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Improving network industries regulation

Policy towards competition in high-speed broadband in Europe, in an age of vertical and horizontal integration and oligopolies

Project Report

Richard Feasey (University College London)

Martin Cave (Imperial College London)

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Centre on Regulation in Europe (CERRE) asbl
Rue de l'Industrie 42 Box 16 - B-1040 Brussels - Belgium
Ph: +32 2 230 83 60 - Fax: +32 2 230 83 70 – info@cerre.eu **–** www.cerre.eu

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About the authors

Richard Feasey is a Research Fellow at CERRE. He consults, writes and lectures on telecommunications policy and strategy. He is currently an Associate at Frontier Economics, an adviser to Wiley Rein LLP, and to various companies in the sector. He was an adviser to the House of Lords on their recent enquiry into the regulation of online platforms and lectures at University College and Kings College, London. He was, until 2013, the Group Director of Public Policy at Vodafone plc.

Martin Cave is Joint Academic Director at CERRE. He is a regulatory economist specialising in the regulation of network industries, especially the communications sector. He is currently a visiting professor at Imperial College Business School, having formerly held chairs at Brunel University (in the Department of Economics), at Warwick University (in the Business School), and at LSE (in the Law Department). He has written a number of books and papers on aspects of communications regulation, including *Spectrum Management: Using the Airwaves for Maximum Social and Economic Benefit* (Cambridge University Press, 2015), co-authored with William Webb.

Executive summary

Europe should remain on the path towards effective competition in telecoms markets which it embarked upon in the late 1990s. As competition expands, so regulation should recede. The extensive deployment of high-speed FTTH and HFC networks, which feature in the Commission's vision of a 'Gigabit Society', should be seen as, and are likely to be, a consequence of policies which promote network competition. The transition from standard DSL to high-speed broadband technologies has already provided an opportunity for significant entry by new firms employing FTTH and HFC technologies, but European policymakers can and should do more to prioritise network competition in the next period.

Competition will not deliver high-speed broadband of the same quality to everyone in Europe. It is not clear to us that a uniform, pan-European high-speed broadband capability is either achievable or desirable in the way that universal narrowband voice telephony provision was. The pursuit of such an objective would be likely to require billions of euros of public subsidy, for which there is no clear political support in Europe and about which there has yet to be sufficient public debate.

Nonetheless, it is likely that the next decade will see much higher levels of public subsidy of broadband network infrastructure than in the past. It is essential that the European taxpayer obtain value for money from these investments. This will be best ensured if policymakers have ensured that there are a number of competing providers of high-speed broadband networks in each Member State to whom subsidies can be directed.

The 'unbundling' model, which has been employed to promote competition since the Framework was adopted in 2002, continues to command widespread support in Europe despite self-evident challenges. It needs to be adapted to the high-speed broadband era. Instead of deploying their own DSLAMs and modems, entrants now need to be able to deploy their own fibre connections to households and businesses. Some entrants will be able to do this by exploiting synergies with other civil engineering assets, such as ducts and poles, which they already own. Others will require access to the civil engineering assets of the SMP (Significant Market Power) telecoms operator or to the assets in utility or transport networks. Regulators should ensure that access to such 'passive assets' is provided wherever feasible, either as part of the market review process or through the application of the Broadband Cost Reduction Directive.

Promoting competition through the exploitation of economies of scope (horizontal integration), or through unbundling the civil engineering assets of the vertically integrated SMP firm, ought to be accompanied by a significant simplification of other elements of the current unbundling regime. Although 'active' access products should remain as a remedy to safeguard downstream competition when network competition is not viable, regulators should not attempt to create intermediary markets for various high-speed broadband wholesale products, as they have done

when applying their version of the 'ladder of investment' hypothesis in the past. The associated multi-level margin squeeze tests between each rung of the ladder would thus be dismantled.

Competition between a small number of vertically integrated firms – often two - ought to mean that properly competitive wholesale markets can replace wholesale markets that have been designed by regulators. This is important when, as we expect in many cases, there will be insufficient vertically integrated networks to ensure effective competition in the downstream retail market without there also being wholesale supply as well. Under monopoly conditions, wholesale supply – unbundling of copper and of ducts – has been delivered by regulation rather than by the commercial actions of firms. The result is that the regulatory framework to date has produced wholesale supply, but it has failed (despite various attempts) to produce wholesale competition. This leads us to the view that competition in both wholesale and retail markets should be key ambitions in the next period.

Regulators should encourage the development of competitive wholesale broadband markets as well as additional network entry, and should be prepared to remove existing regulation when they emerge. Without the development of such competitive supply at the wholesale level in network duopoly markets, we see limited prospect of the kind of regulatory withdrawal we should be aiming for in the next period.

This means, for example, that if regulators find evidence of reasonable commercial offers being made by network duopolists, they should consider removing SMP designations and not simply moderate the access obligations as they do today. The Commission should provide further guidance on this in the revised SMP Guidelines rather than in recitals of the proposed Code. More thought also needs to be given to the incentives of those in a position to accept such offers, so as to ensure that regulation does not deter them from doing so and inhibit the development of the market.

The market review process continues to define markets on a national basis when this is increasingly inappropriate. It results in firms being found to have SMP when this would not be the case if competitive conditions were examined on a local basis. Regulators need the tools to examine competition on a local basis if this is appropriate, as is increasingly the case. Regulators also need the tools to continue to regulate vertically integrated firms which form part of a local duopoly or oligopoly when it is appropriate to do so. This is more challenging than regulating a vertically integrated network monopolist, but neither BEREC's proposals for a new 'tight oligopoly' test, nor the expansion of 'symmetric regulation' proposed in Article 59 of the new Code, are an appropriate response to this challenge. Instead, the Commission needs to work harder to persuade regulators and Member State Governments that the existing framework can be effectively applied when a small number of firms jointly hold Significant Market Power. Again, this should be done through revision to the SMP Guidelines.

High-speed broadband deployment may be extended through collaboration rather than competition amongst downstream competitors. The governance arrangements for such

undertakings might substitute for regulatory obligations, for example by replacing rental arrangements with ownership arrangements. This may result in more effective competition in downstream retail markets. However, horizontal agreements between potential competitors (including reciprocal access arrangements) should also be subjected to close scrutiny by the competition authorities. Whether they are allowed to proceed will depend, amongst other things, on the nature of the assets to be shared and geographical regions to which such agreements apply.

The Commission's latest proposals to replace the existing Framework with a new Code are generally consistent with the recommendations we make in this study. However, we think the Commission should be bolder in ensuring that regulators withdraw altogether from wholesale markets which are functioning on a commercial (i.e. competitive) basis and should avoid any temptation to extend existing 'symmetric' access obligations. At the same time, the Commission should critically assess co-investment and other agreements to ensure that they enhance rather than detract from competition, providing appropriate guidance to firms when doing so. The Commission also needs to provide further guidance on the application of the existing SMP framework to oligopolistic broadband markets in which firms may jointly hold SMP. The Commission should also consider how the broadband State Aid guidelines might be adapted to support the aims of the new Code, since the substantial sums of public subsidy which the Commission envisages represent a powerful means by which to influence the conduct of recipients.

