MARKET DEFINITION FOR CISBO SERVICES

Recommended approach for the 2019 BCMR

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1 EXECUTIVE SUMMARY

Ofcom has begun the process for the next BCMR decision, due to come into force in April 2019. The objective of this report is to support Ofcom in developing the appropriate market definition for CISBO services.

1.1.1 We propose an approach to market definition that is grounded in the features of this specific market – crucially, the dynamic nature of customer demand, the high incremental costs of physically connecting customers (even over relatively short distances), and BT's current ability to price discriminate.

1.1.2 Our framework suggests that there is a single market for the provision of CISBO services extending to all bandwidths.

- This follows immediately from supply-side considerations, given the common fibre infrastructure used to supply services of any bandwidth (which make up the majority of the cost to serve) and the converging unit costs in equipment (and the trend towards using higher bandwidth equipment to provide lower bandwidth services).
- Any demand-side analysis needs to recognise the distortion to current prices resulting from BT's price discrimination. Current switching rates for higher bandwidth services are lower than they would be under competitive pricing because the high price premium on services above 1 Gbit/s means only the most inelastic consumers purchase them. If prices were at the competitive level, the price gradient would be flatter and a proportion of those customers who currently take the 1 Gbit/s would take the 10 Gbit/s bandwidth service. These customers would clearly switch to 1 Gbit/s services in response to price increases (as they currently use the 1Gbit/s service due to the pricing differential). Hence there is no break in the chain of substitution at competitive prices. This is reinforced by dynamic effects where successive Ethernet standards are introduced at higher bandwidths as a premium service, but due to a combination of increased demand and costs converging, every successive generation of Ethernet will eventually become a mainstream service.

1.1.3 Ofcom's broad approach to geographic market definition in the 2016 BCMR, based on availability of competing infrastructures, seems appropriate. However, Ofcom should build on that approach to reflect more detail on the drivers of competitiveness (the number of competing networks in an area and the distance to end users), while recognising that the approach must remain pragmatic and will require some degree of "blurring" of areas with heterogeneous conditions, based on regulatory judgement, in order define a smaller set of large geographic markets.

1.1.4 However, when determining whether Openreach has SMP in a given geographic market the analysis needs to better reflect the incremental costs faced by rivals as this will determine the effectiveness of their competitive constraint.

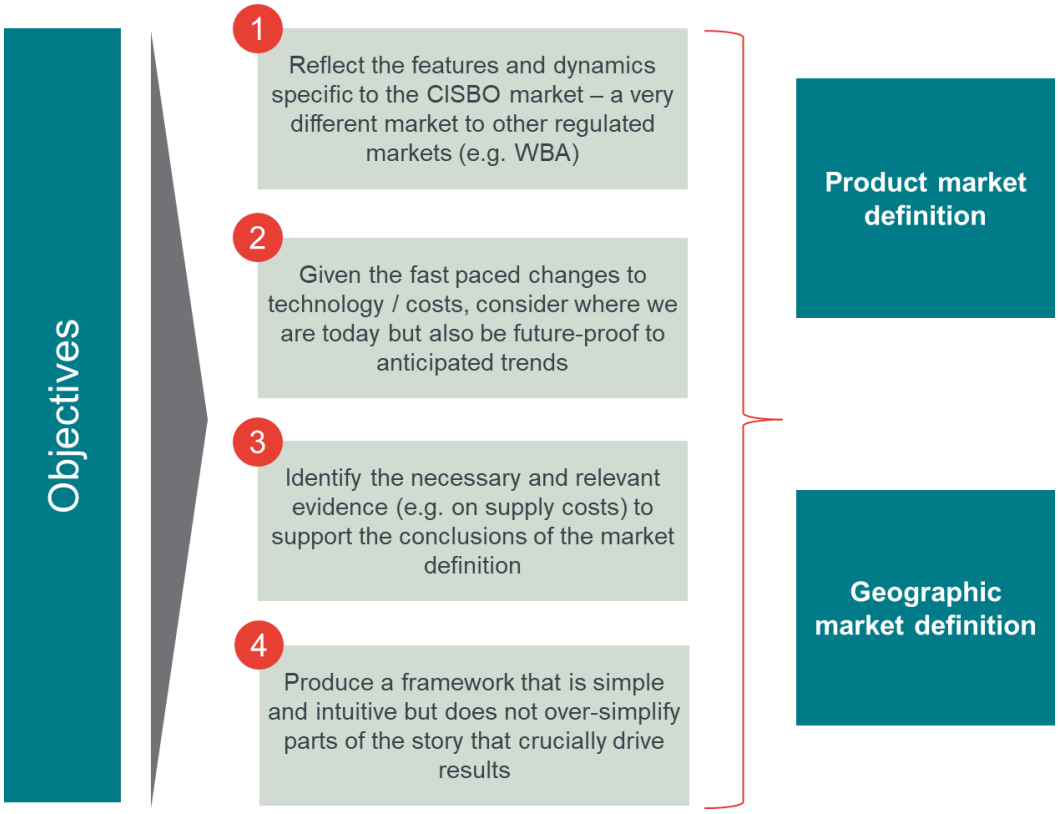
- In the case of CISBO services, the cost to connect an additional customer can be substantial even over short distances.

- Thus, the relationship between distance to alternative infrastructures and competitive constraint is not straightforward as that alternative provider may be present in the vicinity of the premises but face prohibitive cost (and delay) to build the link to the building.
- The constraint on Openreach will therefore be most effective where a specific location is connected to multiple competing networks, which suggests that the share of connections that a provider has in a geographic area is related to the average incremental cost faced and the degree of constraint.

2 INTRODUCTION

2.1.1 This report revisits the question of market definition in CISBO services, and the framework that should be used to define both product and geographic markets, in the 2019 BCMR. The following figure summarises the aims of the approach we have taken in this report:

Figure 1 Objectives of this report



2.1.2 Demand for CISBO services is fast evolving. We set out the characteristics of the CISBO market in section 3 – these drive market behaviour and therefore underpin how Ofcom should think about defining markets.

2.1.3 All CISBO services (i.e. all bandwidths) are delivered using a common infrastructure (fibre) and the cost of deploying fibre to the premises makes up the majority of the cost of serving customers. The other material, but generally smaller, cost is the cost of the active equipment used to 'light' the fibre. Improvements in technology and the standardisation of the active equipment used to deliver CISBO services means each successive generation has been able to deliver ten times more bandwidth than the preceding technology. The unit cost of technology for each new generation is initially at a large cost premium but this premium falls rapidly after introduction due to increasing scale and improvements in production technology. This pattern has been observed as each of the 10Mbit/s, 100 Mbit/s and 1 Gbit/s technologies have been launched and matured on the market, and it is happening today for the 10 Gbit/s equipment which is currently in the middle of this product life-cycle with costs rapidly declining. The pattern is likely to continue with subsequent generations of equipment offering 40 Gbit/s and higher bandwidths.

2.1.4 Today the cost of active equipment for 10 Mbit/s, 100 Mbit/s and 1 Gbit/s is effectively the same and, although the cost of a 10 Gbit/s service is higher than the cost of the 1 Gbit/s equipment, this cost differential is falling and is in any case small relative to the (allocated) cost of the fibre in Openreach's CISBO services. Therefore, the cost of providing the service is only weakly related to the bandwidth being delivered. Despite the small cost difference between different services, Openreach has chosen to adopt a material price differential between the 100 Mbit/s and 1 Gbit/s services and a steep price gradient for services above 1 Gbit/s. The resulting differences in margins for different services has, in turn, driven differing competitive conditions. We describe Openreach's strategy and the result on competitor behaviour in more detail below.

2.1.5 Openreach, which faces limited infrastructure competition in large parts of the UK, is able to price discriminate in the CISBO market by setting a steep tariff gradient, with a particularly large price premium on its 10 Gbit/s product, which is not included in the CISBO charge control basket.[1] Although this may cause Openreach to lose some customers at these bandwidths, this is offset by the very high margins on the customers it retains. Openreach also has the incentive to maintain this steep tariff gradient to raise the costs of BT's rivals in downstream markets, increasing the market shares of BT's downstream divisions. Openreach will continue to price a service at a high premium until the shift in demand makes the service attractive to the large majority of end consumers (or until a charge control is introduced for the product); at that point Openreach will lower prices and retain market share in the mass market. The effectiveness of Openreach's pricing strategy is evidenced by the large margins it makes on the higher bandwidth products and ultimately the high profits it makes overall on its CISBO services.

2.1.6 In some areas of the country, Openreach faces competition from alternative infrastructure-based providers. In addition, some vertically integrated operators serve downstream customers with a mix of self-supplied 'on-net' infrastructure and 'off-net' connectivity purchased from Openreach. However, these alternative providers only have fibre infrastructure connected to a small percentage of business premises and so in most cases will have to dig trenches to install duct from their existing infrastructure to deploy fibre to customer premises[2]. Since this is costly, they will compare the input costs, and are likely to choose to dig only where it has a lower cost than the forward looking cost of buying an equivalent service from Openreach. Given Openreach's price discrimination, the chances of a dig being most cost-effective is higher for high bandwidth connections, as they can avoid higher Openreach wholesale charges (if choosing between on-net and off-net delivery). As a result, one observes that infrastructure-based rivals to Openreach have a higher share of high bandwidth connections than low bandwidth connections, and Openreach has a lower market share in those wholesale services for which it earns the highest margins. This is confirmed by data previously collected by Ofcom which indicates that rivals are economically able to dig greater distances to serve higher bandwidth customers.

[1] There is a so-called 'safeguard' cap applied which prevents Openreach from increasing prices in nominal terms.

