having a satellite dish installed is for many consumers outweighed by the reward associated with being able to watch a wider range of TV channels.)

2.3.4 LOSS AVERSION

Loss aversion is a well-known behavioural phenomenon. It means a potential loss is likely to have a bigger impact on decision makers' choices than an equivalent gain. For consumers, the possibility of losing what they already have can loom large in decision making, even if this is at the expense of overall gains (or psychological reward). Even relatively small 'losses' can be influential in decision making. Where risks or potential losses are (perceived to be) present, a greater reward may will need to be available to elicit a switch decision.

The importance of loss aversion is well-documented. Regulators and Government increasingly consider the impact of loss aversion when studying markets and designing interventions. For example, the Current Account Switching Service offers a guarantee that customers will not suffer financially if anything goes wrong during a switch. This guarantee mitigates consumers' fear of any downside to switching current account provider. Ofcom also links loss aversion to consumer engagement patterns in the broadband market.[31]

Loss aversion is closely linked to reward. Loss aversion is less likely to be a barrier if the promise of reward is strong enough.

Consumers who migrate to FTTP have existing broadband connections. Consumers may perceive there to be a risk that migration could lead to a deterioration in service quality such as losing connectivity for a sustained period during the migration or the new service not working, even if this is objectively a remote possibility. Any such perceptions has the potential to deter consumers from migrating. For some consumers who are highly dependent on their broadband (e.g. consumers who work from home), this will be especially salient.

Beyond the possibility of service deterioration, other perceived risks exist for consumers, including, for example, damage to property during installation or needing to spend a lot of time interacting with the ISP. Unknown risks are particularly significant as consumers will struggle to quantify them, and they are likely to be present in a market in which many consumers feel they have poor understanding. In any case, given that the perceived reward of migrating to FTTP may be small, even small risks or losses may not be worthwhile in the mind of the consumer.

In short, there is a strong 'pull' for consumers to avoid migration (i.e. not to act at all): "If it isn't broke, don't fix it."

2.3.5 SOCIAL PROOF

Social proof refers to how behaviour can be driven by (people's perception of) what others are doing. Copying others' actions and decisions may be seen as a 'safe' or 'obvious' choice, or people may have a desire to 'fit in' (unconsciously). Copying others is an easy 'shortcut' to avoid complex decision making, and social proof can have a big impact on behaviour.

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[31] See, for example: Ofcom, *Consumer engagement in fixed broadband*, September 2019.

An example of social proof in action comes from research by the Government's Behavioural Insights Team. They trialled letters designed to encourage late taxpayers to settle their debt. Recipients of letters that included a message about low rates of late payments in the local area were more likely to engage with HMRC. This intervention was able to induce the intended behaviour by emphasising that similar (i.e. local) people were following the intended behaviour.[32]

FTTP is a relatively new technology, so there is limited social proof. Consumers may not be aware of others who have migrated, making them less likely to switch themselves. Moreover, due to loss/risk aversion, negative social proof is likely to have a stronger impact than positive social proof, and bad experiences (e.g. installation complications) may be shared more widely than good experiences.

Social proof will be a more significant barrier among consumers who are less likely to know people who have migrated to FTTP. For example, we anticipate that elderly households or low income households may be less likely to have peers with FTTP.

The impact of this lack of social proof is likely to be exacerbated by the lack of reward. That is, in the absence of strong rewards, customers may be particularly likely to look to others for evidence that switching is the right thing to do.

2.3.6   EASE

Processing decisions (in particular complex ones) requires cognitive effort and energy. Decision makers generally prefer to take the easiest choice available, even if this does not result in the most rewarding outcome. In other words, decision makers are inherently passive. When not actively making a choice is an option, consumers are disproportionately likely to stick with what they already have. This is called default bias; even if there are better products available, customers often prefer to stay with what they have.

England's transition from "opt-in" to "opt-out" organ donation is a clear example of default basis. Effective levels of consent increased from 38% to 97%. This is despite that opting-out (and formerly opting-in) both only required completing a simple (5 minute) online form.[33]

Choosing between different products and providers when migrating to FTTP requires more cognitive effort than remaining with one's current provider or service. There may also be practical hassle involved which may be off-putting. This includes, but is not limited to: entering into fixed-term contracts; organising an engineer visit, and requesting landlord permission for installation. Default bias implies consumers may be more likely than they otherwise would be to remain on their current package.

According to Which?[34], customers with a disability may be less likely to engage with their broadband provider owing to a lack of 'headspace' to consider the choices available to them. These customers may be particularly affected here. Renters also face the additional hurdle of having to obtain their

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[32] The Behavioural Insights Team was set up by Government in 2010 to apply behavioural insights to policy problems. The most successful message in the trial was '9 out of 10 people in [recipient's local area] have already paid their taxes.' (Cabinet Office, *Applying behavioural insights to reduce fraud, error and debt*, February 2012.)

[33] Frontier Economics based on NHS data, https://www.odt.nhs.uk/statistics-and-reports/annual-activity-report/

[34] Which? 2021, *Consumer barriers to adopting gigabit-capable broadband*

landlord's permission for installation (wayleave). Even relatively small challenges can have a significant impact on consumer choice in the context of the "ease" trait.

The effects of this trait are again compounded by the lack of reward involved with switching to FTTP. The easy option (do nothing) is particularly attractive when the alternative does not create a strong sense of reward.

2.4 THESE BARRIERS ARE LIKELY TO RESULT IN A TAKE-UP GAP, EVEN WITH COMPLETE COVERAGE

Full consumer migration to FTTP will not be easy to achieve. Based on an understanding of the context (with FTTC as the dominant technology) as well as the behavioural barriers to consumer adoption, it is clear that a large proportion of broadband consumers will not migrate in the business-as-usual scenario. Moreover, ISPs are already working hard to migrate customers, going as far as offering the upgrade to FTTP for free (with obvious commercial implications).

Despite industry efforts to increase migration, we forecast that a material share of customers will remain on a copper connection even though they could use FTTP. Our forecast is detailed in the following section.

Government, Ofcom and cross-industry intervention will be necessary to migrate "reticent" customers and to achieve complete FTTP migration (and the associated benefits). Reticent customers perceive the 'reward' from FTTP migration to be lower than other groups, and will be particularly influenced by the loss aversion trait. Minimising the influence of loss aversion and maximising the sense of reward for reticent customers will require a broad set of reinforcing interventions which the industry cannot deliver independently.
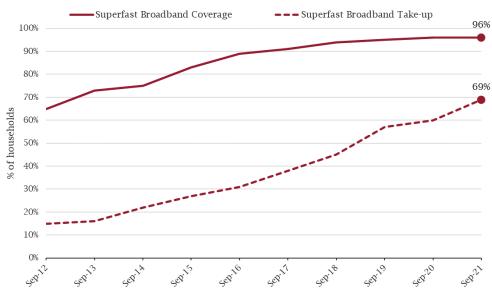
We will explain in more detail why government, Ofcom and industry action is likely to be necessary in Section 4.