We note that many of the tasks we have identified in this study are best undertaken by DG Competition, which we think should (re)engage with telecoms policy as they did when the Framework was originally developed prior to 2002. This would also ensure that the changes that are being proposed remain true to the original objective of replacing ex ante regulation with competition.

1. Introduction

The aim of this study is to better understand how policymakers might promote competition, and what form such competition might take, in high-speed broadband networks in Europe over the next 10 or more years. Our focus is therefore largely confined to fixed communications networks and markets, although high capacity fixed connections also represent an important input in wireless markets, an importance which may increase with the deployment of 5G technologies.[1]

The study assumes that policymakers are in the business of promoting competition. This has been a defining feature of the European Commission's efforts to improve the performance of telecommunications and other network industries since the 1980s. It is a key research interest for CERRE across a range of sectors. The 2002 Framework for Electronic Communications, which underpins most regulation in the telecommunications sector today, requires the national regulators to 'promote competition' in both networks and services.[2] The Commission's latest proposals make some small adjustments to the 'competition' objective (by requiring the promotion of 'efficient infrastructure competition'[3]) but do not fundamentally alter its core purpose. The aim for almost 20 years has been to extend competition and allow for the gradual withdrawal of regulation. Competition and regulation ought to be inversely correlated. We assume these will remain the objectives of European telecoms policy.

The more interesting questions arise not from whether competition is an appropriate objective for regulators to pursue, but in what it might actually mean, how it might relate to other objectives, and how it is to be 'operationalised' under any particular set of conditions. Much of the debate amongst policymakers and regulated firms over the past decade has been concerned with the appropriate balance to be struck between two concepts. Firstly, the concept of promoting competition across the entirety of the value chain by encouraging the creation of new vertically integrated competitors to the owner of the existing copper infrastructure. Secondly, the concept of promoting competition in downstream markets by imposing a set of access obligations on the copper network owner. Both represent forms of 'competition', but each has different merits and may be appropriate in different circumstances. We want to explore how these questions might be tackled under the conditions which are likely to prevail over the coming decade.

Another debate in recent years has involved the question of whether competition - whether in networks or services - has been promoted at the expense of other objectives, such as encouraging greater investment in networks or in particular types of networks such as those

[1] Fibre to the cell site may be particularly important for some very low latency applications that are envisaged for 5G, although wireless fronthaul and other technologies may also be used.
[2] Article 8(2).
[3] Article 3(2) at https://ec.europa.eu/digital-single-market/en/news/proposed-directive-establishing-european-electronic-communications-code.

delivering fibre to the home. In this case, it is important to distinguish carefully between means and ends. Although it is presented as being an objective, we regard competition as being a means of achieving various economically desirable outcomes, such as lower prices, more efficient utilisation of assets and innovation in new goods and services. Investment is not an objective in itself, and there can be inefficient investment just as there can be inefficient competition.

These questions arise because regulatory interventions that are intended to promote competition may distort and direct the market in particular directions and away from others. They may promote some types of investment and not others. Regulation is not, in that sense, 'neutral' and decisions about trade-offs have to be recognised and made. This is implicit in the debate about whether service competition should be preferred over network competition (or vice versa). It also underpins concerns (more often expressed in relation to the mobile sector) that regulators can intervene to promote 'unsustainable' levels of competition by helping firms to enter a market when they would not otherwise be able to or by making it difficult for them to exit thereafter.

Our central question is 'how should policymakers seek to promote competition in high-speed broadband markets in future?' We do not propose to wholly disregard the 2002 Framework when doing so, but rather to consider what further changes to that Framework should be considered to reflect changes in conditions or objectives. The European institutions are undertaking a similar task at the time of writing, and this study is intended to make a contribution to that debate.[4] Accordingly, we start with a brief review of how policymakers have approached this task since the current regulatory Framework was first adopted in 2002 (we see no reason to reach back beyond then). Understanding what has happened thus far is useful when considering what to do in future, not least because there is a strong element of 'path dependency' in regulation. That is, the choices available to policymakers today and tomorrow will, to a greater or lesser degree, be determined by the choices that they have made in the past. However, it is also important to understand when significant changes are proposed, since regulatory certainty and predictability is also an important, although not absolute, aim in policymaking.

Having reviewed the recent past, we then discuss what we consider to be the most significant developments in broadband markets in Europe in recent years. These establish the conditions under which policymakers must now operate. We are interested to understand whether new conditions might create new opportunities or risks, whether they establish new trade-offs for regulation, or whether they allow for the promotion of new models of competition.

The title of the study refers to some of the changes we have in mind, although the reference to 'vertical integration' is intended to remind us that some things may not have changed much.

[4] European Commission, European Single Market, Digital Economy and Society, Proposed Directive establishing the European Electronic Communications Code (https://ec.europa.eu/digital-single-market/en/news/proposed-directive-establishing-european-electronic-communications-code).

That is, whilst policymakers in other parts of the world have sometimes viewed the transition from narrowband to broadband networks as an opportunity to radically restructure the industry, and to structurally separate the ownership of the network from the retail activities which are undertaken over it, Europe has not chosen this path.

European regulators have instead continued to wrestle with the challenges of vertical integration for almost 20 years. The vast majority of this effort has been devoted to ensuring that a single vertically integrated firm, the 'incumbent' owner of the copper network, provides access to wholesale inputs for third parties on terms which are deemed necessary to promote competition in a relevant downstream market. The transition from narrowband copper services to broadband services has not fundamentally changed the nature of this challenge, despite the emergence of new vertically integrated competitors, such as HFC cable or FTTH networks.[5] This raises the question of whether there are alternative approaches, including significant deregulation, or whether the scope of regulation might instead extend to include other such firms.

Horizontal integration is a more recent phenomenon as firms have sought to bundle together complementary products, initially fixed telephony and broadband, but now TV and mobile services as well, or to combine network and other assets to realise economies of scope and cost savings. The realisation of economies of scope[6] has become a basis for entry into high-speed broadband markets, attracting a wide range of firms from outside the traditional telecoms sector or outside the fixed broadband market. The requirements of 5G mobile networks, which involve significantly greater use of high-speed broadband connections, appear likely to contribute further to such trends. Such horizontal integration raises a variety of new and interesting issues, but our principal concern in this study centres on the interdependencies between rivals who may then depend upon each other for various wholesale inputs (and the implications this has for downstream competition). Horizontal integration might therefore be seen to further compound the challenges which regulators already face when regulating vertically integrated firms and input markets.

The title also refers to oligopolies as being a feature of the broadband environment. We consider, as did the Commission in 2002, that oligopolies are an inevitable consequence of efforts to promote competition in telecommunications markets and, in this sense, are evidence of the success of the policy in moving away from monopoly and towards effective (although never perfect) competition. Attempts to promote entry in markets characterised by high fixed

[5] Hybrid Fibre Coaxial' and 'Fibre to the Home' respectively.