[2] While Openreach may also have to dig to some premises to install fibre, Openreach have connections in the majority of premises where new CISBO services are requested.

2.1.7 In section 4 we set out our proposals for how Ofcom should assess market definition in the 2019 BCMR in light of the underlying fundamentals discussed above.

2.1.8 We show that there is a single product market for fibre CISBO services (including services above 10 Gbit/s and WDWM). This is primarily driven by supply side substitution – if an existing provider has fibre infrastructure in place to a premise to deliver one bandwidth product they can easily swap out the electronics to supply any other speed and in some cases will use the same active equipment to offer a range of bandwidths. Thus even where a competitor is currently only supplying a given bandwidth service in a given location, they form a competitive constraint at all bandwidths in that location.

2.1.9 Any HMT / SSNIP test should be applied at competitive prices.[3] At present Openreach's price discrimination means that the price differentials between the 1 Gbit/s and 10 Gbit/s services is much higher than would be the case under competitive conditions. As a result, demand-side substitution between the 10 Gbit/s and 1 Gbit/s services is weaker than it would be under competitive pricing. Therefore, an application of the SSNIP test that uses observed switching rates may result in an incorrect definition of product markets. Competitive prices would have a much smaller differential that more closely reflected differences in incremental cost, and in that situation we would expect to see more demand side switching.

2.1.10 The observation that there are varying levels of competitive outcome (in terms of the market share of rivals to Openreach) for different products is not due to fundamentally different competitive constraints on Openreach. Openreach's strategy of price discrimination means it has set higher margins for the services above 1 Gbit/s, out of line with actual cost differentials. This has created particularly strong incentives for rival providers to enter the wholesale market, or self-supply in the case of providers choosing between on-net and off-net delivery, above 1 Gbit/s. As such, we observe higher levels of alternative supply in those bandwidths where Openreach earns the highest margins. The higher levels of competition do not follow from the rivals' particular ability to compete more effectively in those services, but from the distorted incentives they face.

2.1.11 Geographic market definitions should be driven by the proximity of competing infrastructure and number of competing infrastructures to the relevant customers. Having defined a pragmatic approach that produces a small set of contiguous areas, the SMP findings within these markets needs to take account of the particular barriers rivals face in deploying a leased line connection.

2.1.12 For rival infrastructures to be a sufficient constraint on Openreach's prices such that Openreach does not have SMP, the infrastructure needs to be sufficiently dense such that CPs can recover their average incremental cost of connecting a customer when setting prices which reflect Openreach's average cost. The cost of laying fibre can be substantial even over short distances, so that the constraint will be very different in an area where a rival is present but connected to a very small

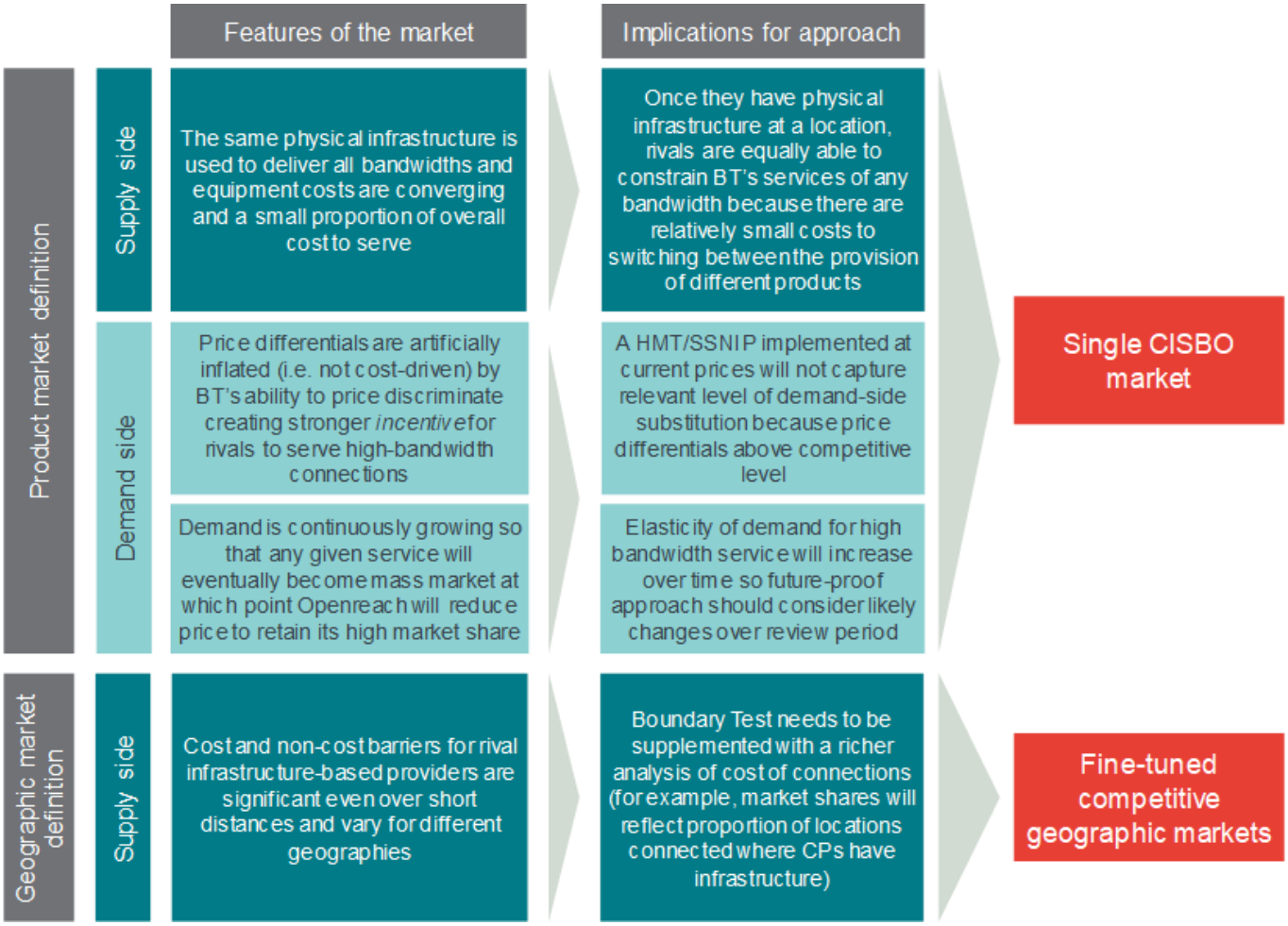
[3] EC in its guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services (2002/C 165/03) recognises that if prevailing prices are not competitive, because a player already has market power, then "the application of the hypothetical monopoly test may lead to a different market definition from that which would be produced if the prices were set at a competitive level".

number of premises compared to one where it has fibre all the way into a majority of buildings. Therefore, the boundary test between SMP and non-SMP markets should incorporate information on the proportion of relevant premises connected to alternative providers as a way of segmenting the geographic areas into ones with higher and lower levels of competition.

2.1.13 In addition, the fact that the cost of laying fibre can vary significantly even over short distances means that applying a simple threshold rule mechanistically to identify SMP areas (e.g. a threshold based on identifying areas with more than four infrastructures present within 100m of each premises) is likely to result in areas within which actual competitive conditions vary widely. While a simpler set of rules may be pragmatic for the purposes of defining the boundaries between geographic areas with different intensity of competition, any market power assessment should be carried out separately as a second stage of analysis and consider other complementary measures of competitive constraint.

2.1.14 The following diagram summarises the conclusions of this report on the approach to market definition.

Figure 2 Summary of conclusions for market definition approach



Source: Frontier Economics

3 KEY CHARACTERISTICS OF THE MARKET

3.1 CISBO services

3.1.1 Contemporary Interface Symmetric Broadband Origination ("CISBO") leased line services are fibre-based, dedicated, point-to-point data transmission services used by businesses and providers of communications services. Compared to mass market broadband products, these services provide a more reliable service, since the bandwidth is not shared with other internet users and hence the quality of service is not affected if, for example, traffic from other users on the network is high. Fault rates are lower, as fibre optic cables are not affected by some sources of faults in copper cables, for example water ingress. CISBO services are also generally offered with higher speeds than those delivered with broadband services and with symmetric bandwidth making them suitable for connecting servers[4].

3.1.2 The main purchasers of wholesale CISBO services are:

- End-consumers, mainly large businesses that require a fast connection between their different locations (e.g. headquarters and local offices) or to the Internet;
- Mobile network operators that require backhaul services to carry data between their radio base stations and their core networks.
- Broadband service providers using local loop unbundling or VULA also require uncontended backhaul to carry large amounts of broadband traffic from BT's exchanges and their core networks.

3.1.3 The most commonly used technology for delivering CISBO services today is Ethernet which is provided using fibre and consists of a particular set of interfaces and framing formats. Ethernet can also be provided over wavelength-division multiplexing ("WDM"), an optical technique which allows a number of channels to be transmitted over a single fibre increasing the cable's capacity. The set of products in the CISBO market, as defined by Ofcom in the 2016 BCMR, includes all Ethernet and WDM services delivered over fibre.

3.1.4 Ethernet services can also be delivered over Openreach's legacy copper access network using EFM (Ethernet First Mile) technology which utilises multiple 'bonded' copper pairs. However, the nature of the legacy copper access network means that the bandwidth offered is limited and dependent on the characteristics of the copper loops used[5] and EFM services will be affected by the higher rate of faults on Openreach's copper access network compared to fibre networks.

3.1.5 In addition to CISBO products, legacy copper- and fibre-based technology leased lines (SDH/PDH services) continue to be supplied. Ofcom refers to these as Traditional Interface Symmetric Broadband Origination or "TISBO" products.