3 FORECASTS INDICATE THAT ONE SIXTH TO ONE THIRD OF CONNECTIONS WILL STILL RELY ON COPPER IN 2030

The previous section explained that consumers are likely to face significant barriers in migrating to FTTP. This will reduce the speed and extent of FTTP migration.

There is already a significant FTTP take-up gap. 28% of UK premises are covered by FTTP (as of September 2021), but only one quarter of these premises have so far migrated to FTTP– the take-up gap is 75%.[35] Ofcom data also shows there is still a superfast broadband take-up gap of 27%, despite superfast coverage passing 90% in 2017. Figure 2 shows that while 96% of the UK can access a superfast connection (the majority of which are provided by FTTC connections), only 69% of households used a superfast capable connection in September 2021. Beyond the UK, evidence of material FTTP take-up gaps can be found in other countries with more advanced rollouts.

FIGURE 2 COMPARISON OF SUPERFAST BROADBAND COVERAGE AND TAKE-UP IN THE UK

Source: Ofcom, Connected Nations Reports

Note: Ofcom define a superfast broadband connection as any connection with a speed of at least 30 Mbit/s. Superfast broadband coverage is defined as the proportion of households who have a connection with a speed of at least 30 Mbit/s available to them. A superfast broadband connection can be provided by a range of technologies such as FTTC, FTTP and cable. Superfast connections are not possible on ADSL connections.

Our forecasts suggest that, under the status quo, the take-up gap between those covered by FTTP and those taking up FTTP services could range between one sixth and one third in 2030 (when FTTP coverage is expected to be 99% in line with the government's 2030 gigabit-capable coverage target).[36] Our forecasts are illustrative, and are not a precise predictor of future developments.

However, our forecasts have been informed by: the evidence of take-up gaps in other countries; our identification of the behavioural barriers to FTTP migration, and the UK's experience to date with FTTC and FTTP migration. When this evidence is considered in the round a clear argument emerges

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[35] Ofcom, Connection Nations 2021: UK report, p.24

[36] We follow this assumption to be consistent with the government target, and as the UK appears to be on track to achieve near 100% gigabit-capable coverage by 2030. Whether the target will be achieved depends on the successful delivery of the Project Gigabit programme; workforce availability and reforms to the process to agreeing wayleaves among other dependencies.

for the government, Ofcom and industry to discuss the case for intervention. If this does not happen, FTTP migration will be slower and more limited than ideal, and this would reduce how quickly and how much the UK can tap into the socioeconomic benefits of FTTP.

In this section we first present data on the FTTP take-up gap in other countries with more advanced FTTP rollouts. We then present our forecast of the future FTTP take-up gap in the UK in 2030.

3.1 TAKE-UP GAPS IN COUNTRIES WITH MORE ADVANCED FTTP ROLLOUTS INDICATES A TAKE-UP GAP IN THE UK IS LIKELY AND ACTION WILL BE NEEDED
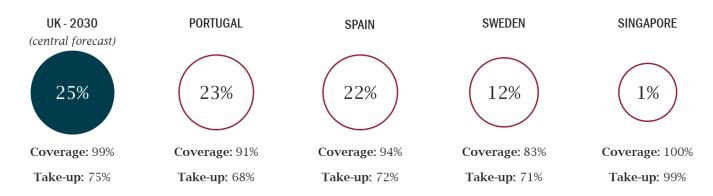
A number of European countries and jurisdictions further afield have rolled out gigabit-capable networks ahead of the UK and have also faced a take-up gap.

Gigabit-capable coverage currently exceeds 80% of households in each of Spain, Portugal and Sweden. The take-up gaps in these countries, in 2021, were 22%, 23% and 12% respectively. Their experiences illustrate what could happen in the UK in terms of a take-up gap, and also provide a useful reference for possible pro-migration interventions.

Each of these countries had more favourable conditions for FTTP migration than the UK. Consumers faced a more pressing need to migrate to FTTP as many were reliant on ADSL connections when FTTP was rolled out. These countries did not have widespread FTTC coverage as an intermediate solution, as is the case in the UK, so FTTP presented more of a step change in service than it represents in the UK. This means that the UK's FTTP migration challenge could be harder to overcome, and the take-up gap could be larger. Figure 3 highlights a comparison between the current gigabit take-up gaps in other countries with more advanced FTTP rollouts and our central forecast of the UK take-up gap in 2030.

Singapore's experience is also informative. Singapore rolled out FTTP early through the publicly funded Next Generation National Broadband Network and achieved 100% coverage in 2013. At that point, Singapore only had 36% FTTP take-up. Singapore now has a very small, almost negligible, take-up gap (1%). But the gap was only minimised after further intervention from government.

FIGURE 3   COMPARISON OF CURRENT GIGABIT TAKE-UP GAPS ACROSS COUNTRIES

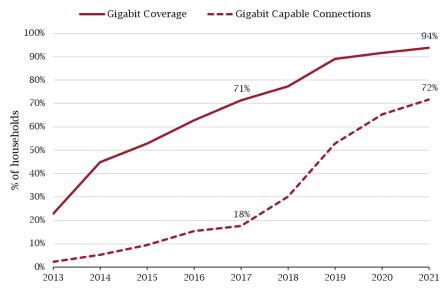| UK - 2030 (central forecast)	PORTUGAL	SPAIN	SWEDEN	SINGAPORE
25%	23%	22%	12%	1%
Coverage: 99%	Coverage: 91%	Coverage: 94%	Coverage: 83%	Coverage: 100%
Take-up: 75%	Take-up: 68%	Take-up: 72%	Take-up: 71%	Take-up: 99%

Source: European Commission Digital Scoreboard, Frontier forecasting

Note: Coverage = Gigabit network coverage which measures the percentage of households covered by either or both FTTP and Cable DOCSIS 3.1 technologies. Take-up = the percentage of households with an ultrafast broadband connection.

3.1.1 SPAIN

In Spain, 94% of households are covered by a gigabit connection, but only 72% have migrated to a gigabit-capable connection. Figure 4 shows that a sizable take-up gap has existed since the rollout of gigabit-capable networks began and continues to persist despite high coverage.

FIGURE 4 COMPARISON OF GIGABIT COVERAGE AND TAKE-UP IN SPAIN

Source: European Commission, Digital Scoreboard

Note: Gigabit Coverage = Gigabit network coverage which measures the percentage of households covered by either or both FTTP and Cable DOCSIS 3.1 technologies. Gigabit-capable connections = the percentage of households with an ultrafast broadband connection.

Before the start of the increase in gigabit coverage in 2013 and 2014, the broadband technology available to the majority of Spanish households was ADSL. Unlike in the UK, there was no significant FTTC roll-out in Spain and cable has only ever accounted for less than 20% of connections. The maximum download speed on ADSL connections is up to 24 Mbit/s (for premises near to the telephone exchange). As slow ADSL connections were the alternative that Spanish households faced to gigabit services, migration conditions in Spain were more favourable than they will be in the UK where the status quo is FTTC.