[6] 'Economies of scope' arise when there are a cost-saving externalities across product lines, so that costs are reduced when two or more products or services are supplied together rather than separately on a 'stand-alone' basis. They might arise in both network and retail activities. Thus costs can be saved if the same network delivers both voice and data, and a firm with a customer base in mobile services might be well placed to acquire fixed broadband customers at a lower cost than one without. Clearly economies of scope can (and, in broadband networks, do) co-exist with economies of scale, which arise when the average cost of production of a single service falls as its level of output rises.

costs was always likely to produce an oligopolistic market structure involving relatively few firms. Indeed, such an outcome is likely to be necessary if firms are to be able to earn sufficient margins to recover their fixed costs.

We think it is important to recognise that the job of regulating under conditions where oligopolies are prevalent is more difficult than regulating in the earlier period when the primary aim was to introduce competition into monopolistic markets, or some later period where competition has fully taken root and there is agreement that sector specific regulation is no longer needed. The 'oligopolistic' period of the industry's development, in which we now find ourselves in many markets, is the most challenging but also the most interesting. Regulation could diminish or expand, depending on the approach taken.

Finally, it is important to clarify the role and aims of this study in relation to the proposals published by the European Commission in September 2016. Many of the industry trends and regulatory challenges which we identify in this study appear also to have informed the Commission's thinking and that of its advisers.[7] It would be surprising and worrying if they had not. However, our study is not intended to duplicate nor to critique the work undertaken by the Commission or the proposals that have resulted from it. Where we think our findings are relevant to particular aspects of the Commission's proposals, we highlight this and explain why. But we also aim to discuss how we arrived at the position we find ourselves in today, so as to provide some context for the debate, and to discuss policy issues and options which the Commission may not have considered, or which it may have discarded prior to publishing its proposals. In that sense, our study is intended to help readers understand why the debate about competition in high-speed broadband is so interesting and so important, and to allow them to better assess for themselves the policy proposals that will be advanced by various parties in the coming months.

The study is structured as follows:

- In the next section, we provide a brief overview of the application of the telecommunications regulatory framework since 2002, including key lessons that might be drawn from it.
- We then examine how conditions have changed in telecommunications markets, and in broadband markets in particular, in recent years and how it might change in the foreseeable future. We focus on the key developments relevant to policymaking.
- We then discuss the implications that the changes in conditions might have for policymaking and for the existing European regulatory framework, given the aim of promoting competition. We discuss both how policymakers have already sought to adapt to the changes we identify, and how they might do so in future.

[7] In particular, the study by WIK et al, Regulatory, in particular access, regimes for network investment models in Europe, (http://bookshop.europa.eu/en/regulatory-in-particular-access-regimes-for-network-investment-models-in-europe-pbKK0216677).

- We then make some brief recommendations, providing comments where appropriate on how our views might relate to the current Commission proposals.

2. The application of the European telecoms regulatory regime since 2002

In this section, we provide a brief overview of relevant policy issues that have arisen from attempts to apply the existing European telecoms regulatory regime since 2002. This is not intended to present a comprehensive summary of all issues, nor provide a detailed history, but to inform our later consideration of the challenges which European regulators and policymakers are facing today and are likely to face in the next 10 years.[8] As already noted, there is a high degree of 'path dependency' in regulation, meaning that it is important to understand why we have arrived at the present position before we consider what we might do in future. History also has a habit of repeating itself.

In 2002, broadband services were still in their infancy in Europe, a Europe which consisted of only 15 Member States. All Member States had extensive copper infrastructures that were owned by a single, vertically integrated national provider in each. Some also had significant HFC cable networks (most of which still required significant upgrades to support broadband services), but others did not. 3G mobile broadband services were anticipated, but were not well developed. Digital Subscriber Line (DSL) technologies were maturing and allowed those with access to copper access lines to provision them for the delivery of 'always on' broadband connectivity at speeds which were significantly greater than anything experienced previously by most consumers and many businesses.

Prior to 2002, the deployment of competing, independent access networks (to compete with the copper network owner) had been largely confined to urban areas and to larger corporate users. Technologies such as fixed wireless access, which might have competed with the copper network in rural and consumer markets, had not been successful. Prices for mobile services were too high to represent viable substitutes for fixed voice calls. Competition in the consumer market was therefore still largely confined to competition for voice traffic, chiefly for international and national calls where prices had been high in the past in order to subsidise below cost access charges or line rentals. Customers were accessed using a wholesale 'carrier pre-selection' service that was purchased from the copper access network provider on a minute by minute basis, and the traffic then carried on the competitors' own national or international facilities. Conditions became more challenging as prices and margins for voice calls were driven lower, but opportunities for entry into local access markets (which might have appeared more attractive as the vertically integrated firms 'rebalanced' their prices) appeared rather limited and the barriers to entry rather high.

Some Member States, such as Germany, had required the copper network owner to 'unbundle' their network since the 1990s, but with very limited take up (unbundling to provide narrowband

[8] On the origins and early history of the 2002 regime, see Richard Cawley, The New EU Approach to Sector Regulation in the network Infrastructure Industries, 2007.

services was challenging whilst retail access line charges remained subsidised). That meant that by the time the Commission published a Communication on unbundling in 2000,[9] seven out of fifteen Member States already had some form of obligation for the owner to unbundle the copper network. The Commission was therefore in the position of 'scaling up' and promoting models of competition which had already been adopted in some Member States, so as to apply them across the Union as a whole. The Communication and the Regulation which followed it (in December of that year[10]) confirmed that unbundling was a key element of Commission and then European telecoms policy, providing the basis for much of the next 15 years of regulatory activity and debate.

The Commission's approach was initially shared by policymakers in the United States, who had adopted an 'Unbundled Network Elements' (UNE) policy in the 1996 Telecommunications Act. In both cases, regulators required the copper network owner to allow third parties to lease various passive 'network elements' or assets in their access network. The most important of these was the dedicated copper line or lines which ran between the local exchange and the household, although there were also various other facilities (and services) associated with the provision of 'unbundled local loops' or ULL.

A very important consideration in this approach was that it removed the capacity of the SMP operator to control the rate at which new technologies might develop and be deployed in the broadband market. This had not been a relevant consideration for competition in voice telephony, where the technology was mature and differences in quality more difficult to detect.[11] In contrast, the DSL standard was still an evolutionary technology, the limits of which were unknown at the time (or indeed today). Some DSL technologies were rapidly adopted by the SMP firm as customers revealed an appetite for broadband services (and as profits from traditional voice telephony continued to be eroded by competition), but others, such as 'symmetric' DSL (SDSL), threatened to cannibalise existing revenues from other technologies, such as traditional leased lines. In such cases, the SMP operator had little incentive to promote technologies like SDSL or to deploy them within its own network. Allowing third parties to attach their own SDSL modems to the unbundled copper loops was therefore seen as an important enabler of competition in markets for business data services.

Unbundling also required the downstream competitors to invest more heavily in their own network facilities than had been the case when providing voice services through carrier pre-selection. It was therefore seen as a step towards network competition, even if there were different views about how great a step it might be. Competitors were required to install their own DSLAM[12] equipment in space that was made available at each local exchange, and to obtain

[9] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32000Y0923(02)&from=EN.
[10] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32000R2887.
[11] There was some quality-based competition in voice telephony in the 1990s and early 2000s, particularly for international calls where operators would trade off price and quality using contention ratios.
[12] Digital Subscriber Line Access Multiplexer.

backhaul circuits which allowed them to carry traffic from that location to their core network. These represented quite large fixed costs, the recovery of which would depend on the number of customers which could be served from each exchange. However, the fact that demand for DSL broadband was relatively immature, that prospective unbundlers often did not have an existing base of customers who they could be confident of recruiting, and that several competitors might all seek to unbundle the same exchange all contributed to uncertainty about the number of customers which a new entrant might expect to obtain at any given exchange.