[4] Mass market broadband services are typically asymmetric as end users are more frequently consumers of content than distributors of content.

[5] For example, the service may be rate adaptive offering lower bandwidths over longer loops.

3.1.6 This report exclusively considers market definition for fibre CISBO services.[6]

3.1.7 Within the CISBO market, services are offered at different speeds / bandwidths. A service with a higher bandwidth generally provides more capacity to the customer (e.g. faster downloads), with the result that the customer is less likely to suffer a drop in the quality of the service during peak times due to congestion. However, the marginal benefit to the customer declines with increasing bandwidth and may be close to zero if the bandwidth available significantly exceeds traffic even in peak periods. Therefore, the services are vertically differentiated – consumers prefer higher bandwidth products (all else equal), but different users will have different willingness to pay for additional bandwidth. If higher bandwidth products have higher prices, consumers will self-select into each service, and consumers with higher offered traffic[7] and/or higher QoS requirements will purchase the higher speed services. If the price of a higher speed service falls sufficiently, some consumers will migrate from the lower speed service to the higher speed service.

3.1.8 In addition, consumers' needs for bandwidth are continuously increasing over time to maintain a similar QoS, as more applications are developed that require access to the internet, and especially as businesses transition towards storing their data on the cloud instead of on physical servers at their premises. This means that, as their demand shifts, wholesale customers also migrate to higher bandwidth products over time.

3.1.9 Openreach's CISBO services exist at fixed increments – 10Mbit/s, 100Mbit/s, 1 Gbit/s, 10 Gbit/s etc – with each successive generation to date delivering an increase in speeds by one order of magnitude (i.e. a factor of ten). This reflects bandwidths chosen by standards bodies that set standardised technology for equipment across the industry to allow interworking between different vendors. It is however technically possible for any intermediate bandwidth to be delivered by CPs using a higher speed connection and restricting throughput. Such intermediate services are offered by incumbents in some countries (e.g. openeir, the wholesale arm of the Irish incumbent offers Ethernet access circuits at bandwidth at 100 Mbit/s increments between 100 Mbit/s and 1 Gbit/s[8]). However, the standard services tend to form focal points in the UK market given that Openreach, with a high market share, does not offer intermediate services.

3.1.10 Customers' choice of CISBO service is therefore relatively discontinuous[9] – when they choose to upgrade this involves a large step increase in bandwidth.[10] The discontinuity is exacerbated by the artificially high price difference. Given the increasing needs for bandwidth over time, the key decision is therefore the timing of upgrades. A change in the price differential between two services could affect

6 Although we point to some differences between EFM, TISBO and CISBO services where these help illustrate some particular features of the CISBO market that are relevant for the assessment of market definition.

7 Offer traffic is the demand unconstrained by the available bandwidth.

8 Openeir Leased Line Reference Offer (http://www.openeir.ie/Reference_Offers/?selectedtab=llro)

9 We note however that at the retail level there may be more bandwidths offered to customers than at the wholesale level. But given Openreach does not offer any intermediate products between the 1Gbit/s and 10Gbit/s services, the choice for Openreach's customers does involve a step up in bandwidth.

10 The alternative is to purchase several low speed products to combine into an intermediate product. For example, two 1 Gbit/s products can be combined to deliver a 2Gbit/s connection. However, depending on market prices it may in fact be cheaper (or be expected to be cheaper in the near future) to purchase a 10Gbit/s service than two 1 Gbit/s products.

how quickly a customer migrates and this may mean an asymmetry of the observed impact of price changes. If the higher speed product becomes relatively cheaper, one may observe more switching to that product immediately following the price change; however, if the higher speed product becomes more expensive, consumers may not switch down given their expectation that they will soon need the high speed connection anyway, and consumers on lower speeds may simply delay their upgrade, so that there is a weak effect on overall switching.

3.1.11 Since demand is always increasing, this means a given bandwidth is bought by different groups of customers over time. The customers that purchase services with more than 1 Gbit/s (often called Very High Bandwidth or "VHB" services) today are those whose data needs are highest. BT has attempted to argue that "the nature of demand for VHB services remained distinct from lower bandwidth services and that the increase in demand for VHB services was primarily from new users rather than customers upgrading from the lower bandwidths".[11] However, our view is that this mischaracterises the market:

- A significant proportion of current 1 Gbit/s customers would be likely to upgrade if prices were at a competitive level; and
- Over time, as demand per user increases, there is little reason to believe that the vast majority of customers currently purchasing the 1 Gbit/s service would *not* migrate to the 10 Gbit/s service. Indeed, we see 100 Mbit/s customers are migrating to the 1 Gbit/s service over time and there is no reason to believe this would not continue.

3.1.12 In any case, while relatively high bandwidth services may be a niche product for high end consumers for given prices and when first introduced, shifting demand and BT's strategy to lower the price of products over time mean that these products will eventually become a mainstream product.

3.2 The providers of CISBO wholesale services

3.2.1 Openreach is the incumbent network operator and owns a ubiquitous network of ducts and poles and substantial fibre infrastructure throughout the UK. Out of Openreach's fibre-based rivals, Virgin Media owns and operates the network infrastructure with the greatest geographic reach[12] and is vertically integrated, providing retail services based on its own infrastructure. Other infrastructure-based rivals with smaller networks include Vodafone (following its acquisition of Cable & Wireless), Colt, Level 3, Zayo, Verizon and several smaller companies.

3.2.2 The areas served by these competitors will reflect a combination of economies of scope (e.g. Virgin Media's ability to offer services to business customers passed by a network primarily built to serve residential customers with cable television) and density (i.e. networks built in the City of London to serve the high concentration of high value customers in this area).

3.2.3 Openreach faces, to varying degrees, competition from other infrastructures in some geographic areas, but is still the monopoly provider of wholesale services in

[11] Paragraph 4.100, Business Connectivity Market Review, Final Statement, April 2018.

[12] While much of the Virgin Media infrastructure is designed to serve residential and SOHO premises, in doing so Virgin Media has an extensive fibre network passing a large number of business premises.

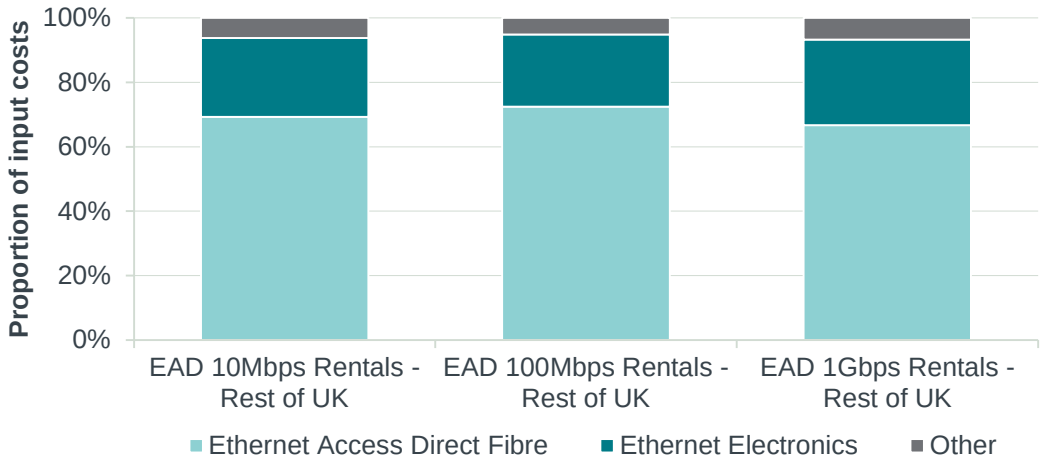
a significant part of the UK. The evidence presented by Ofcom in the 2016 BCMR shows that rival CPs have built physical networks that extend to the main business concentrations and sites, but for a significant part of the UK territory, Openreach is still the sole infrastructure-based provider operating in the area. This can provide a significant advantage when branch networks are being procured, with Openreach often being the only provider who can serve all premises 'on-net'.

3.2.4 In fact, Ofcom's analysis, which was based on the presence of CPs within 100m of most users in a post code sector, is likely to overestimate the competitive constraint on Openreach from CPs as the cost of installing infrastructure (i.e. installing duct and fibre) to a premise less than 100m from existing infrastructure may be still prohibitively expensive and there may be significant numbers of customers further away than 100m in a given area.

3.3 The cost structure for providing CISBO services

3.3.1 All CISBO services are delivered using a common network infrastructure (point-to-point fibre). Active equipment connected to the ends of the fibres is used to aggregate and route traffic, and it is this equipment that determines the speed of a connection. The cost of active equipment makes up only a small part of the end-to-end cost of providing a leased line, while the passive infrastructure makes up the majority of the end-to-end cost. For example, in the case of Openreach, based on the regulatory accounts, duct / fibre makes up approximately 70% of the cost of providing the Ethernet Access Direct (EAD) services. This is shown in the figure below for the 10Mbit/s, 100Mbit/s and 1 Gbit/s services.

Figure 3 Breakdown of input costs for EAD services



Source: Frontier Economics based on Openreach RFS data for the year ended 31 March 2016.

Note: Other costs are calculated by subtracting EAD fibre and Ethernet Electronics costs from the fully allocated cost for the service.

3.3.2 Therefore, the only difference in the cost of providing connections of different speeds is the difference in the cost of active equipment used. A provider that was connecting a new customer would face a cost differential between a low and high speed connection equal to the difference in cost between the two pieces of equipment required to deliver each speed. This cost differential today is essentially zero for the services up to 1 Gbit/s because the modern equivalent asset for

delivering lower speed services is 1 Gbit/s equipment. For services above 1 Gbit/s (including WDM), the cost of the active equipment is higher than for the basic equipment used to deliver lower bandwidths but this difference is small relative to the overall cost of the service and the difference in equipment cost has been declining in recent years.