Government and regulatory initiatives in Spain focussed on encouraging infrastructure investment and competition, and increasing coverage throughout Spain (in particular in rural areas). This included no access regulation on FTTP networks and public funding for rural roll-out. There have been no specific interventions designed to stimulate take-up so far. Regulations were introduced by the national regulator, CNMC, concerning notice periods for the switch-off of copper exchanges. The proportion of users on an exchange that need to be using an alternative service, before the notice period can start, has been set at 25%. There is no national target for copper switch-off but Telefonica, who owns the copper infrastructure, is aiming to switch-off most copper exchanges by 2025.[37]
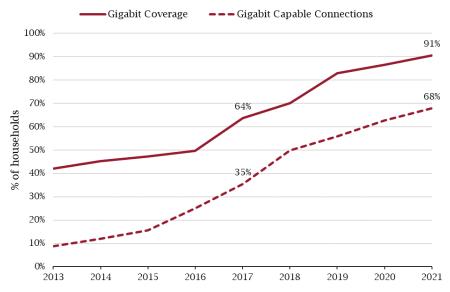
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[37] Telefónica, The gradual farewell to copper plants, December 2021

3.1.2 PORTUGAL

In Portugal, 91% of households are covered by a gigabit-capable connection, but only 68% of households are using such a connection. Figure 5 shows that a take-up gap has existed since gigabit rollout began, and – similar to in Spain – it persists despite high coverage.

FIGURE 5 COMPARISON OF GIGABIT COVERAGE AND TAKE-UP IN PORTUGAL

Source: European Commission, Digital Scoreboard

Note: Gigabit Coverage = Gigabit network coverage which measures the percentage of households covered by either or both FTTP and Cable DOCSIS 3.1 technologies. Gigabit-capable connections = the percentage of households with an ultrafast broadband connection.
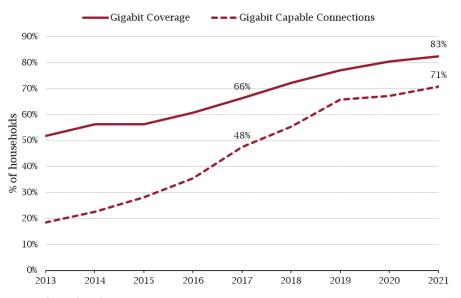
As was the case in Spain, there was no significant FTTC rollout in Portugal. The majority of customers were using ADSL connections before FTTP became available. Cable accounts for around 30% of connections, but operators have no plans to upgrade their cable networks to be gigabit-capable. As the non-FTTP option is in general less desirable in Portugal than in the UK, it is arguable that Portugal benefits from more favourable conditions for migration than is likely to be the case in the UK.

Government and regulatory initiatives in Portugal have focussed on encouraging infrastructure investment and competition and increasing coverage. No specific intervention has so far aimed to increase take-up. In addition, there are no formal plans for copper switch-off in Portugal, but Altice, the incumbent copper operator, has started a gradual process of copper switch-off which is led by customer migrations rather than the regulator (who has imposed long notice periods for switch-off at individual exchanges).

3.1.3 SWEDEN

In Sweden, 83% of households are covered by a gigabit connection, but only 71% use one. Figure 6 shows that a take-up gap has existed since gigabit rollout began, and it persists despite high coverage. The take-up gap is smaller than in Spain or Portugal.

FIGURE 6   COMPARISON OF GIGABIT COVERAGE AND TAKE-UP IN SWEDEN

Source: European Commission, Digital Scoreboard

Note: Gigabit Coverage = Gigabit network coverage which measures the percentage of households covered by either or both FTTP and Cable DOCSIS 3.1 technologies. Gigabit-capable connections = the percentage of households with an ultrafast broadband connection. .

Similar to the Spain and Portugal, there was no significant FTTC roll-out in Sweden. The majority of consumers used ADSL copper connections before FTTP was available. This context again creates more favourable migration conditions than is the case in the UK.
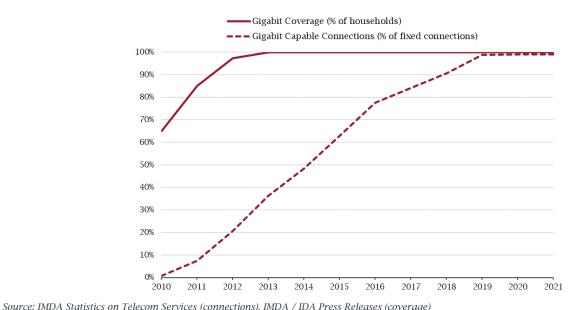
There has so far not been any specific intervention aimed at increasing take-up. The Swedish government's vision is for a "completely connected Sweden" where the entirety of Sweden has access to high-speed broadband.[38] However, the relatively small take-up gap in Sweden could be explained by their advanced copper switch-off programme. By September 2020, 54% of copper exchanges in Sweden had been switched off. This has mainly happened in rural areas where the incumbent operator, Telia, has focussed on switching consumers to fibre or wireless solutions. More copper switch-off progress has been made in rural areas as the alternative infrastructure (FTTP) in rural areas has mainly been rolled out by Telia. The copper switch-off has been driven by Telia's action and customer demand, rather than being mandated by the regulator.

3.1.4   SINGAPORE

Today Singapore has almost no take-up gap for gigabit services (see Figure 7). However, government intervention was necessary for Singapore to effectively close its take-up gap. When nationwide FTTP coverage was reached in 2013, only 36% of connections had migrated to a FTTP service.

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[38] Government Offices of Sweden, A Completely Connected Sweden by 2025 – a Broadband Strategy

FIGURE 7   COMPARISON OF GIGABIT COVERAGE AND TAKE-UP IN SINGAPORE

Source: IMDA Statistics on Telecom Services (connections), IMDA / IDA Press Releases (coverage)

Note: Gigabit Coverage = FTTP coverage. Gigabit-capable connections = the percentage of households with an optical fibre broadband subscription.

As was the case in Spain, Portugal and Sweden, the majority of customers used ADSL copper connections before FTTP was available. As such migration conditions were more favourable than they are in the UK. Nonetheless, the government introduced several initiatives to close the take-up gap:

- Singapore launched a "Most Fibred-Up Constituency Contest" to promote take-up of FTTP services through local competitions. Prizes were awarded between 2010 and 2012. The first wining constituency, from 2010, achieved 60% take-up against 65% FTTP coverage. The telecoms regulator organised the contest, as part of their public outreach effort to inform and promote the adoption of FTTP. The competition relied on grassroots leaders who engaged residents and explained the benefits of FTTP to drive take-up. The prize was $6,000 for use on IT equipment or a computer laboratory in the area.[39]

- The regulator also instructed the single fibre infrastructure provider to waive installation fees as long as households signed up to FTTP within six months of being passed by the infrastructure.

- Full copper switch-off occurred in 2018. This occurred when most customers had already migrated but did encourage the final migrations.