This meant that the economics of deploying broadband services using unbundled local loops varied significantly by geography, since there were often large variations in the total number of lines terminating at a particular exchange, as well as significant differences in the likely retail market share which a new competitor might hope to achieve. This meant that, unlike earlier competition in voice services which had occurred across the entire network, competition for broadband services was more localised from the outset. In some cases, the density of lines meant that the SMP operator itself struggled to make a business case for installing DSL equipment (with the result that truly national deployment of DSL technologies took many years in most Member States and some required public subsidies to achieve). In other cases, the SMP operator was confident of obtaining sufficient market share to be able to deploy DSL technologies in the local exchange, but potential competitors were not.

In order to address this issue, regulators required the SMP operator to offer a 'resale' or 'bitstream' product at a higher aggregation point in the network. From the outset, this was regarded as an inferior form of competition, since in this case the SMP operator retained control over the technology deployed and so the opportunities for differentiation on anything other than price were more limited. Nonetheless, it was seen as providing some form of competition in broadband services (at least at the retail level) for those living in more rural areas. It was also seen as being a necessary 'stepping stone' towards the unbundling of more exchanges. The hypothesis, closely associated with one of the authors of this study, was that as competitors gained retail market share using lower risk 'resale' or 'bitstream' products, so more and more local exchanges would become viable to unbundle.[13] Customers who had previously been served using 'resale' or 'bitstream' products would then migrate to and benefit from the full unbundled service.[14] As the Commission noted in 2000, it ought to be possible for regulators to set prices which would reflect the relative risks of each option, allowing firms to make an undistorted choice of whether and when to migrate from one product to the other:

[13] Cave, Martin. (2006) Encouraging infrastructure competition via the ladder of investment. Telecommunications Policy, Volume 30 (Number 3-4). pp. 223-237. This account did not envisage that all access products would be permanently available. Instead, as infrastructure investment occurred, more comprehensive access products would be withdrawn or priced out of use. As shown below, a more restrictive access policy of this kind now enjoys increasing support.

[14] It was also suggested that there would also be more effective competition in areas which could be unbundled economically, since the ability to offer a resale or bitstream service in other areas allowed competitors to advertise services in national media (when they would not otherwise have been able to do so).

> "In order to achieve the aim of increased consumer choice the economic incentives created by the policy framework, in particular the pricing methodology, must encourage all operators to make appropriate investments. Thus when priced at a level that does not distort the 'make or buy' decision of an entrant, local loop unbundling can encourage long term infrastructure competition by allowing entrants to test out the market before building their own infrastructure, and can encourage a more competitive and innovative market for simple voice telephony and the roll-out of local broadband (high-speed) services."[15]

Although persuasive in theory, the policy proved quite challenging to implement in practice. It was clear from the outset that the incentives of those competing with the SMP operator to substitute unbundled loops for the 'resale' or 'bitstream' entry-level products would depend upon the relative pricing, the risks and the ease of use in each case. If the entry level products were priced too low and unbundling were seen as too risky or difficult to implement, then firms might never migrate up the 'ladder of investment'. On the other hand, if the margins on the entry-level products were too narrow, firms might never enter or attain the scale to contemplate further network investment.[16]

To avoid the risk that firms remained stuck on the bottom rungs of the ladder, it was suggested that a graduated set of pricing adjustments should set entry level prices low at the outset (to induce entry) but raise them over time (to induce migration). As sufficient entrants began to unbundle exchanges, it was hoped it would then be possible to withdraw from price regulation of resale products, and perhaps bitstream, as competitive wholesale markets for such products developed amongst the SMP firm and the unbundlers. This led some regulators to develop complex multi-level margin squeeze tests – many of which are still in operation today – which were intended to ensure that the price differentials between different wholesale products were sufficient to enable competition in each intermediary market. It was, however, very difficult in practice for regulators to determine when adjustments to relative prices should be made, given that different firms entered the market at different times and achieved different market positions, nor exactly how the prices of different wholesale products should relate one to the other. Accusations of 'margin squeeze' by the vertically integrated firm have been quite a prominent feature of broadband competition since 2002, with the European Commission's Competition Directorate imposing fines of increasing magnitude on telecoms firms who were

[15] EC 2000/C272 para 3.1.

[16] We refer in this report to 'economies of scale' in relation to returns on investments in broadband network assets such as DSLAMs, which involve fixed costs (or which are at least 'lumpy'). If a firm already has a significant share of retail subscribers in the downstream market then the prospective returns on network investments will be higher and the corresponding risks lower as a result of such 'economies of scale'. This is contrast to 'economies of scope' , which refer to the ability of a firm to share fixed costs amongst different services.

found to be engaging in such practices since that date.[17] At the same time, examples of meaningful competition in intermediary wholesale markets for copper broadband services have been rather limited.

Aside from requiring a very complex wholesale pricing regime, the model also required significant engagement by regulators in the process to resolve concerns about non-price discrimination on the part of the vertically integrated SMP firm. Unbundling literally required the co-existence of the network owner and its rivals within the same physical premises. This created obvious tensions, as employees of the former monopoly operator were often reluctant to co-operate with people who they had not had to deal with before and who were competitors. There were numerous opportunities to disrupt or delay services, with very low prospects of detection and without impacting the services provided by the network owner themselves. There were numerous complaints about non-price discrimination – delays in fulfilling orders or fixing faults – which have proved very challenging for regulators to resolve. Doing so required the development of detailed performance measurement systems which had not previously existed and without which it was impossible to adjudicate on complaints. Often it was difficult for regulators to distinguish between complaints about general performance (which might be poor but might affect everyone, including the network owner's own retail services) and discrimination (which might involve the same poor performance, but in this case only for rival services). Even when clear cases of discrimination could be identified, it was still difficult for regulators to determine who was at fault. Many processes, such as ordering new lines, require actions by both parties and effective communication between them. There is a natural tendency to assume that the other party is at fault, but it was often difficult and very time consuming to determine the true facts.

Despite these challenges, one of the interesting features of the European debate is that a broad consensus amongst European policymakers (and indeed many firms) in favour of the unbundling model has been sustained for such a long period. This contrasts with the US experience, where the US regulator, the Federal Communications Commission (FCC), first encountered difficulties in implementing the UNE policy in the face of a series of adverse rulings by the Courts (or challenges which resulted in protracted delays). It then largely abandoned the approach altogether by 2005 in the face of growing disagreement amongst the Commissioners as to its merits. Australia and New Zealand also pursued unbundling before moving in radically different directions. In contrast, the resolve of European regulators and policymakers to apply unbundling as a model for broadband competition has remained relatively firm to this day.