3.3.3 In a world with perfect competition for all CISBO services, price differentials would be cost-reflective as competition would drive margins down. Therefore, we would observe a flat tariff gradient for CISBO services up to 1 Gbit/s, and a positive price differential for the 10 Gbit/s but considerably smaller than that which exists today under Openreach's existing pricing structure (which is of the order of 250%).

3.3.4 The nature of fibre infrastructure means that there are significant economies of density in the provision of a fibre link, as existing infrastructure in a geographic area can be extended to serve new premises at a lower incremental cost than a new end-to-end link by an operator with no existing local access infrastructure. This implies that there are significant barriers to geographical expansion of rival infrastructures that exist today in some of the UK's denser areas and it will often be inefficient for these rivals to overbuild Openreach's fibre network.

3.3.5 There are also significant economies of scope given the common infrastructure required to deliver different speeds – providing a variety of speeds over a common infrastructure is more cost-effective than having standalone networks for different speeds. This also suggests that given the common infrastructure a rival provider offering only fast speeds in a given geography is equally able to constrain the incumbent's offering of low and high speeds. Even if it chooses not to compete in some products, it has a credible threat to do so if the incumbent is earning sufficiently high excess profits for those services.

3.3.6 Finally, the incremental cost of connecting a leased line customer (and the delay for doing so), for an operator that hasn't already rolled out fibre to a given location, is relatively high, even if the operator is already present in the area or on the street that the customer is located in. One consequence is that rival operators expanding their networks will make decisions at the level of the individual customer location.

3.3.7 This is in contrast to the dynamics in the wholesale broadband access market. Once an LLU-based broadband providers has a presence in a Openreach exchange, the incremental cost of serving any customer in the area covered by the exchange with a LLU-based product is similar and relatively low. This means that all addressable customers[13] will be served independently of their location. Lead times for installation are standardised between all users of the network with no party having a lead time advantage. This means geographic markets can be defined on an exchange-by-exchange basis. In contrast for Business Connectivity ("BC") services, the cost to the provider will be significantly lower for a customer in a building that the CP is already connected to than for a customer further along the street. This indicates a link between share of connections of a provider and its competitive constraint- the more premises that are connected to the CP's network, the lower the average cost of connecting customers in the area and the greater the constraint it provides.

[13] Subject to technical restrictions on the ability to offer services on an individual loop.

3.4 Competitive incentives of infrastructure-based providers

Openreach as a regulated SMP operator with a ubiquitous infrastructure network

3.4.1 Openreach has the competitive advantage of owning the most extensive duct and fibre infrastructure in the country, which is shared with other services that it provides. Therefore, it faces the lowest cost (on both an average and incremental basis) to deliver CISBO services for much of the country.

3.4.2 Unlike rivals, Openreach has a regulatory obligation to provide access in areas where it has been found to have SMP and so cannot *not* serve a customer because the incremental cost of doing so is too great. However, where Openreach's infrastructure is not already in place in the customer premises (and so Openreach will incur significant cost to connect), Openreach charges Excess Construction Charges (ECC). Openreach quotes that for EAD,

> *"[i]n April 2012 the probability of an ECC was 33% with an average charge billed of £4400".*[14]

3.4.3 This indicates that for the majority of customers there were no incremental infrastructure costs for Openreach to connect the customer, and even for those customers where there is a net incremental cost this is relatively low.[15]

3.4.4 In comparison, rival CPs with a much less extensive network will generally face additional construction costs, both to dig to and to gain access to the customer premises. Given the more limited scope of CPs' networks, the dig distance will also generally be greater.

3.4.5 Ofcom's approach to price regulation allows Openreach to include the fixed and common cost of infrastructure and fibre in the regulatory asset base and provides the expectation that it will fully recover the cost incurred. Therefore, it is largely indifferent to the fixed cost of infrastructure when setting prices. Its incentive is to maximise short run margins, with its main lever to do so being its ability to price discriminate by bandwidth. When a new product first becomes available at a higher bandwidth, mainstream consumers are initially not willing to pay much of a premium for speeds that they do not currently require. Openreach therefore finds it profitable to target the tail of consumers with particularly high and relatively inelastic demand for bandwidth (either because they generate very high volumes of traffic or they have very high QoS requirements) by charging them a high premium and extracting more revenues from them.

3.4.6 Openreach also has an incentive to set a high price on wholesale products used by competitors in downstream markets in order to stifle downstream competition from access seekers, allowing it to earn increased margins in the corresponding

[14] Openreach ECC Frequently Asked Questions. https://www.openreach.co.uk/orpg/home/products/serviceproducts/excessconstructioncharges/excessconstructioncharges/downloads/ECC_FAQ130709.docx

[15] Assuming the average quoted is a mean, it is likely that the large majority of customers will pay less. in 2016 there was a change in ECC so that the first £2,800 of ECC was 'free' with connection costs covered through rental charges https://www.ofcom.org.uk/__data/assets/pdf_file/0023/82715/excess-construction-charges-statement.pdf

downstream markets. For example, by increasing the cost of backhaul to broadband competitors, these competitors may either reduce quality or increase prices, allowing BT to gain market share or increase prices in the retail broadband market.

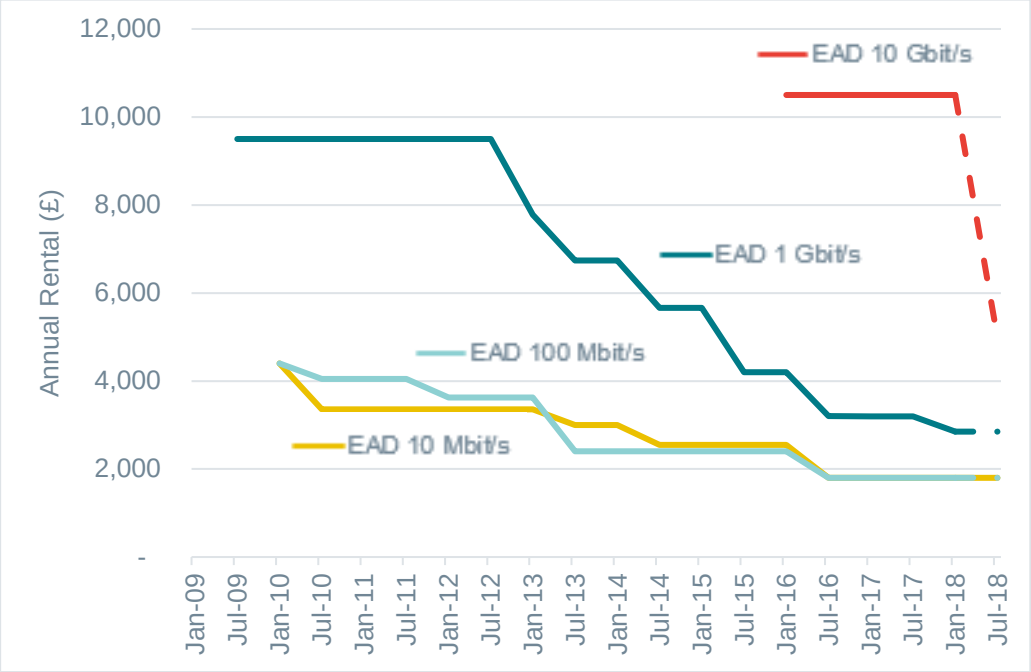
3.4.7 The existence of rival infrastructure-based providers creates a disincentive to set high prices for a given product, as Openreach will potentially lose some customers to those providers. However, Openreach will balance this against the increased revenue from customers it retains, and increased margins in downstream businesses in areas where it does not face competition. The more limited the set of connections over which Openreach faces infrastructure-based competition, the stronger the incentive for Openreach to price discriminate more aggressively by setting a high price for the high bandwidth services.

3.4.8 Openreach's pricing is also constrained to a degree by regulation, with services below 1 Gbit/s being charge controlled, requiring overall reductions in prices over time to align prices with costs, and with sub-caps further (somewhat) constraining Openreach's ability to price discriminate. To the degree that it can, Openreach still price discriminates within the basket of services up to and including 1 Gbit/s, since raising the price on the 1 Gbit/s service allows it to sustain a higher price and extract more profit from the services above that bandwidth.

3.4.9 Over time customers' needs for bandwidth increase, causing a shift in the demand curve – they become more price sensitive as a result, with reductions in the price of the high bandwidth product attracting higher volumes of customers to switch. At the same time supply costs decrease for the higher speed service. At that point Openreach finds it profitable to start lowering the price of the product and migrating more customers to the higher speed service. Openreach is also able to leverage its position as the dominant provider of the SMP service customers are migrating from, so that it faces a lower cost of connection compared to rival providers.

3.4.10 This pattern in Openreach's pricing over time is illustrated in the figure below.

Figure 4 Openreach prices (annual rental) for EAD services over time



Source: Frontier Economics based on Openreach's EAD price list.