3.2   WE FORECAST THAT ONE SIXTH TO ONE THIRD OF CUSTOMERS COULD STILL BE ON THE COPPER NETWORK IN 2030

Turning to the UK, under current conditions, a significant proportion of broadband connections will still rely on the copper network in 2030. Figure 8 shows a comparison between:

- expected gigabit coverage (based on Ofcom reports and government targets); and
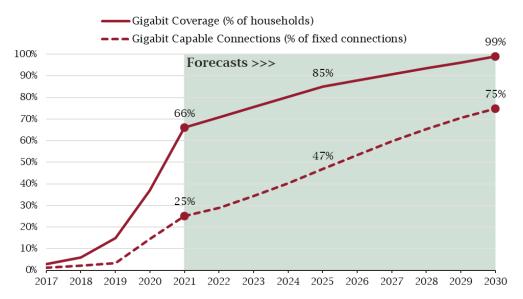
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[39] IMDA, Chua Chu Kang Top Next Gen NBN Fibred-Up Constituency for 2010, November 2010

■ expected take-up (based on Ofcom data and our forecasts).

Our central forecast is that, by 2030, there will be a take-up gap of 25%. However, the take-up gap may range between one sixth and one third under alternative assumptions. Our forecast assumes there is no further intervention to stimulate FTTP migration.

As is the case currently for Spain, Portugal and Sweden, and as was the case for Singapore, the data suggests take-up will lag behind coverage and there will be a persistent gap between the two.

FIGURE 8   COMPARISON OF GIGABIT COVERAGE AND TAKE-UP IN THE UK TO 2030

Source: Frontier analysis, Ofcom Communications Market Reports and Ofcom Telecommunications Market Data
Note: Gigabit Coverage = Coverage of gigabit-capable technology which includes FTTP and Cable DOCSIS 3.1, pre-2021 this is from Ofcom data, the forecasts for this value are just based on government gigabit coverage targets. Gigabit-capable Connections = percentage of fixed connections in the UK with FTTP or Cable based connections based on Ofcom data pre-2021 then our forecasts. The values are year end numbers.

Figure 9 shows the total number of fixed broadband connections over time by technology.[40] The figure illustrates that one sixth to one third of connections will use FTTC or ADSL technology in 2030.

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[40] Gigabit-capable connections would be those based on FTTP or cable (from 2021). ADSL and FTTC services are reliant on copper parts of the network.

FIGURE 9   UK FIXED BROADBAND CONNECTIONS BY TECHNOLOGY, 2005 TO 2030

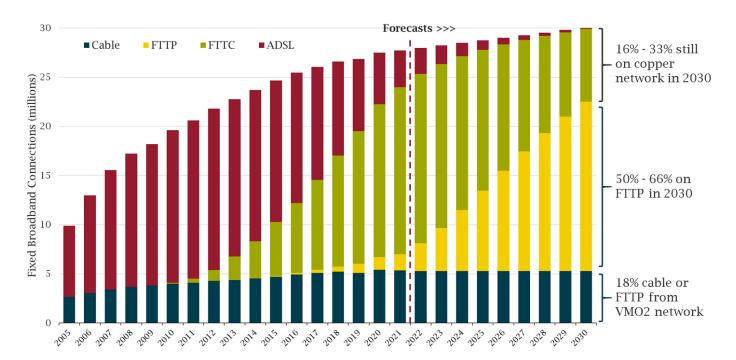*Source: Frontier analysis, Ofcom Communications Market Reports and Ofcom Telecommunications Market Data*

Note: The forecasts presented in this figure are based on the assumptions outlined in Annex B with an inflection point of FTTP take-up occurring at the start of 2026. The inflection point is where the rate of take-up of FTTP services starts to slow due to a shift from "early adopters" and "followers" taking up the service, to "followers" and "reticent" customers being to take it up. The percentage range for each technology in 2030 is based on the assumptions outlined below with the inflection point ranging from the start of 2024 to the start of 2027.

Our forecasts suggest that the UK will face a significant take-up gap in 2030. However, we consider our forecasts to be relatively conservative, and the actual take-up gap could be close to the higher end of our forecasted range (or even above it). This is because our forecast is informed by the experiences of the other countries we have considered. The circumstances in those countries were generally more supportive of FTTP migration.

These forecasts are instructive, and point out that, absent intervention, the UK could see a significant share of broadband consumers continuing to use the copper network in 2030. Policymakers should not assume the take-up gap will just disappear over time. This would limit the nation's ability to access the socioeconomic benefits of FTTP to the fullest extent. It would also create a significant risk of digital exclusion for those who do not migrate.

4 CLOSING THE TAKE-UP GAP REQUIRES INDUSTRY AND GOVERNMENT ACTION TO ADDRESS BARRIERS

Industry players are already actively encouraging customers to migrate to FTTP, and will continue making significant efforts to this end. For instance, Openreach's Equinox offer provides a strong commercial incentive for their wholesale customers to transition new and existing customers to FTTP. 'AltNets' are also supporting FTTP migration through competitive wholesale pricing and by maintaining high standards around FTTP installations.

However, despite the actions and commercial interests of ISPs and infrastructure providers, an FTTP take-up gap is likely under the status quo (as explained by the behavioural barriers we identify, and as indicated by the international evidence and forecasting presented). Industry-led interventions will go some way towards minimising the take-up gap, and will be particularly effective at encouraging the 'follower' consumer group to migrate. But interventions from the government and Ofcom will be necessary to help migrate the stickiest customers (the 'reticent' consumer group). Government and Ofcom interventions will extend the speed and extent of FTTP migration.

There is unlikely to be a single 'silver bullet' intervention that will accelerate FTTP migration. Encouraging full consumer migration to FTTP will require a number of parallel initiatives that reflect the full range of barriers to FTTP migration and the diversity of broadband consumers:
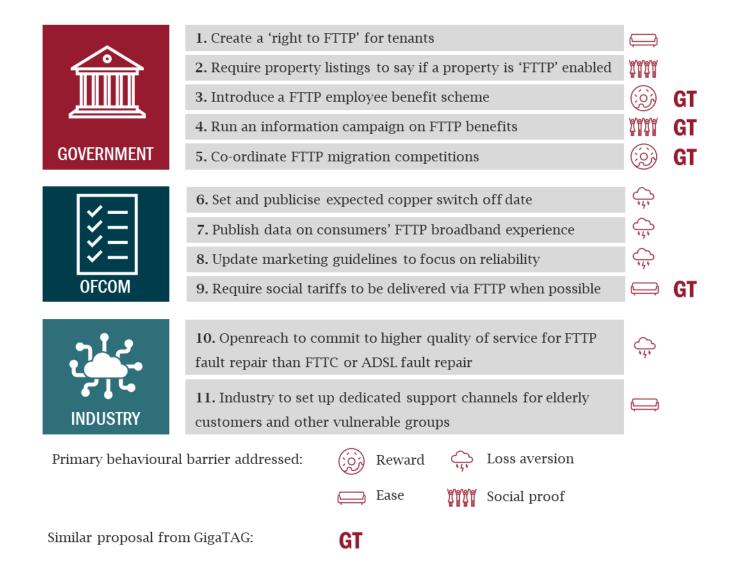
- Some interventions will address specific barriers to FTTP migration, whereas other interventions will potentially reduce several barriers at once. Indeed, when it comes to behavioural barriers, interventions will often necessarily address more than one barrier and can be mutually reinforcing.