This support remains in spite of the fact that non-price discrimination has remained a constant source of friction between network owners and competitors, and a constant challenge for European regulators. The Commission has made various attempts to strengthen the hands of national regulators in tackling non-price discrimination, most notably by introducing a

[17] For a summary of cases, see European Commission, Competition, Telecommunications, Broadband (http://ec.europa.eu/competition/sectors/telecommunications/broadband_en.html).

'functional separation' remedy in the 2008 revisions to the Framework (which no European regulator has since taken up) and then by requiring 'equivalence of input' (and a range of associated performance measures and sanctions for non-performance) for next generation access (NGA) products as a part of its 2013 Costing Recommendation.[18] Ofcom, the UK regulator, has probably invested more time and energy than anyone in trying to deter and police non-price discrimination by BT, being the first European regulator to impose a 'functional separation' remedy in 2005. The assumption was that BT's network business, Openreach, would be incentivised to improve its own performance if BT's own retail divisions relied upon the same products and processes as its rivals – known as 'equivalence'. However, there have been concerns about Openreach's performance ever since 2005, with some claiming that this affects all retail providers (including BT's own operations) and rivals claiming that it still has a discriminatory effect. Coming to a clear conclusion on these claims and counter-claims is, we suspect, an impossible task. The debate is ongoing, with Ofcom now proposing to deepen the separation of BT to full 'legal separation' (under which Openreach would be governed by an independent Board and run by independent management, albeit whilst remaining a subsidiary of BT Group).[19] If legal separation happens, it will be the first case of such a measure in Europe.

The effect of regulatory price setting on competitive entry and movement up the 'ladder of investment' has proven less challenging. Entrants have migrated from 'resale' and 'bitstream' products to 'ULL' in most Member States, with a significant acceleration in the rate of growth after about 2005 (the year in which the number of new unbundled loops first exceeded the number of resale or bitstream lines).[20] This has allowed wholesale prices for the former products to be fully deregulated in a significant number of Member States (Sweden, Romania, Netherlands and Austria) and deregulated in most urban areas in others (Spain, Poland and the UK). The rationale for deregulation has been that there is sufficient competition in the downstream retail market rather than because those unbundling the exchanges have begun to sell resale or bitstream products to other parties or otherwise contributed towards the development of a functioning wholesale market.[21] New entrants have tended to remain vertically integrated and have relied exclusively upon their own retail activities to exploit whatever network investments they have made.

[18] European Commission Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=2735).
[19] Ofcom, Strengthening Openreach's strategic and operational independence, Proposal for comment (https://www.ofcom.org.uk/__data/assets/pdf_file/0022/76243/strengthening-openreachs-strategic-and-operational-independence.pdf).
[20] Sophie BISMUT, Unbundling in Europe: Recent Trends (http://www.idate.fr/fic/revue_telech/161/CS63_BISMUT.pdf). Resale and bitstream remain significant in a small number of Member States such as Slovakia, see Europe's Next Generation Networks: The Essential Role of Pro-Competitive Access Regulation (http://www.dotecon.com/assets/images/160823_ief_procompaccreg_01.pdf), p.22 and WIK et al, p.222.
[21] There are exceptions. For example, BT in Ireland currently provides wholesale DSL services to Vodafone and Sky from it ULL platform.

In some cases, entrants have migrated to ULL by installing their own facilities alongside those of other competitors. In other case, the migration has occurred through mergers amongst those retailing broadband services. For example, a firm which has already unbundled a large number of exchanges can expect to improve their financial returns on assets by acquiring the retail customer base of a firm which currently relies on reselling services and migrating those customers onto its own platform. Many such transactions have occurred amongst DSL service providers in recent years -including some acquisitions by the incumbent copper network owners (e.g. BT acquired Plusnet in 2007). Regulators and competition authorities have generally appeared content to allow such consolidation, although some larger and more recent transactions – such as Orange/Jazztel and Vodafone/Ziggo– have involved divestitures of assets or customers as a condition of approval.

There might still be room for debate about whether the rate of migration to fully unbundled exchanges might have occurred more quickly in some Member States if wholesale pricing had been different or other obligations had been withdrawn. However, this does not strike us as likely to be a particularly productive line of enquiry. We have already noted that the incentives to move from one set of wholesale arrangements to another will depend on a variety of factors, including the non-price and other operational challenges associated with each product, as well as the broader competitive conditions (for example, the presence of cable appears to have had an important (negative) influence on the adoption of ULL). Our view is that the scaling of unbundling in Europe after 2005 is as likely to be attributed as much to the 'industrialisation' of the processes (and the consequent reduction in frictions and costs) as to the evolution of wholesale prices over time.

This brings us to the final aspect of unbundling policy which was not fully anticipated at the time of adoption in 2000. As already noted, the initial focus of the policy was on creating conditions to promote entry and investment by new competitors to the existing, vertically integrated owner of the copper network. The price of unbundled local loops (and associated facilities) was set by regulators to achieve that objective, although a variety of costing methodologies were adopted by different Member States to do so. As entrants initially proved reluctant to migrate from other wholesale products to ULL, as was the case until around 2005 (at which point only 0.8% of all lines in Europe had been unbundled), the tendency was for regulated ULL prices to fall - and fall faster than any underlying movement in costs. This was often achieved through adjustments to the costing methodology employed by the regulator or a revaluation of the network assets.[22]

As wholesale prices fell and as DSL technologies continued to evolve, copper network owners and policymakers became increasingly concerned about the impact of ULL pricing on investments that might need to be made by the incumbent network owner to further upgrade

[22]See Pricing Methodologies for Unbundled Access to the Local Loop (http://ec.europa.eu/competition/sectors/telecommunications/archive/inquiries/local_loop/pricing_open_loop.pdf).

the performance of its network. These upgrades generally required the deployment of fibre to street cabinets in support of a new generation of VDSL technology[23] or the deployment of fibre all the way to the home itself (FTTH). The network owners had two concerns – that the methodologies applied when setting the prices of existing local loops might be extended to their new investments, despite the latter being much riskier and having yet to recover any of their costs; and that the retail prices for broadband services that were established by the ULL regime would also constrain the prices (and hence returns) that might be available from new technologies.

The relationship between wholesale prices across different technologies, and their implications for the incentives of different parties to invest, has proven to be perhaps the most intractable aspect of the Commission's broadband policy since 2000.[24] For a number of years European regulators assumed that reducing ULL wholesale prices would yield unambiguous benefits in the form of lower consumer prices and greater competition in broadband retail markets. This could partly be explained by the fact that technology benefits and upgrades could be achieved through the deployment of new DSL standards in DSLAMs and in modems, neither of which required or assumed significant investment in the copper access infrastructure itself. In such circumstances, regulators could rely upon competition from unbundlers of the existing copper network to incentivise the owner of that network to invest in its own broadband facilities or risk losing customers.[25] In time, however, it became clear that further improvements in broadband performance in Europe would also require further complementary investments in the access network infrastructure itself, and not just in the network electronics and modems.

The Commission first wrestled with these issues in the late 2000s, producing the first NGA Recommendation in 2010 after three years of difficult debate.[26] That Recommendation largely

[23] Very High Bit Rate Digital Subscriber Line.