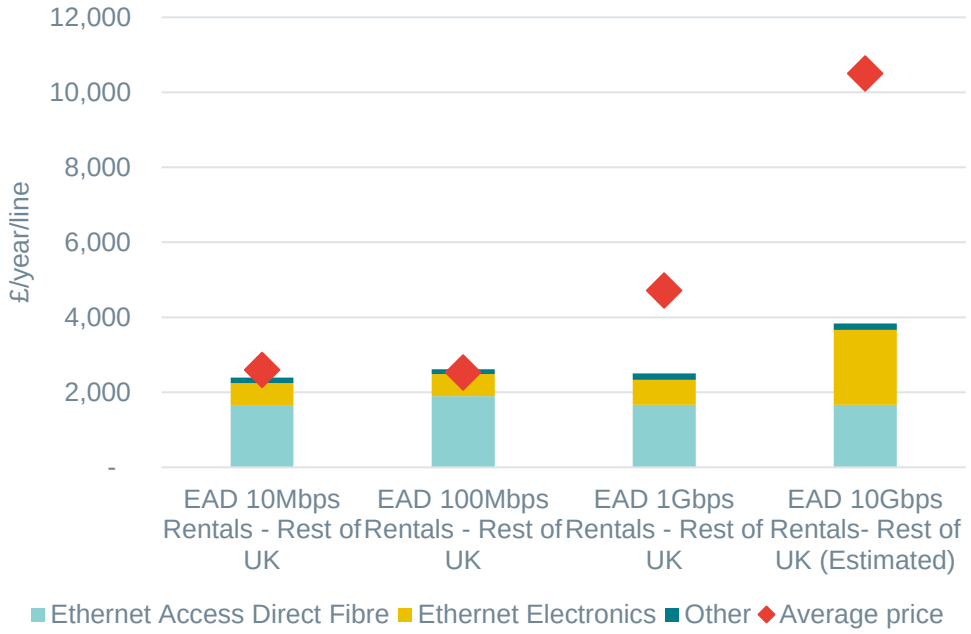
3.4.11 As described above, prices will be determined by Openreach's strategy to price discriminate. Today's rental price for the 1 Gbit/s is £2,850, while it is £1,800 for the 100Mbit/s and 10Mbit/s products. The premium on the 10 Gbit/s service is particularly large - the listed rental for the 10 Gbit/s service is £10,500, nearly four times the rental of the standard 1 Gbit/s service. Openreach announced on the 6th of March 2018 that the price for the 10 Gbit/s EAD services will be reduced from April 2018 – the rental of their EAD 10000 product will come down to £4,980 (a 53% reduction).[16]

3.4.12 There exists a positive cost differential between the 1 Gbit/s and 10 Gbit/s services both due to differences in unit equipment costs but also support costs, such as accommodation. While 10 Gbit/s connections can use the same infrastructure as 1 Gbit/s connections, the density of connections that can be supported in a rack of equipment may be lower for 10 Gbit/s connections depending on the specific equipment and configuration used. However, this differential will fall over time both as the cost of equipment falls and higher density equipment becomes available. In the chart below we have assumed the total, fully allocated, unit cost for 10 Gbit/s active equipment is three time that of 1 Gbit/s active equipment. The resulting estimated margins in Figure 5 appear to be broadly in line with Ofcom's assumptions when determining the 2016 leased line charge control. Ofcom estimated that under a Dark fibre Access ("DFA") regime where the DFA service was priced on an 1 Gbit/s 'active-minus' basis (i.e. making the same contribution to Openreach's infrastructure costs as the 1 Gbit/s service) the total cost of ownership of a CP providing a 10 Gbit/s services using DPA was 55% lower than

[16] https://www.openreach.co.uk/orpg/home/updates/briefings/ethernetservicesbriefings/ethernetservicesbriefingsarticles/eth01118.do

the equivalent 10 Gbit/s EAD service,[17] i.e. the difference between the contributions to fixed costs of the 1 Gbit/s and 10 Gbit/s services was 55% of the revenues from the provision of the 10Gbit/s EAD service.

Figure 5 EAD Rental Cost Stack from 2017 RFS



Source: *Frontier Economics, based on Openreach's 2017 RFS*

Note: *The price of the EAD 10 Gbit/s product is taken from Openreach's EAD price list while the active costs is estimated as three times that of a 1 Gbit/s connection.*

3.4.13 This difference in margins or contribution to infrastructure costs (i.e. the price less the avoidable active and other costs) then drives the incentives of other providers to compete[18].

Rival infrastructure-based providers

3.4.14 As discussed in section 3.3, infrastructure-based competitors to Openreach face material incremental costs of providing a point-to-point fibre to the customer premises for the majority of customers, even where they have existing infrastructure in the street outside the building.

3.4.15 The incremental costs Openreach faces when first deploying the fibre to a new premise will have been recovered through Excess Construction Charges (ECC) paid by access seekers. When the customer later makes a purchasing decision, either at the end of an existing contract or when they choose to upgrade, no further ECC will apply if they remain on the Openreach network. However, infrastructure-based competitors that now consider entering an area where Openreach already operates will be unable to apply such extra charges to customers with an existing connection as the customer has the option of remaining with Openreach. Therefore, the competitive constraint that potential entry places on Openreach's pricing will be weaker for these customers than where the CPs have an existing

[17] 2016 BCMR Statement, Table A33.4

[18] For comparison,

connection to the premises – i.e. the most effective competition will take place at sites that have multiple networks connected to them.

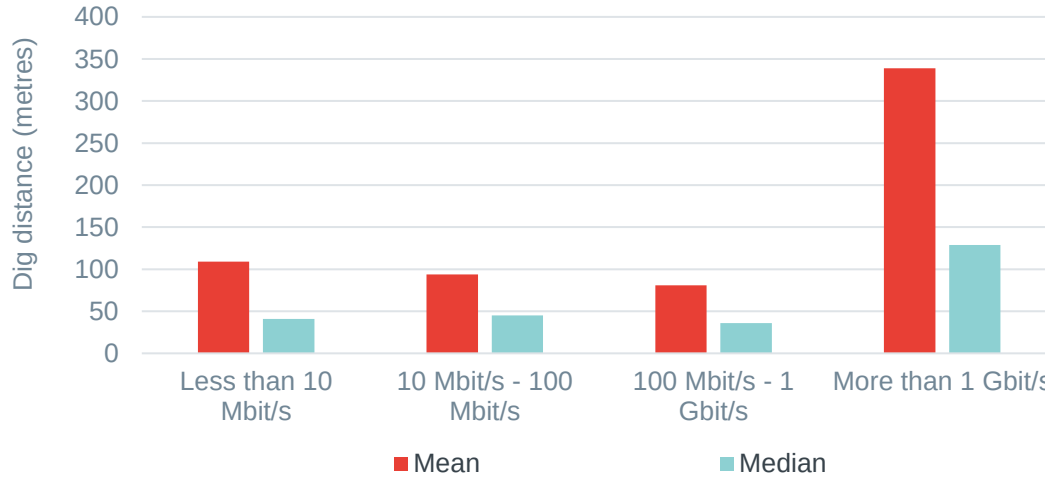
3.4.16 CPs will only compete for areas, premises and market segments for which they expect to earn sufficiently high margins going forward to recover the incremental cost of connection, in addition to the costs of active equipment. The dynamic is slightly different for wholesalers compared to providers of retail services that own some physical infrastructure, but in both cases the outcome is the same – the likelihood of putting their own fibre in the ground is higher for the set of connections that Openreach priced high.

- In the case of wholesalers, if they are able to charge higher prices for higher speed connections (because Openreach's price discrimination inflates the prices for these connections) then these providers will target the high speed (/ high margin) segment.
- In the case of CPs operating in the retail market who face a build/buy decision to connect a customer, they may serve all end consumers but they will make the build/buy decision based on which option allows them to serve the customer at lower cost. Therefore, they are more likely to build for higher bandwidth connections as the wholesale charges avoided by building increase with bandwidth (while the cost of building is independent of bandwidth).

3.4.17 Put another way, as the costs of connecting a customer is an approximately linear function of distance, the margin that CPs providing wholesale services require to break even is also a linear function of distance. As a result, CPs will be willing to dig further to connect high margin/high bandwidth customers.

3.4.18 This dynamic is illustrated by information on the distances dug by other CPs ("OCPs") to connect customers- CPs are able to dig three times further on average to connect customers who purchased circuits at greater than 1 Gbit/s than customers who purchased lower bandwidth services (broadly reflecting the fact that the margin available on these services is of the order of three times higher than the lower bandwidth services).

Figure 6 OCPs reported dig distances for CISBO



Source: Frontier based on Ofcom 2016 BCMR Table A13.4

3.4.19 This ability to dig further for high bandwidth customers results in the relatively high market share for OCPs in this segment of the market.

3.4.20 Where Openreach's prices are geographically uniform (i.e. excluding the non-SMP geographies), Openreach's own price (super-)elasticity for customers of 10 Gbit/s services and above will reflect both the willingness to pay of customers and the proportion of customers who can switch to alternative providers. It may be profit-maximising to maintain high prices even if some market share is lost, if demand for these services for the subset of customers who do not have alternative providers is relatively inelastic. The high price also helps BT to sustain higher prices for 1 Gbit/s services by dis-incentivising OCPs from aggregating multiple 1 Gbit/s circuits to a single 10 Gbit/s circuit.

3.4.21 Since Openreach will not find it profitable to compete too aggressively on price in areas where it faces some competition (because it still holds a monopoly in a significant proportion of the country), high prices and profits will be sustainable post-entry precisely in those segments that appear most competitive.

3.4.22 Despite the fact that the cost to serve is not significantly different for different bandwidths, price discrimination introduced by Openreach creates varying incentives for the rival providers to serve different sets of customers. In other words, the level of observed competition is driven, not by the fundamental technical ability of rivals to compete for a product, but by their incentive to compete given Openreach's price discrimination.