- Some interventions will encourage migration generally across all customers, whereas other interventions may be targeted at particular sub-groups (such as renters, or customers that use social tariffs).

Previous reports, such as GigaTAG's final report, have provided some recommendations about how to incentivise FTTP migration. Previous recommendations have tended to focus on practical barriers. As this report emphasises the role of behavioural barriers as an impediment to swift and complete FTTP migration, this section:

- Suggests new possible interventions that have the potential to reduce practical and behavioural barriers to FTTP migration; and

- Discusses previously proposed interventions from a behavioural perspective.

We group the interventions according to the stakeholder who has the clearest ability to make the intervention a reality. Figure 10 below summarises the interventions that are discussed in this section. Our discussion of these interventions is designed to serve as a starting point for future debate. More work will be needed to refine these ideas, or to identify additional interventions.

FIGURE 10   POSSIBLE INTERVENTIONS TO STIMULATE FTTP MIGRATION

GOVERNMENT

1. Create a 'right to FTTP' for tenants
2. Require property listings to say if a property is 'FTTP' enabled
3. Introduce a FTTP employee benefit scheme   GT
4. Run an information campaign on FTTP benefits   GT
5. Co-ordinate FTTP migration competitions   GT

OFCOM

6. Set and publicise expected copper switch off date
7. Publish data on consumers' FTTP broadband experience
8. Update marketing guidelines to focus on reliability
9. Require social tariffs to be delivered via FTTP when possible   GT

INDUSTRY

10. Openreach to commit to higher quality of service for FTTP fault repair than FTTC or ADSL fault repair
11. Industry to set up dedicated support channels for elderly customers and other vulnerable groups

Primary behavioural barrier addressed:

Reward   Loss aversion

Ease   Social proof

Similar proposal from GigaTAG: GT

4.1   GOVERNMENT INTERVENTIONS SHOULD FOCUS ON AREAS BEYOND THE INDUSTRY'S REACH

The government is ideally placed to introduce several pro-FTTP migration interventions that neither the industry nor Ofcom can. The interventions that government can unlock address three of the behavioural barriers we have identified: reward, ease and social proof. We introduce five potential government or local-government led interventions:

Intervention 1: The government could create a 'right to FTTP' for tenants.

Tenants require permission from their landlords to carry out the necessary alterations to a property to install FTTP. Even when landlords would agree to authorise the works, the mere requirement that the tenant has to seek permission requires effort on behalf of the tenant, reducing the 'ease' of migrating to FTTP. This means some tenants will not migrate to FTTP even though their landlords would have granted their consent. The government could

legislate to allow tenants to assume that landlords have given 'deemed consent' to the installation of FTTP. This would shift the need to undertake effort from tenants to landlord. Landlords would need to make the effort of withdrawing assumed consent, rather than tenants needing to seek explicit consent. It is clear that neither the industry nor Ofcom can implement this intervention itself. We understand that the Telecommunications Infrastructure (Leasehold Property) Act 2021 and the Product Security and Telecommunications Infrastructure Bill partly addresses FTTP availability in blocks of flats. We consider that our proposal would extend on the provisions of the Act and the Bill.

Intervention 2: The government could require property listings to state whether a property is 'FTTP enabled'.

Listings for properties for rent and for sale could be required to state whether a property is passed by a FTTP network. As property listings generally outline the desirable characteristics of a property, disclosing whether a property is passed by an FTTP network will increase consumers' perceptions about how desirable FTTP is. This will help create positive social proof for FTTP.

A more ambitious version of this intervention is to require listings to state whether a property is connected to, rather than passed by, a FTTP network. Property owners would need to purchase a FTTP service to get their property connected which could then be transferred to the new occupiers. This version of the intervention might motivate property owners to take out an FTTP service if they are seeking to maximise their property's attractiveness on the market.

The government previously introduced a requirement for properties for sale to be marketed alongside their Energy Performance Certificate (EPC), so there is a precedent for an intervention of this nature. However, the burden caused to property owners from disclosing whether their property is 'FTTP enabled' will be minimal compared to the EPC. Again, while the industry can advocate for this intervention, it is unable to introduce it itself.

Intervention 3: The government could introduce an FTTP employee benefit scheme.

This could be similar to the popular 'Cycle to Work' scheme (wherein the 'out of pocket' cost of cycling equipment is reduced via the advantageous tax treatment of cycling equipment vouchers). Employers could offer FTTP vouchers to employees that allow them to make savings on the cost of FTTP broadband subscriptions.

GigaTAG recommended a scheme such as this (which it called 'broadband to work') as it would benefit both employers and employees (with both benefiting from productivity improvements, and employees accessing lower cost FTTP broadband). A further, behavioural, justification for an employee benefit scheme is that it would increase the sense of reward consumers feel when migrating to FTTP. Consumers are likely to perceive that they are enjoying a perk at their employer's expense, which increases the desirability of the FTTP proposition.

Intervention 4: The government could launch an information campaign led by a trusted authoritative figurehead that highlights the wider benefits to society of FTTP migration.

This intervention was proposed in GigaTAG's final report. The GigaTAG report emphasised the need to raise awareness around the benefits of FTTP. Taking steps to make consumers as informed as possible is clearly desirable, but an information campaign can also encourage FTTP migration by providing social proof.

For example, creating a creative, memorable national advertising campaign with a trusted, figurehead showing, for instance, Martin Lewis migrating to FTTP, would get people talking and spreading the message about FTTP. If the information campaign communicates the wider socioeconomic benefits of full FTTP, it could also foster a spirit of national effort to "upgrade the nation". This would in turn enhance the positive social connotations of subscribing to FTTP broadband.

The campaign should highlight both the private benefits to consumers of FTTP, but also the broader public benefits. To ensure the credibility of the campaign, the information should be presented by a third-party.

Intervention 5: Local government could play a co-ordinating role in FTTP migration competitions.

GigaTAG recommended that funding is provided to local government, so that local information campaigns and 'digital champions' can be established to advocate the case for gigabit migration. Our proposal goes one step further and would expand local campaigns to include some form of community reward for FTTP migration. By offering a reward, or creating the prospect of winning some reward, linked to FTTP migration, the perceived attractiveness of migrating to FTTP may increase among community minded consumers.

The scheme could be similar to the 'Computers for Schools' voucher scheme previously operated by Tesco. There is also an international precedent for using competitions to encourage FTTP migration. Singapore held a series of 'Most Fibre-Up Constituency Contests'. Constituencies that achieved the highest rates of FTTP migration received prize money 'for the purchase of IT hardware, software and/or services for their constituency's IT corner or computer laboratory'.

4.2 OFCOM CAN ALSO ACT TO SUPPORT FTTP MIGRATION

We have identified four interventions that Ofcom, as the market regulator, can unlock.