[24] See WIK et al pp.213-215, or Annex 1 (pp. 42-46) of BEREC at (http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/6488-berec-report-challenges-and-drivers-of-nga-rollout-and-infrastructure-competition) for overviews of the current academic literature. Authors have examined the relationship between unbundling policies and total levels of network investment, see Carlo Cambini and Jiang Yanyan. "Broadband Investment and Regulation. A Literature Review" Telecommunications Policy Vol. 33 (2009). Empirical studies of the relationship between unbundling and investment in 'NGA' services such as VDSL and/or FTTH are now beginning to emerge, see Neumann, Smidt, Schwabb and Stronzik (2016) at (http://www.wik.org/index.php?id=diskussionsbeitraegedetails&L=1&tx_ttnews%5Bcat%5D=4&tx_ttnews%5Byear%5D=2016&tx_ttnews%5BbackPid%5D=93&tx_ttnews%5Btt_news%5D=1799&cHash=ef9598176920c91320da1c80fe3753e3, and Briglauer (2015) at http://link.springer.com/article/10.1007/s11149-015-9283-1.).

[25] There is (limited) empirical evidence – in Nardotto, Valletti and Verboven's study of UK data – that unbundling enables entrants to deploy new DSL technologies which an incumbent operator might otherwise not deploy. However, that study found no evidence to suggest that the deployment of higher speed DSL services by entrants induced a competitive response from the incumbent themselves (BT), see (http://onlinelibrary.wiley.com/doi/10.1111/jeea.12127/epdf).

[26] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2010:251:FULL&from=EN. For a review by one of the current authors, see Unbundling The Incumbent: Evidence

ignored the impact of the pricing of existing copper assets on investment incentives in fibre and instead focussed on how 'next generation' fibre networks (NGA) might be promoted. This had two aspects to it, both of which have been a feature of every subsequent debate about high-speed broadband networks.

The first aspect concerned the terms under which anybody building a new high-speed network might be required to make it available to others. Prior to this, there had been some debate about whether those deploying NGA networks ought to be obliged to provide access to the network at all. The FCC had effectively abandoned its unbundling policy after 2005, in part because it was thought that it deterred investment in new high-speed infrastructure. However, a key aim of the 2010 Recommendation was to reaffirm that access obligations in Europe would be applied by reference to the competitive conditions prevailing in the market, and not by reference to the type of technology that was being deployed. The nature of the technology might affect assessments of what an appropriate 'risk adjusted' rate of return on capital employed might be, (and which underlying assets were to be considered as 'replicable' (and priced on one basis) or non-replicable (and so priced on another)). However, technology would not affect whether it would be subject to the same type of price controls that already applied to the copper networks. Where possible, the Recommendation stated that unbundled fibre loops were to be provided on a similar basis to unbundled copper loops (as would unbundled sub-loops in cases where fibre was being deployed to cabinets), except that access might be withdrawn:

> "in geographic areas where the presence of several alternative infrastructures, such as FTTH networks and/or cable, in combination with competitive access offers is likely to result in effective competition on the downstream level."[27]

The second aspect concerned the promotion of alternative NGA networks. Whilst it was hard to imagine a competitor replicating the existing copper lines that were owned by the incumbent network operator, it was easier to imagine that new fibre lines (to the home) might be installed by other parties. Indeed, since the owner of the existing copper network might be expected to be reluctant to write off its existing investments in those copper assets before the end of their economic life (and so might be more inclined to invest in technologies, such as VDSL or G. Fast, which would allow their continued exploitation), other firms might have stronger incentives to invest in FTTH. Economists refer to this as the 'replacement effect', which tends to discourage investment in new technologies in the absence of competition from which the firm might otherwise be incentivised to escape by investing. This effect seems to play a significant role in some telecoms markets.

A competitor might install an FTTH network without any reliance on the existing assets used by the copper network owner and, indeed, this was the case in some Member States during this

From UK Broadband (http://cerre.eu/sites/cerre/files/Intermedia_Vol_38_No4_2010_MC_PA_NGA.pdf).
[27] Ibid, para 22.

period where firms exploited ducts, poles and conduits that were owned by other utility providers or by the local authorities. However, in other cases, it was anticipated that third parties would be unable to deploy their own FTTH without access to civil engineering infrastructure that was owned by the existing SMP network provider. There was therefore a requirement in the Recommendation that, in addition to unbundling their own network, SMP operators should offer access to their 'civil engineering infrastructure' – ducts, poles and manholes – on an 'equivalent' basis to allow rivals to deploy their own fibre within them. This was the first time, so far as we are aware, that the Commission expressly endorsed 'passive access' as a means of promoting network competition in fibre networks.[28] In fact, earlier drafts of the Recommendation had been significantly more positive towards the concept and significantly less enthusiastic about extending the existing 'unbundling' regime to fibre networks. This may have partly reflected experience in France, which had adopted a national broadband plan in 2008 which envisaged significant fibre to the home deployment using such remedies, and Portugal, which had seen the deployment of fibre through Portugal Telecom's ducts begin in the same year.[29] It may also have reflected a growing recognition amongst other Member States that the existing 'unbundling' model had limitations which we have already described. In the event, the Commission appears to have adopted a more 'balanced' view, seeking to promote both end to end network competition through the introduction of passive access, and downstream competition through continued requirements to provide unbundled access to fibre and, where appropriate, access to 'active' bitstream or resale products as well.

Two points are worth making at this stage. First, the Commission's promotion of passive access to civil engineering infrastructure could be reconciled with its existing approach to competition if such access were viewed as simply being another (higher) rung on the 'ladder of investment'. On this view, entrants would initially employ 'resale' or 'bitstream' products to offer NGA services and gain sufficient scale in the retail market, before moving to buy access to ducts and deploying their own fibre. Thus far, less attention (than in relation to copper) has been given by the Commission or by regulators to the question of how the relative pricing of the different wholesale products would be managed to incentivise such behaviour, although the 2013 Recommendation does provide some guidance on the methodology to be used when setting prices for duct access.

Many of the firms deploying FTTH networks had no retail market presence at all in 'downstream' broadband markets when they decided to deploy their own FTTH infrastructure over ducts, although some have subsequently acquired existing retailers as part of the consolidation process referred to earlier. Investors in new FTTH networks have sometimes been existing providers of broadband services using DSL technology, but often not. One possible reason for this is that the

[28] It is also important to note that amendments to the Framework in 2009 had introduced requirements to allow the sharing of in-building wiring and other facilities (under Article 12). This reflected another important aspect of the Spanish and French models of competition, both of which required owners of such wiring to offer access on a 'symmetric' basis.
[29] Spain introduced obligations for Telefonica to provide access to its duct infrastructure in 2009.

'replacement effect' incentives which we identified as deterring the copper network owner from deploying FTTH might also apply to those who have unbundled the copper networks. Both they and the SMP firm have significant sunk investments in copper technologies (albeit that those of the network owner are much greater) and good reasons for wanting to extend the life of those assets. The implication of this is that the ladder of investment, which emerged in an overwhelmingly copper world, may apply within a single generation of technology, but may have difficulty in spanning across technologies (e.g. from 'broadband' to NGA). If that is the case then some of the concerns associated with the ladder of investment theory, in particular how relative prices between different wholesale products affect the incentives of new entrants, may have less relevance to models of competition for fibre networks than was the case for competition over copper.