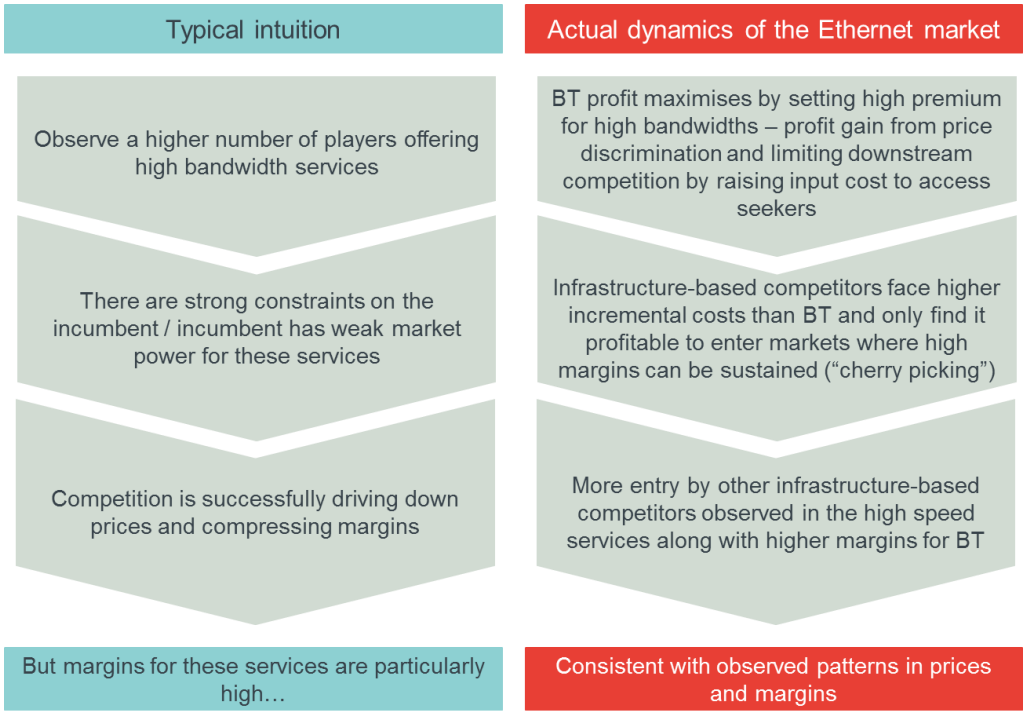
Observed outcomes under the status quo

3.4.23 The success of price discrimination as a profit-maximising (as opposed to welfare maximising) approach is demonstrated by the consistently high level of returns generated by CISBO services as a whole over time.[19] Based on the 2017 RFS, Openreach earned a return on capital employed of 30.6% in the London periphery and 14.8% in the 'Rest of the UK' compared to an allowed rate of return of 9.8%.

3.4.24 The behaviour of competitors resulting from Openreach's strategy of price discrimination implies a relationship between levels of competition and the degree of constraint on Openreach that is the opposite of the usual intuition – typically higher levels of competition are associated with lower margins but in this case higher levels of competition are observed for services with higher margins for Openreach. The figure below summarises this "reverse causation" playing out in the market today.

[19] The high level of returns for CISBO services is also in part the result of under-estimation of demand which means future costs were over-estimated at the point of the price review.

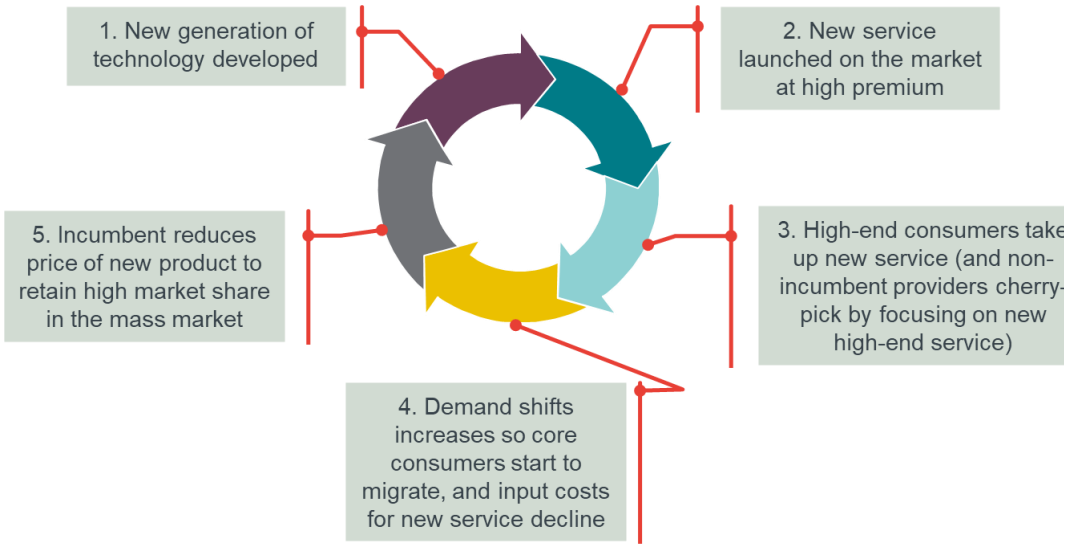
Figure 7 Relationship between number of competitors and competitive constraint



Source: Frontier Economics

3.4.25 However, it is worth noting that the static view of the market will only give a partial picture of outcomes. As discussed above, the evolving technology and shifting demand for bandwidth means the market goes through cycles with each successive generation of the service. The diagram below illustrates the typical product life cycle.

Figure 8 Typical product life-cycle



Source: Frontier Economics

4 MARKET DEFINITION APPROACH

4.1 EU guidelines

4.1.1 The EC issued guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services (2002/C 165/03).

4.1.2 According to the EC's 2002 guidelines, the exercise of market definition is based on the following basic principle:

> *"The extent to which the supply of a product or the provision of a service in a given geographical area constitutes the relevant market depends on the existence of competitive constraints on the price-setting behaviour of the producer(s) or service provider(s) concerned"*

4.1.3 The EC points to the two types of constraints that must be considered – demand side and supply side substitution – as well as the potential for new entry where relevant. The EC points to the HMT/SSNIP test as "one possible way of assessing the existence of any demand and supply-side substitution". However, the EC also recognises that if prevailing prices are not competitive, because a player already has market power then "the application of the hypothetical monopoly test may lead to a different market definition from that which would be produced if the prices were set at a competitive level". The EC concludes that

> *"Any assessment of market definition must therefore take into account this potential difficulty. However, NRAs should proceed on the basis that the prevailing price levels provide a reasonable basis from which to start the relevant analysis unless there is evidence that this is not in fact the case."*

4.1.4 This suggests that, before applying an SSNIP test based on empirical data on switching, Ofcom should ascertain that the hypothesis that prevailing price levels reflect competitive prices is prima facie reasonable. If there is an indication that prices may not reflect competitive levels, Ofcom should seek to gather appropriate evidence on whether prices reflect the competitive level (for example, by considering differences in incremental cost) before using switching data based on prevailing prices in the market definition.

4.2 Product market definition

4.2.1 The evidence suggests there is a single product market for high quality business connectivity – CISBO services. This follows from the supply side considerations. This is also supported by demand side considerations although these are less straightforward because the price distortion introduced by Openreach does not allow for the typical analytical approach (the HMT/SSNIP test) to be implemented using empirical data on observed consumer choices. While Ofcom could seek to extrapolate the missing information (switching at competitive prices) from observed behaviour (switching given the non-competitive price premia for the 1 Gbit/s and 10 Gbit/s services), this evidence is unlikely to be robust given the large differences in actual and competitive price differentials.

4.2.2 Below we discuss supply and demand side arguments in turn. However, we note that given the clarity of arguments on the supply side, and the difficulty of evaluating demand side effects empirically, more weight should be placed on supply side effects. This is also consistent with the approach taken in the geographic market definition, which looks at infrastructure independently of products, i.e. the analysis is based on the supply side and does not distinguish between infrastructures used for different products (but should consider the geographic location of the purchasing customers).

4.2.3 Our view is that EFM (Ethernet First Mile) should not be included in the market for CISBO services as it is based on a different underlying infrastructure and one cannot extend the supply-side arguments. Similarly, differences in the quality of service offered are likely to limit demand side switching even where the prices of comparable bandwidths reflect incremental costs.

4.2.4 Finally, we note that while most of the discussion below focuses on a possible break in the chain of substitution and of the product market between the 1 Gbit/s and the 10 Gbit/s services, our arguments apply by extension to higher bandwidth products and to DWDM. While these services may have different cost structures today, the same dynamic arguments around changes to consumer demand and declining input prices mean that one should include these services in the same market as those for lower bandwidths.

Supply side effects

4.2.5 The costs for suppliers to switch between products or offer the full portfolio of products if they already offer one product is minimal:

- The infrastructure (ducts, fibres and buildings) used to deliver services of different speeds is identical. Equipment costs are a much smaller proportion of the overall cost to supply services than infrastructure costs.
- Operating and business support systems (OSS/BSS) are designed to allow different variants of products (i.e. different bandwidths) to be included at little incremental cost.
- Aggregation and core networks can support a range of different end user circuits at different bandwidths. Although higher capacities may require technologies such as DWDM, these technologies are becoming increasingly prevalent.
- Given the convergence in active equipment costs of providing services at 1 Gbit/s to that of lower speeds (and the expectation that take-up of higher bandwidth products is continuously on the rise), the modern equivalent asset[20] equipment at <1 Gbit/s is the 1 Gbit/s equipment as any marginal increase in initial cost over lower speed equipment is more than offset by the flexibility in being able to potentially upgrade customers without a hardware swap.[21] This means that the cost differential to the provider for these different services is

[20] The modern equivalent asset refers to the asset that would be used today to replace an existing asset if the existing asset was no longer usable in order to restore a given service.