The first relates to 'copper switch off' – the decommissioning of Openreach's copper network. In a 2021 regulatory decision, Ofcom set out the process that would allow Openreach to turn off its copper network (telephone exchange by telephone exchange). Turning off the copper network will be a lengthy process and Openreach is required to pass a number of thresholds as it progresses from: ceasing to sell copper services to new customers; ceasing to sell regulated copper services to existing customers, and (finally) ceasing to sell copper services entirely.

Intervention 6: Ofcom could allow Openreach to set, and publicise, an <u>expected</u> copper switch off date.

This switch off date would need to be set at the telephone exchange level, and it would need to be made clear to consumers that legacy copper services will be withdrawn after this date. This intervention would primarily address the loss aversion barrier. If a switch off date is set and clearly communicated to the public, then it would communicate that copper broadband is a 'technology of the past' and a 'sinking ship'.

Consumers may fear migrating to FTTP because of a concern about the 'unknown'. If consumers are satisfied with their copper connection, consumers may fear swapping something that works for something that (they perceive) might not. Any trepidation about migrating to FTTP may be placated if it is clear to consumers that they are relying on an outdated technology. Setting a switch off date would also address the social proof barrier. It would become obvious to consumers that 'everyone else' will be using FTTP eventually, this would motivate consumers to migrate to FTTP to avoid being left behind. The UK public is familiar with staggered timetabling of "switch off" programmes. For instance, analogue terrestrial TV was switched off region-by-region between 2007 and 2012. Clear advanced communication of each region's switch off date ensured a smooth transition to digital terrestrial TV.

Intervention 7: Ofcom could publish data on consumers' experiences of FTTP broadband versus FTTC broadband.

In its role as a trusted, authority figure, Ofcom can lend credibility to claims about the enhanced reliability of FTTP. Ofcom could collect, and publish, data on the difference between actual and quoted speeds; consistency of speeds and line faults among FTTP and FTTC connections. Publishing this data may mitigate the loss aversion barrier, as it may reduce the perception of the 'riskiness' of FTTP migration among consumers.

Similarly, Ofcom could track and publish data on FTTP migration. This data could be broken down at local authority level. This would allow ISPs to refer to local FTTP migration rates in marketing materials. The promotion of the prevalence of FTTP locally should help generate positive social proof for FTTP.

Intervention 8: Ofcom could spearhead an update to industry marketing guidelines to ensure a greater emphasis on broadband reliability.

Loss aversion means that consumers tend to disproportionately focus on what they could lose, rather than what they could gain, when making a decision. As the speeds available on 'good' FTTC connections are sufficient for typical current broadband uses cases, there is an even greater likelihood consumers will worry about what they could lose from migrating to FTTP (an adequate broadband service). To address this issue, the marketing of broadband packages could place more emphasis on reliability. As FTTP connections are more reliable and offer more consistent performance than FTTC connections, staying with FTTC is a 'risker' option. FTTP migration will benefit by making the difference in reliability clearer to consumers.

This intervention would be most impactful if GigaTAG's recommendation of common terminology in the broadband market is adopted (i.e. consistent labelling of different broadband technologies). There is a role for industry to ensure standard terminology is presented to consumers; Ofgem has convened an industry working group to this end.

Intervention 9: Ofcom could require social tariffs to be delivered via FTTP wherever possible.

Many ISPs now offer 'social tariffs' – discounted broadband packages accessible to those receiving certain benefits. ISPs currently offer these tariffs on a voluntary basis. Low income households, or households otherwise facing affordability issues, would find it easier to migrate to FTTP broadband if the 'default' option is FTTP. FTTP could effectively become the default option, for low income households, if social tariffs are delivered over FTTP (or other gigabit-capable technologies) wherever possible by ISPs and network providers.

This proposal is similar to GigaTAG's recommendation that the government should consider 'a targeted voucher scheme, to help support those vulnerable consumers facing affordability issues'. The GigaTAG recommendation would address affordability concerns, however, it would not necessarily make migrating to FTTP easier. Consumers would need to seek out FTTP packages to redeem the vouchers. If social tariffs are delivered over FTTP, then low income households will not need to make an effort to identify the FTTP option.

4.3 IF CO-ORDINATION ISSUES CAN BE OVERCOME, THE INDUSTRY CAN TAKE THE LEAD ON SOME INTERVENTIONS

We have identified two interventions that the industry could deliver (beyond the actions that industry players are already undertaking).

Intervention 10: Openreach could commit to higher quality of service levels for FTTP fault repair than FTTC or ADSL fault repair, which ISPs could incorporate into retail offerings.

If consumers can expect potential broadband faults to be fixed more promptly on FTTP connections than on FTTC connections, then the relative attractiveness of FTTP packages will increase. This may be a particularly powerful intervention given the loss aversion barrier. As with the other interventions that target loss aversion, the objective of this proposal is to ensure a closer alignment between customer perceptions about the riskiness of staying with a copper connection rather than migrating to FTTP, with the actual difference in the stability of FTTP connections compared to copper connections.

Intervention 11: The industry could set up dedicated support channels for elderly customers and other vulnerable groups.

Similar to the telephone helpline provided by Digital UK during the Digital TV switchover, the industry could provide targeted support to those who will need additional help engaging with the market. A copper switch off helpline could provide impartial recommendations on the most appropriate FTTP (or cable) package for consumers whose copper based package will be discontinued.

4.4 INTERVENTIONS SHOULD BE PRIORITISED BASED ON THEIR IMPACT AND TIMELINESS

While the industry works to agree on and then implement interventions that it can independently deliver, there is a benefit to society from the government starting the process of evaluating, and then implementing, the interventions only it can unlock. There are three main reasons why government action should be prompt:

■ Industry-led interventions, like government or Ofcom-led interventions, will take time to implement, and their impacts will take longer to materialise. There is also a real risk of 'coordination failure' on the part of industry players (who may have different incentives). A piece-meal approach by individual industry players will not be effective as infrastructure providers are rolling out in different areas at different times. Industry interventions will struggle to 'cut through' if there is no wider co-ordination across the industry.

■ Interventions to reduce behavioural barriers will generally reinforce each other. The impact on migration from a package of interventions will likely exceed the impact that comes from the sum of its parts. All stakeholders will find their respective interventions more effective if there is co-ordinated cross-stakeholder action.

■ The outturn impact of behavioural interventions can never be predicted with complete precision. There is a risk that any given intervention is not as effective as anticipated. This risk poses a greater threat to achieving prompt FTTP migration if the government 'waits and sees' how effective the industry-led interventions are.

There is a need to prioritise which interventions to introduce, and when. As there is no 'silver bullet' solution, the potential effectiveness of a 'portfolio' of interventions must be considered. The effectiveness of an intervention portfolio will depend on its impact (the number of reticent customers that are affected) and the timeliness of the impact. We discuss the general considerations that influence the impact and timeliness.

In terms of impact, the core consideration when prioritising interventions will, in essence, be the costs and the benefits associated with that intervention. With regards to the latter, the benefit of each intervention will depend on:

■ how many consumers will be potentially affected by the intervention (interventions can target broadband consumers generally, or specific groups such as low income households or renters);

■ the likelihood that the intervention will result in an accelerated migration; and

■ how much sooner the migration has been brought forward.