Another reason for entrants to deploy their own FTTH networks may be that fibre networks appear more difficult to unbundle than copper networks. Unbundling of 'point to point' or P2P fibre networks, in which each household is served by a dedicated fibre all the way back to the local exchange, is straightforward. However, it requires sufficient space in the ducts to accommodate the fibres and is said to involve higher costs of deployment than the alternative FTTH technology, Gigabit Passive Optical Networks or GPON. GPON networks have tended to be favoured by copper network owners (such as Orange in France, Telefonica in Spain and Portugal Telecom) and involve the aggregation of traffic over common fibres within the access network. This means they require less space in ducts, may be cheaper to deploy, but are also more difficult to unbundle (even if the regulator requires such unbundling to be undertaken, which is not always the case). Technologies such as Wave Division Multiplexing (WDM) over GPON allow separate virtual connections to be provided over aGPON architecture, but there remains some uncertainty as to how 'unbundling' of FTTH GPON might develop in future. Some commentators have wondered whether the Commission's continued adherence to 'technology neutrality' might have adverse consequences for competition over FTTH infrastructures in the longer term, but European regulators have not, thus far, sought to directly influence the technology choices being made by operators deploying FTTH.[30] The technical challenges of unbundling existing FTTH networks may therefore be another factor driving entrants towards their own FTTH infrastructures.

Although unbundling FTTH may have challenges, so does sharing ducts and other assets. Although the availability of space in local exchanges required for copper unbundling varies by location, the availability of capacity in duct infrastructure for rival FTTH networks would appear to be subject to far greater uncertainty and unpredictability. Some copper networks have been deployed without using ducts at all. Where they exist, co-ordination for inspections and repairs of ducts and chambers is likely to be challenging. Regulators who have spent the past 15 years wrestling the challenges which arise from the co-existence of retail rivals within a common

[30] Martin Cave, Tony Shortall, "How incumbents can shape technological choice and market structure – the case of fixed broadband in Europe", info, Vol. 18 Iss: 2, pp.1 – 16.

infrastructure will be under no doubt about the challenges ahead if passive access is to be widely employed in Europe. Ofcom, for example, has required BT to offer 'passive infrastructure access' for a restricted range of purposes since 2010, but take up has been very limited to date. Ofcom is now taking steps to intervene more decisively in an attempt to promote greater adoption of passive remedies in the UK.[31] However, it remains unclear whether these will succeed or whether Ofcom's efforts will be replicated in other Member States. These are often highly detailed, operational matters which are difficult for the Commission to address in general guidance, and which we suspect the 2010 and subsequent Recommendations tend to underestimate.

It is difficult to assess whether the 2010 NGA Recommendation had any impact on broadband market developments. We suspect it had very little. In part, this is because the large telecoms operators and their investors remained cautious and were still addressing the consequences of the global financial crisis of 2007, whilst consumer confidence in many European markets remained muted. In part, it was because Member State regulators and Governments had already adopted a variety of different models for promoting NGA competition, which made it very difficult for the Commission to align Member States around a common policy or a common model. Significant investments in next generation broadband networks were being made in Scandinavia, but these often relied upon the civil engineering infrastructure of other utilities or of local authorities, rather than upon regulated access to the passive assets of the SMP copper network owner. Similar considerations applied in some central and eastern European markets. On the other hand, regulators in markets such as the UK had earlier concluded that BT's local loop represented a non-replicable monopoly (beyond those areas where cable had been induced to build in the 1980s) and so competition would be secured through a continuation of unbundled access obligations applying to BT's NGA network. The German regulator took a similar view, but anticipated that sub-loop unbundling of DTAG's network could extend network competition to the cabinet. It was already apparent by 2010 that any Europe-wide policy on next generation broadband competition would either need to be sufficiently elastic to accommodate a wide range of facts on the ground, or enforced with sufficient rigor to superimpose conformity on a variety of different market conditions. In the event, the Commission opted for the first approach, with the result that it is difficult to detect the influence of the 2010 Recommendation in the divergent approaches that have been adopted by different Member States since then. Spain and Portugal are often cited as having been most obviously influenced by Commission thinking during this period, but in their case they appear to have largely adopted earlier draft proposals which the Commission itself subsequently abandoned, at least in part.

Although there was significant progress in NGA deployment after 2010, particularly in the deployment of services by cable operators (who had been almost entirely ignored by the 2010 Recommendation), there was also widespread discontent amongst the copper network owners.

[31] Ofcom Progress update: supporting investment in ultrafast broadband networks, (https://www.ofcom.org.uk/__data/assets/pdf_file/0031/68791/july_2016_progress_update.pdf).

Some of these firms faced regulatory constraints from the application of the existing copper unbundling regime alongside growing and significant threats from (unregulated) HFC cable operators who had used DOCSIS technology to rapidly upgrade their own infrastructure. The Commission itself was also concerned, having adopted targets for the rollout of NGA broadband infrastructure after 2010 which appeared increasingly unlikely to be met.[32]

The result of this anxiety was the Commission's 2013 Costing Recommendation, a measure which was intended to supplement the 2010 NGA Recommendation and which addressed several obvious gaps in the earlier document.[33] Most significantly, the 2013 Recommendation specified the conditions under which regulators would now be expected to desist from setting the wholesale prices for 'virtual' or passive NGA products (the nature of the products to be supplied, namely unbundled fibre or virtual unbundled line access over VDSL networks did not change). The primary conditions were that the pricing of the NGA wholesale products had to be constrained either by competition from 'one or more' competing NGA networks or by the regulated price of the copper 'anchor product' (i.e. ULL). The aim here was to allow operators freedom to set wholesale prices for NGA products in a way which better reflected market demand (e.g. for different grades of service or speed provided over common infrastructure), rather than requiring the regulator to set a single 'cost orientated' price derived from some assessment of the costs of the underlying network assets.

Allowing firms to set their own wholesale prices (and hence retain greater influence over the structure of prices in the downstream market) was, in our view, a very significant development. High-speed broadband products share a common set of assets, but fixed costs are recovered from different customers by pricing different products in a way which seeks to map consumer preferences. Thus, a 1 Gb/s connection might have substantially the same costs of provision as a 500 Mb/s connection, but might be priced at a multiple (2x or 3x) of the former. Such prices are likely to be efficient provided there is sufficient competition in the downstream market to ensure that profits are not excessive. It is, however, very difficult for regulators to set wholesale prices in a way which allows such demand-led price discrimination. The result of regulation is invariably a single, uniform input price which tends to produce price conformity in the downstream retail market. The ability to extract a higher surplus from users who may attach a

[32] Latest projections suggest around 45% of households will have connections at 100 Mb/s or more by 2020 (compared to Digital Agenda targets for 50%), but with very significant variations between Member States, see WIK et al, p.60-61.