[21] Other advantages of employing the 1 Gbit/s equipment to serve customers for all speeds up to and including 1 Gbit/s include the added simplicity of only having to maintain one type of equipment, only dealing with one supplier and economies of scale in purchasing.

essentially zero. The service model today is then for providers to install flexible equipment that scales bandwidth via software (constraining throughput to deliver the lower bandwidth services) rather than a hardware swap out as customers switch services. This means the cost to the CP of switching between these products is negligible.[22]

- Between 1 Gbit/s and higher speeds there is a material increase in the costs of equipment. However, when investing in their networks or points of presence / handovers with other suppliers, the investment (equipment space, racks, power, etc.) is independent of the bandwidth of the Ethernet equipment installed. As such operators can offer both services at and below 1 Gbit/s and services above 1 Gbit/s using common infrastructure and processes and can switch customers between these groups of services incurring only the incremental cost of the equipment itself.

4.2.6 Therefore, a competitor in this market that is able to effectively constrain Openreach for one bandwidth service, must be equally capable (even if it is potentially less willing given its incentives under current market conditions) to compete with and constrain Openreach for any other bandwidth service. We do not consider that any weight should be placed on differences in market participation (the number of connections served at different bandwidths) by rival infrastructure-based providers as the basis for product market definition. As explained in section 3 these differences are the result of distorted incentives due BT's price discrimination.

4.2.7 In terms of a SSNIP test, if prices were at a competitive level, i.e. reflecting incremental costs, a hypothetical monopolist in one product who increased prices for that product materially above the competitive level would stimulate switching from providers of other products, as the margins available would then be greater than for the other products and the costs of switching to provide the product (other than differences in the incremental cost of equipment for VHB services) are immaterial.

Demand side effects

4.2.8 CISBO products are vertically differentiated – with all consumers ultimately preferring a higher speed and the higher quality of service that brings but varying in their willingness to pay for it. Following the EC framework for evaluating demand side effects, in the absence of supply substitution separate product markets should be defined where one observes a break in the chain of substitution.

4.2.9 The standard demand-side approach to evaluate the existence of a break in the chain of substitution is the HMT/SSNIP test. Much of the BCMR appeal process in front of the CAT centred on the appropriate application of the HMT, to identify breaks in the chain of substitution between services of different bandwidths.

4.2.10 In essence the SSNIP test applied on the demand side is designed to test to what extent two products are close enough substitutes to be effectively in the same product market. It asks the following question: if there was a hypothetical

[22] There is some additional backhaul, core, and Internet peering cost associated with high local access speeds – but this is small.

monopolist providing the 1 Gbit/s services and it raised prices by 5%, would so many consumers switch to the 10 Gbit/s speed products that the price increase would not be profitable? If the answer is yes, then the 1 Gbit/s and 10 Gbit/s products are in the same product market.

4.2.11 This test is typically implemented by using data on switching rates in response to price variation to calculate the implied profit loss of the hypothetical monopolist. However, crucially, the HMT/SSNIP should be evaluated at competitive prices. If switching data is only available at non-competitive prices, then one would need to make assumptions about what switching rates would be at competitive prices and using observed behaviour may lead to incorrect results for the SSNIP. In the extreme, if all services were actually provided by a monopolist, the monopolist would already be setting prices at the profit maximising level. Therefore, a SSNIP in any service must be unprofitable regardless of the degree of demand-side substitutability and the SSNIP test would lead to the conclusion that each service was in a separate market.

4.2.12 As described in section 3:

- Current prices are clearly not competitive and Openreach is price discriminating by inflating the price premium higher bandwidth services, both within the <= 1 Gbit/s products where the cost of provision is essentially the same and between the 1 Gbit/s and the 10 Gbit/s service. This is evidenced by the fact that the price differential between the 1 Gbit/s service and the 10 Gbit/s service is not reflective of the incremental cost differentials, which are the difference in active equipment costs, given that the infrastructure used is the same for both products.[23]
- Observed switching rates are not the relevant input to the SSNIP because these are depressed as a result of an artificially high price differential. A 5% increase in the price of the 1 Gbit/s from current prices may not induce a large amount of switching to the 10 Gbit/s service because even under the 5% SSNIP the price differential is still very large. But, were the two services priced to reflect incremental cost differences, a 5% SSNIP is likely to induce significant switching as customers anticipate their future need for bandwidth and bring forward the date of upgrade.
- Therefore the test, based on current switching rates, could result in narrower markets being defined than would be the case with a correct application of the test at competitive prices.[24]

4.2.13 As set out above, one cannot implement the HMT empirically using actual switching rates at current prices. What can we say in theory about the real degree of substitutability between these services?

4.2.14 Under perfect competition, prices would be cost reflective and there would be little, if any, differential in prices at 1 Gbit/s or below meaning that demand would be concentrated in the 1 Gbit/s product. A similar dynamic occurred in the Wholesale

[23] The differences in dig distances for OCPs is further evidence of this difference in margins.

[24] In addition, the test as previously implemented by Ofcom assumes a static environment rather than being forward looking Even at competitive prices, switching rates would be distorted by dynamic effects, such that the response to a price change may be for some consumers to delay migration, rather than resulting in an immediate switching response. Again observed switching may understate the degree of substitutability between products.

Broadband Access market. Prior to the widespread entry of LLU operators, BT differentiated by offering a range of bitstream products offering different bandwidths from the customer to the exchange at different rental prices[25], even though the underlying equipment used was the same. When LLU operators entered and became a competitive constraint on BT, BT was unable to maintain a premium on higher bandwidth services, moving to a product/pricing structure offering a broadband service that operates at the highest speed possible[26] with any remaining price differentiation being based on underlying cost differences reflecting incremental costs for backhaul/peering.

4.2.15 Without a dark fibre remedy[27] a similar collapse in the price differential of CISBO services cannot play out in the market. Consistent with this, Ofcom assumed in the 2016 BCMR decision that the introduction of a DFA product, with a consequent increase in competition at the active level, would result in a sharp reduction in the differential between 1 Gbit/s and 10 Gbit/s services.

4.2.16 Therefore, a break in the chain of substitution would require that consumers who purchased the 1 Gbit/s product under a much smaller competitive price differential would be highly price inelastic. BT has argued that this is the case, that "the nature of demand for VHB services remained distinct from lower bandwidth services and that the increase in demand for VHB services was primarily from new users rather than customers upgrading from the lower bandwidths",[28] suggesting that today's users of 1 Gbit/s services are simply not interested in purchasing a 10 Gbit/s service, regardless of price.

4.2.17 While under current non-competitive prices there may be some differences in the groups buying 10 Gbit/s services and those buying lower speed services, this reflects the fact that Openreach currently has an incentive to raise prices to an extent that only the most inelastic customers remain on the 10 Gbit/s service. But this is not the relevant set of consumers for the elasticity measure used in the SSNIP test – one should consider the elasticity of the marginal consumers under competitive prices, which are likely to be much more elastic.

4.2.18 There is further evidence that points to there being no break in the chain of substitution if prices were at competitive levels.

- For a number of user groups, offered demand at peak hours will scale roughly linearly with the number of individual end users supported, e.g. the number of broadband customers served by a CP at a given exchange, the number of mobile subscribers covered by a mobile base station or the number of users on a LAN. The distribution of preferences for bandwidth for these customers would be continuous, reflecting the distribution of the number of end users by site, with no sharp discontinuities. At a given price differential there will be a threshold number of users above which it will be cost effective to switch to a higher bandwidth to maintain quality of service. If the price differential is

[25] For example IPStream Home 500, 1000 and 2000.

[26] IPStream Max.

[27] Or alternatively competing nationwide infrastructure networks or price regulation that flattened the price gradient.

[28] Paragraph 4.100, Business Connectivity Market Review, Final Statement, April 2018.

increased this threshold will increase, leading to switching to the lower bandwidth;

- On a dynamic basis there are no significant switching costs for changes in capacity at a retail level. While there are some one off costs to capacity increases, as capacity increases over time these will be incurred at some point so a decision to accelerate or defer upgrades reflecting changes in differentials between services has little impact on the total cost of ownership (TCO) when they move from one speed to another.
- We have observed with previous Ethernet generations that when new products come on the market, introduced at an (artificially) high price initially, a small set of consumers take this up; but when the price differential is reduced, migration to the higher speed service follows in a smooth manner with all customers eventually migrating to higher speeds. For example, in the 2016 BCMR Ofcom found a substantial increase in demand for the 1 Gbit/s services since 2013. Higher bandwidth services were being taken up increasingly by typical leased line users, including retail customers. Ofcom's view was that this trend would extend to CISBO services with speeds above 1 Gbit/s over the next review period, especially given the growing adoption of cloud technology by businesses.
- Ofcom also found direct evidence of competitive interactions between the 1 Gbit/s service and higher bandwidth services – CPs were found to be encouraging customers to take up higher speed products, including through reductions to price differentials of VHB products. This suggests a positive cross elasticity at the 1 Gbit/s-10 Gbit/s speed interval even at the current inflated price differentials. Ofcom also presented survey evidence in the 2016 BCMR indicating CISBO service users are price sensitive when it comes to their decision of whether to migrate to VHB services (in both directions) even with the currently inflated differentials.

4.3 Geographic market definition

4.3.1 Ofcom's approach in the 2016 BCMR, which grouped areas based on the number of infrastructure-based operators with a sufficiently dense network, is a pragmatic approach for differentiating between areas with differing competitive conditions, given that Openreach will only face a competitive constraint if alternative infrastructure operators can quickly and relatively cheaply connect to a high proportion of potential customers. However, we consider that an approach based purely on the proximity of customer premises to existing infrastructure (duct) is too high a level of aggregation and the share of premises actually connected to a network will be an important indicator of its density and competitive constraint on Openreach.