The first of these factors is straightforward to assess, however, further work will be required to assess the second and third factors. When assessing the benefits of an intervention it will be important to factor in the power of potential interventions working together in conjunction. For example, the interventions designed to enhance the social proof of FTTP migration will reinforce one another if it becomes hard for consumers to 'ignore' or 'escape' the promotion of FTTP.

With regards to costs, some interventions will only require upfront investment costs (which may cover the costs of consultations, legislating, planning and co-ordination). Other interventions will require ongoing implementation costs. The expected benefits and costs of interventions will need to be considered to maximise value for money.

In terms of timeliness, it will be necessary to deploy interventions at the most appropriate time. This does not necessarily mean deploying interventions immediately when full fibre roll-out is still below 50% of the country. Interventions should be ready to 'go live' as soon as market conditions are right to ensure they are as effective as possible.

- Inducing behaviour change is not straightforward. The difficulty energy suppliers face in convincing consumers to participate in the smart meter rollout, and low rates of switching between current account providers (despite the introduction of the switching guarantee) are two examples of consumers being resistant to change. Interventions in the broadband market may need time to take effect.

- Some interventions will need to be an industry wide effort involving both ISPs and infrastructure providers, and this could involve co-ordination among ISPs to align messaging and run joint initiatives where needed. Industry efforts will take time to emerge as commercial priorities may differ. Ofcom can play a critical role in facilitating industry co-ordination. The common terminology working group is an example of Ofcom playing this co-ordinating role.

- Slow take-up and uncertainty on copper switch off reduces returns and means a slower recovery of investment. This makes it more likely investors will reduce the rate of rollout. The uncertainty on copper switch off also means Openreach lacks information around how long they may need to run costly parallel networks.

Further work is necessary to assess the optimal timing for each intervention, as this is not immediately clear for every intervention. For example, consider the proposal for Openreach to publish an expected copper switch off date. Suppose, Openreach determine that the switch off date for one locality will be 2030. If that switch off date is announced today, it may not create a sense of urgency among consumers. It may even have the opposite impact. Making an announcement in, say, 2028 that copper broadband services will cease to work in 2030 may be more effective at creating the desired effect.

In general, understanding how behaviour changes in response to interventions is difficult to get right, which further underlines the need for a co-ordinated effort to develop and evaluate the nascent proposals bought forward in this report and previous reports.

Further work is necessary to estimate the possible benefits of the proposed interventions, although it is possible to identify, for each intervention, which customer groups will be affected, the relevant timing considerations and the broad nature of the costs involved. Table 1 summarises this information at a high level for the interventions proposed in this report.

TABLE 1   INDICATIVE SCOPE, TIMING AND COSTS OF THE PROPOSED INTERVENTIONS

PROPOSED INTERVENTION	CUSTOMER GROUP AFFECTED	TIMING CONSIDERATIONS	COSTS
'Right to FTTP for tenants'	Renters	Suited to immediate implementation	Consultation and legislative costs, but likely no material ongoing costs
Property listings to say if a property is FTTP enabled	All consumers	Suited to immediate implementation	Consultation and legislative costs, but likely no material ongoing costs

FTTP Employer benefit scheme	Working households	Wait for further FTTP rollout	Some cost to taxpayer
FTTP benefits information campaign	All consumers	Wait for further FTTP	Some co-ordination and planning costs
Community competition/reward for FTTP take-up	Consumers engaged in community	Wait for further FTTP rollout	Some implementation costs
Set local copper switch off dates	All consumers	Await findings of consumer research	Some cost to Openreach and regulator
Publish data on consumers' FTTP experiences	All consumers	Potentially suited to immediate implementation	Some cost to regulator and industry from data collection and publication
Industry marketing guidelines to focus on service quality	All consumers	Potentially suited to immediate implementation	Some cost to industry and regulator from co-ordination and planning
Social tariffs delivered via FTTP where possible	Low income households	Wait for further take-up of social tariffs	Some cost to the industry
OR maintain higher QoS for FTTP fault repair than for FTTC	All consumers	Potentially suited to immediate implementation	Some co-ordination and planning costs, but potentially no ongoing cost
Support channels for elderly and other vulnerable customers	Elderly customers and other vulnerable groups	Wait for further FTTP rollout	Ongoing promotional and operational costs

Source: Frontier Economics

4.5 FURTHER WORK

Policymakers cannot assume that the successful rollout of FTTP will lead to the full socioeconomic benefits that FTTP is expected to deliver. The risk of a persistent FTTP take-up gap should not be ignored and warrants proactive approach to stimulating FTTP migration.

This report has explained the behavioural barriers to FTTP migration and present a selection of nascent interventions. However, further work is needed to address the problem in practice:

- The government should actively monitor FTTP migration progress in addition to FTTP rollout progress.
- Further research into actual consumer behaviour in the broadband market is necessary.
- The proposed interventions need further refinement and scrutiny. It will be necessary to consider any legal or practical barriers to the interventions, and to estimate the costs and benefits of the proposals.
- Similar work will be needed to investigate how broadband end users other than households can be encouraged to migrate to FTTP.

ANNEX A - "LONG-LIST" OF POTENTIAL ACTIONS

As set out in Section 4, this annex provides a long-list of potential ideas to encourage migration. It is not intended to be mutually exclusive or exhaustive, but a "starter for ten" to help push the thinking on the subject. Further work would be needed to test, refine and prioritise among these ideas (or indeed identify more).

A.1 - GOVERNMENT LED INTERVENTIONS

1. **Create a 'right to FTTP' for tenants.** By giving tenants the right to assume landlords have given 'deemed consent' to authorise the installation of FTTP, it will be easier for tenants to migrate to FTTP.

2. **Legally require property listings to state whether a property is 'FTTP enabled' (for both sales and rentals).** If vendors and landlords are required to disclose that their property is passed by or connected to a FTTP network, then this would stimulate FTTP migration among vendors/landlords who are keen for their 'property' to stand out.

3. **Set up an employer benefit scheme, similar to the cycle to work scheme, to cover the cost of FTTP broadband subscriptions.** This would increase the sense of reward from migrating to FTTP, as consumers would feel that they are getting additional value from their broadband service on their employer's account. However, such a scheme would involve some costs, including implementation costs.

4. **Information campaigns from a trusted, authoritative body that highlights the wider benefits of FTTP**. An information campaign which emphasises the socioeconomic benefits of FTTP, will help to establish positive social connotations to migrating to FTTP.

5. **Introduce a community campaign that offers some form of reward to telephone exchange areas that achieve a certain level of FTTP rollout.** By offering some form of reward, or the creating the prospect of winning some reward, linked to FTTP rollout, the perceived attractiveness of migrating to FTTP may increase among community minded consumers.