4.3.2 While we recognise the need for a pragmatic approach that defines a small set of contiguous areas for the purpose of market definition, our view is that the approach to determining SMP needs to take account of the particular barriers rivals face in deploying a leased line connection which may severely limit their ability to compete for new connections in an area even where they have some infrastructure.

4.3.3 Given that the incremental cost to a CP for connecting a customer premises is a function of distance from existing infrastructure, the distance from the existing network will provide an indication of an operator's willingness to compete for customers at a given price level. Similarly, the number of competing operators in an area will, given imperfect competition, be correlated with increasing pricing pressure.

4.3.4 However, it is important to recognise that for the CISBO market, in contrast to other markets such as wholesale broadband access, the incremental cost for a rival infrastructure-based provider to connect a particular location, even where they have network in the vicinity, is likely to be considerably greater than the cost to Openreach. This is because:

- The CP will have fewer existing connections to premises, so there are fewer instances where existing connections can be used or re-activated;
- Cable entry for additional networks is often more challenging than the first connection, with new duct and cable trays required as well as landlord permission; and,
- CP networks are often further away than Openreach who (given its ubiquitous duct network) will, typically pass immediately outside the customer premises, if they do not already enter the building. The rivals' network will often pass the customer premises many meters further away than Openreach's network (potentially the far side of the pavement, on the carriageway or even across the road) so that they may require wayleaves and traffic management to install the connection, or out of hours working.

4.3.5 These factors drive considerable additional costs for rival providers that impact build / buy decisions and could prevent them from acting as a constraint on Openreach even where they operate in the area.

4.3.6 In addition, if non-cost barriers mean that CPs cannot connect in a reasonable timespan compared to customers' requirements, this will also prevent them acting as an effective competitive constraint on BT.

4.3.7 This means that care must be taken when interpreting the available data on how far OCPs have been willing to dig to connect customers as there will be a degree of selection bias in this data. For example, the sample is likely to be biased towards those customers where dig costs are relatively low or where access to buildings is not problematic. As a result, the fact that a CP has been willing to dig 100 metres to connect a given customer in the past does not mean that a CP would be willing to dig 100 metres to connect all customers. As such the competitive constraint from OCPs will be lower than indicated by the raw data.

Proposed analytical approach

4.3.8 Ofcom has already gathered substantial information on network and customer locations. However, there are some parameters that should be re-evaluated for the 2019 BCMR. Specifically, Ofcom should combine the rich information on locations with better data on the distribution of total costs to CPs of connecting clients at different distances from the nearest point of presence and compare this to the expected forward looking margins available.

4.3.9 Ofcom's framework for assessing variation in competitive conditions was based primarily on the extent of rival infrastructure present in the vicinity of the business premises. However, Ofcom appeared to conflate the market definition and SMP determination stages of the market analysis process. The approach used to identify the set of areas without SMP consisted of applying a simple distance threshold – Ofcom considered all large business sites and calculated the average number of CPs within 100m of premises for each postcode sector, as well as the proportion of business sites that had more than a given number of CPs within those distances.

4.3.10 The market power test applied considered that an area has sufficiently dense rival infrastructure to have effective competition if it satisfies at least one of two conditions:

- Businesses have on average five or more OCPs within 100m; and/or
- Businesses have on average four or more OCPs within 100m and 90% of businesses are within 100m of at least two OCPs.

4.3.11 However, it is not clear that the 100m threshold adequately reflects how close CPs need to be to effectively constrain Openreach's prices to a competitive level. Ofcom will need to better understand the relationship between incremental connection costs for CPs and distance and hence determine how close the CP needs to be to potential customers, on average, to be able to connect to potential customers at a cost that will constrain Openreach's pricing.

4.3.12 The relationship between distance and costs will reflect:

- those premises where the CP is already present, (effectively at zero distance) where the additional infrastructure costs would be similar to Openreach's; and
- for other premises the cost of gaining access to the building and constructing any fibre required between the CP's existing infrastructure and the premises.

4.3.13 For example, the evidence on the share of buildings connected and the costs of building a connection to an unconnected building could feed into an analysis on how close, on average, a CP's existing infrastructure would need to be for there to be an effective competitive constraint on Openreach's prices, i.e. there would be a sufficient proportion of customers where the incremental costs of connecting new customers would be low enough to allow the CP to compete at the competitive level of prices.

4.3.14 This distance threshold would be determined by comparing the one-off incremental cost to the CP of connecting the customer with the annual contribution to fixed costs of Openreach's EAD products (effectively the FAC of the passive assets in the Openreach cost stack). If the resulting payback period of the cost of connecting the customer was sufficiently short (taking into account typical customer lifetimes), then the CP would effectively compete for these customers.

4.3.15 The resulting distance would be an average, taking into account variations in costs. However, there would be some premises closer which could not be competitively served and others further away which could. Applying this threshold to geographical information on the location of customers and CPs networks would show approximately the proportion of customers who could be served competitively (also taking into account evidence on the proportion of clients where

there are such high non-price barriers that CPs cannot gain access in a reasonable time frame whatever the cost).

4.3.16 The challenge is to balance the need to remain pragmatic with the desire to accurately capture variation in competitive conditions. On the one hand, a pragmatic approach cannot be at too granular a level. While the most accurate measure of competitive constraint will be one based on the number of locations connected to multiple networks, an analysis of infrastructure at the level of individual sites would be a hugely data-intensive exercise. In addition, it would also not be pragmatic to de-regulate a set of non-contiguous sub-postcode areas scattered across the geography. For the purposes of defining the geographic markets there needs to be a degree of blurring which results in a reasonably small set of geographic markets that are made up of contiguous postcode sectors (e.g. a city centre).

4.3.17 Ultimately, the segmentation of geographic areas will inevitably require some degree of regulatory judgement in the final boundaries between markets but should have as a starting point an analysis of incremental costs that reflects the features of the market.

4.3.18 One additional consideration for Ofcom, is whether the geographic market analysis needs to reflect the particular features of LLU backhaul and mobile backhaul services. The premises for these customers are typically in different locations to those of business customers, and their connection needs are different as a result. For example, a LLU backhaul customer may be looking to connect two BT exchanges in different towns. In order to serve the customer, a rival provider would need to be present in both the towns making it harder to compete. In contrast, a provider present only in one town could pose some degree of competitive constraint for business customers (it can compete in the town where it is present). Therefore, the intensity of competition depends on network density and structure in a different way for backhaul and business customers.

4.3.19 For mobile backhaul the end point of the circuit may be in a business premises (e.g. a rooftop site) on the public highway (street works) or potentially away from a built up area in the case of rural masts. As such the availability of competing infrastructures and the cost of connections could vary considerably between sites.

4.3.20 In terms of the market power test, which is outside the scope for this report, we note simply that this should be a wider test than that used for market definition which reflected a richer set of indicators of effective local competition. The threshold for an area to be defined as competitive should reflect the set of conditions under which Openreach would not be able to set prices to earn supra-normal profits and consider wider evidence on profitability and drivers of cost for fibre deployment that can vary substantially at the local level. To be clear, Ofcom must not presume that the more competitive geographic areas are sufficiently competitive for there to be no SMP but rather properly test whether Openreach has SMP or not.

5 CONCLUDING REMARKS

5.1.1 Given the cost structure and demand dynamics of CISBO services, it follows that there is a single product market for all CISBO services.

5.1.2 Firstly, this follows immediately from supply side substitution considerations – the degree to which competitors are *able* to compete for customers (given the costs they would incur to connect a customer) does not vary significantly across services.

- If an existing provider already has infrastructure at that location to deliver one speed they can easily use different electronics to supply any other speed on a circuit. OSS/BSS can be upgraded at little incremental cost to supply a new product variant and where necessary core network capacity can be enhanced, e.g. by using DWDM on backhaul links. Thus even where a competitor is not currently supplying a given speed in a given geography, they do form a constraint at that speed.
- The infrastructure to all speeds is common; if a competitor is sufficiently closely located to customers (i.e. its infrastructure is sufficiently dense) to constrain Openreach for one speed, then since the connection costs are similar for all speeds the competitive constraint does not vary for different speeds.

5.1.3 Secondly, on the demand side, once the HMT/SSNIP is applied at competitive prices this would be likely to suggest a single product market for CISBO services. Currently the artificially high price of the 10 Gbit/s service means that only the customers with the highest willingness to pay are selecting to purchase it – these customers have particularly strong needs in terms of large data volumes / high quality of service, which means they are willing to pay the large premium relative to the 1 Gbit/s service. Therefore, at current prices we may observe relatively low levels of switching in response to a SSNIP. However, at competitive prices, with a much smaller differential, there would be a large group of relatively elastic customers spanning the 1 Gbit/s and 10 Gbit/s services and we would observe higher levels of switching which would undermine a SSNIP.

5.1.4 The geographic market definition should also reflect supply side factors following a similar approach to that in the 2016 BCMR. The parameters used to segment the geography according to the likely intensity of competition faced by Openreach in the local area should reflect the differences in incremental cost faced by Openreach's competitors. Much of the required information on the availability of competing infrastructure already exists - Ofcom has a rich dataset on the location of premises and network infrastructure across the UK.

5.1.5 The distance thresholds applied need to reflect factors (in addition to distance) that influence the effectiveness of the constraint from rival providers on Openreach. Given the high infrastructure cost to these CPs of connecting customers that are located nearby, even for relatively short distances, the constraint is much stronger where a CP is already at the premises than where it is not yet connected. Therefore, one factor to incorporate into the assessment of geographic market definition is the proportion of connections of rival CPs in the area. In addition, the test for finding a lack of SMP should be carried out separately from the geographic market definition and consider a broader set of indicators of competitive conditions (such as profitability and other drivers of cost for fibre deployment).

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