6. **Include 'FTTP clause' in new tenancy (and related) agreements.** Encourage, or require, model tenancy (and related) agreements to give tenants permission to install FTTP. If landlords opt-out of this during the new tenancy process, only then will the tenant need to contact the landlord to seek permission to install FTTP.

A.2 - OFCOM LED INTERVENTIONS

7. **Set an appropriate copper switch off date, ideally at a local level, to emphasise that FTTC is a 'technology of the past'.** If it is clearly communicated to consumers that FTTC is a technology that will be discontinued, the connotations of obsolete and out dated technology may heighten the perception that not migrating is risky.

8. **Publish data and research into consumers' experiences with FTTP broadband.** As the sector's regulator, Ofcom is well placed to lend credibility to messaging about FTTP's superior reliability. By publishing data and research on consumers' experiences FTTP, Ofcom can further support the public perception of FTTP.

9. **Revise industry marketing guidelines and requirements to mandate a greater emphasis on broadband reliability (on a par with broadband speeds).** By increasing the salience of reliability, and by informing consumers about the difference in reliability between FTTC and FTTP, consumers may view staying with FTTC as the 'risky' option instead of migrating to FTTP.

10   **Require social tariffs to be provided using FTTP wherever possible.** This would improve ease by making FTTP the default option for consumers who access broadband using a social tariff. There is a risk, however, that this would create perverse incentives for infrastructure providers.

11   **Require ISPs to publish data on the proportion of their new installs / contracts that are FTTP.** Consumers may consider switching to FTTP to be a safer option if they are assured that it is a popular option. This intervention should be introduced only once a critical mass of FTTP migration has been reached.

12   **Publish data on FTTP migration locally.** It may be possible to tap into a 'keeping up with the Joneses' feeling by publishing data on FTTP migration locally. This intervention should be introduced only once a critical mass of FTTP migration has been reached. However, there is a risk of highlighting the 'haves' and 'have nots'.

A.3 - INDUSTRY LED INTERVENTIONS

13   **Allow Openreach to commit to higher service quality levels for FTTP fault repairs than FTTC fault repairs, and incorporate this into retail offers.** If consumers can be convinced that potential faults will be fixed quicker on FTTP lines than FTTC lines, then consumers may believe they have more to lose by staying with FTTC than they would do so otherwise.

14   **Set up dedicated support channels for elderly customers and other vulnerable groups.** Some customer groups, of which elderly customers are an example, struggle to understand the options available in the broadband market. A dedicated support channel can provide impartial advice to help customers migrate with confidence.

ANNEX B - FORECAST METHODOLOGY

Our forecast of the future FTTP take-up gap involves two main steps:

- We mapped expected FTTP rollout and coverage until 2030. We based our rollout forecasts on existing FTTP rollout (based on Ofcom and Openreach data) and augmented this using future rollout plans, including: Openreach's aim to cover 25 million UK premises by 2026 and rollout to all commercially viable premises by 2030[41]; CityFibre's plan to rollout FTTP to 8 million UK homes by 2025[42]; information on planned rollout by AltNets, and Virgin Media O2's Project Lightning plan (and Virgin Media O2's stated intention to upgrade its fixed network to FTTP by 2028).[43]

- For each year, we estimated how take-up of the forecasted expansion in coverage would evolve in that year and subsequent years. In other words, we forecast a take-up curve for each set of additional premises covered by FTTP each year between 2022 and 2030. We assumed take-up follows a logistic function. This fits with the standard S-shaped curve of take-up of new technologies. The S-shaped curve shows that a small group of "Early adopters" drive a slow initial take-up. This is followed by a delayed and relatively rapid migration as the "Followers"' migrate across. This is subsequently followed by a long tail of slow migration from the "Reticent" group.

Our forecast also depends on two sets of assumptions. The first set relates to the starting and end points of the take-up curves. The second relates to the speed with which the end point is reached.

- **Assumptions on the starting and end point.** The forecast for take-up among each set of additional premises covered assumes that 20% of households would migrate to FTTP in the first year. This is consistent with the current ratio between FTTP coverage and FTTP take-up in the UK.

  As can be seen in Figure 9, we have also assumed a constant share of connections would use a cable or FTTP connection from Virgin Media. This means that the long run market share for ISPs such as TalkTalk and Sky who will use Openreach's, CityFibre's or AltNet's FTTP networks is 80% of UK fixed broadband connections.

- **Assumptions on the speed of take-up.** The relevant assumption to make here concerns the 'inflection point' for each curve. This is the point at which the speed of migration to FTTP would peak. Assuming that the inflection point is reached sooner is equivalent to expecting that the mass migration of "Followers" happens sooner.

  Our central forecast assumes that the inflection point is 2026. This would coincide with the government's 85% gigabit coverage target, and Openreach's target of covering 25 million homes.

  The range in the forecasted proportion of connections reliant on the copper network in 2030 of one sixth to one third of connections is based on alternatively assuming that the rate of FTTP migration peaks in 2025 or 2027.

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[41] BT, BT to increase and accelerate FTTP build to 25m premises by the end of 2026, May 2021

[42] CityFibre, CityFibre passes 1 million homes milestone in its Full Fibre rollout, November 2021

[43] Virgin Media O2, Virgin Media O2 bolsters future network with fibre upgrade plan, July 2021

We calibrated the shape of the curve by considering the rate of migration from ADSL-based broadband to FTTC in the UK and experiences in other countries which have more advanced FTTP rollout (as set out in Section 3.1). We made comparisons and then adjustments to reflect the difference in circumstances of the FTTP migration relative to the FTTC migration, as well as the country-specific factors facing the UK relative to other countries:

- **FTTC v FTTP.** As discussed in Section 2.2, the barriers to FTTP migration are likely greater than the barriers to FTTC migration. In other words, migration drivers on the demand side may be weaker. Loss aversion, a perceived lack of reward from migration, the additional 'hassle' of migrating to FTTP and a lack of social proof, all conspire to mean FTTP migration will likely be slower than FTTC migration.

  Despite the lower barriers, the UK still has a FTTC take-up gap. In March 2022, 15% of Openreach's broadband connections were using 'fully' copper products despite nearly full national coverage of FTTC.[44] This bodes ominously for FTTP migration.

  However, migration drivers on the supply side may be stronger. ISPs have stronger commercial incentives to migrate customers to FTTP than they did to migrate customers to FTTC. For example, infrastructure providers that offer wholesale access have put in place commercial offers to incentivise migration, such as Openreach's Equinox offer. These demand and supply-side effects work in opposite directions, but as migration is currently a consumer driven decision, we assume the demand factors are have more influence, and that the migration to FTTP will be slower than migration to FTTC.

- **UK v Other Countries.** The circumstances in countries considered in Section 3.1 were more favourable to rapid FTTP migration than is likely to be the case in the UK. Although this could change with the right interventions. Our forecast for FTTP migration in the UK is optimistic as it sits between the Spanish and Portuguese take-up curve.

Bringing our assumptions and calibrations together, our model indicates that one sixth to one third of broadband subscribers would still be on copper-based connections by 2030.

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[44] BT, Key Performance Indicators, FY22 Financial Results Q4

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