[33] European Commission, Digital Single Market, Digital Economy and Society, Commission recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment - C(2013) 5761 (https://ec.europa.eu/digital-single-market/en/news/commission-recommendation-consistent-non-discrimination-obligations-and-costing-methodologies).

greater value to higher speeds is generally lost, as is an ability to price lower speed products at below average total cost to expand output.[34]

In this case, the Commission's thinking was heavily influenced by Ofcom, which had already adopted a similar 'anchor pricing' approach when allowing BT to set its prices for its VDSL wholesale products (although this aspect of the Recommendation had little relevance to those Member States who had adopted 'passive access' to ducts as being their primary remedy to promote competition in fibre networks). Allowing the vertically integrated firm to set its own prices for NGA inputs raised renewed concerns about the risk of margin squeeze (no doubt exacerbated by the number of margin squeeze cases which had been prosecuted by DG Competition by then). The result was that the 2013 Recommendation also contains further, much more detailed guidance, on how an 'economic replicability' or margin squeeze test might be applied to high-speed broadband products. The Commission was also keen to provide significantly greater detail on the application of the 'equivalence of input' principle which it had earlier proposed apply when access was provided to civil engineering infrastructure. This principle was now to be applied to all NGA products, for which new IT and other systems would be developed, even if the weaker principle of 'equivalence of output' would apply to existing products where the costs of adapting systems and reengineering processes might outweigh any anticipated benefit. Both the effective application of the margin squeeze test and the implementation of 'equivalence of input' arrangements were presented as additional conditions to be met before the wholesale pricing freedoms were granted. We are aware that some competitors have since complained that one or other of these conditions have not been implemented or enforced in the manner envisaged by the Recommendation, although we are not aware of any systematic effort on the part of the Commission to assess their implementation.

The other gap in policy which the 2013 Recommendation attempted to fill concerned the relationship between the pricing of unbundled copper loops and the incentives on the part of the copper network owners to invest in NGA networks. This is a complex and controversial topic, on which the empirical literature remains relatively underdeveloped.[35] The Commission initially appeared to envisage that applying downward pressure on copper access prices (i.e. the price of unbundled loops and associated facilities) would reduce prospective returns for the owners of those assets and so incentivise them to allocate resources to other assets, such as fibre networks, which might offer higher returns. This was widely criticised by industry figures at the time as being naïve and by economists as likely to be applicable in only a narrow range of circumstances (e.g. when copper was then rapidly decommissioned).[36] The Commission then

[34] As we explain later, regulated wholesale prices also tend to impose nationally averaged prices which do not reflect regional variations in the cost of supply.
[35] See footnote 22 for references.
[36] A (theoretical) study commissioned by the Commission to examine the issue concluded: The issue of joint calibration of copper and fibre access prices and its effect on investment is complex. Whether lower access prices for copper (that would be induced for instance by excluding some fixed and common cost or

changed its mind, concluding that the maintenance of relatively stable copper access prices was more likely to support its objective of NGA investment (on the part of the copper network owners). This was embodied in the Recommendation itself, with the Commission going so far as to specify not only the common methodology to be applied by regulators in setting the price, but the precise range within which the resulting prices were expected to fall.[37] Several regulators appear to have subsequently adjusted their pricing methodologies to move into this range.

Our discussion of European policy on broadband since 2002 has thus far largely ignored the role of HFC cable networks. That reflects the approach taken by the Commission itself, which has generally sought to exclude cable networks from the scope of regulation. As previously noted, the 2002 Framework was developed at a time when the potential for HFC cable networks to deliver very high-speed broadband connections using the DOCSIS technology was recognised, but when the future prospects for its deployment were still uncertain (DOCSIS 3.0 was deployed extensively after about 2007 in Europe). Cable was a potential competitive force in broadband markets, but one which was relevant to some Member States and not to others. Thus, the regulatory analysis always started with the vertically integrated copper network, with the geographic scope of the market being defined as national. The result was that the incumbent copper network owner was almost always found to hold a majority market share and Significant Market Power (SMP) in the downstream retail broadband market. In time, cable operators might come to acquire significant retail market share in some broadband markets, but in many cases this still translated into a relatively modest market share on a national basis.

Cable was also generally excluded from consideration of the upstream wholesale market, in which the copper network owner was again found to hold SMP. It was recognised that cable might apply an indirect competitive constraint on wholesale pricing by the copper network owner, on the basis that any increase in wholesale prices would be passed through (at least in part) to higher retail prices, which would in turn result in some loss of sales to the cable operator. However, the Commission and regulators invariably concluded that this constraint was insufficient to constrain the copper network. They also found that the architecture of cable

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by using historic rather than current costs) would trigger investment in fibre depends crucially on whether copper and fibre networks are operated in parallel. If copper is switched off at the time of fibre deployment, investment would likely be triggered by lower access prices for copper. If not (as would appear to be realistic), then the effect of copper access prices on incentives to invest in fibre is, in principle, ambiguous. We observe that the incentives to invest are largely determined by the number of access seekers to copper infrastructure that different copper access prices would induce. We find that lower copper access prices increase the number of access seekers and tend to reduce the incentive to invest. These results should be seen as illustrative and should not be applied literally in any particular member state or region. However, they clearly suggest that a reduction in copper access prices for the sake of encouraging investment in fibre may not work, or would at least require a level of regulatory oversight that may not be realistic. See ICT Regulation Toolkit (http://www.ictregulationtoolkit.org/Documents/Document/Document/4032).

[37] The range was €8-10 in 2012 prices (net of taxes), see para 41 of the Recommendation.

networks made them poorly suited to the provision of wholesale services which might otherwise compete with the resale, bitstream and unbundled copper products supplied over the copper network. Cable operators had themselves shown no inclination to offer wholesale products on commercial terms during this period.

The result of effectively excluding HFC cable networks from the competition analysis was that regulators have, since 2002, focussed on overseeing a single, vertically integrated firm which is assumed to retain SMP in upstream and, absent intervention, in downstream markets. As a result, there have been comparatively few debates as to which firm holds SMP and whether they should be regulated. Instead, as we have seen, most of the debate has arisen in relation to the remedies which are then to be applied – their scope, how they are priced, and how non-price issues are addressed. To the extent that constraints from competing vertically integrated networks such as HFC cable have been recognised, they have influenced the way in which remedies are then applied (and not the finding of SMP itself). Thus, some regulators have applied different wholesale access obligations in different regions on the basis that less invasive remedies are required in areas where there are competing networks. As we have seen, Commission Recommendations have encouraged such a graduated approach. One important consequence is that the regulator may not actually withdraw from the market as competition develops, but simply moderates the remedies applied. Whether this is consistent with the original intent of the 2002 Framework, or otherwise desirable for other reasons, is a question we address later in this study.

The previous section has provided a necessarily selective account of the most significant developments in regulatory policy, insofar as they affect broadband markets, since 2002. In this section, and before turning to developments which might prompt changes to the approach, we reflect on some of the lessons which might be drawn.

The first point is that the model of competition which relies upon unbundling the network of the vertically integrated incumbent operator has proven remarkably resilient in Europe, and continues to command broad support amongst a wide range of parties. This is in stark contrast to the experience in the United States and elsewhere, where the practical and legal challenges of unbundling the vertically integrated incumbent have led to the abandonment of this model and the adoption of alternative models, including both full structural separation of the market (Australia and New Zealand) and competition between vertically integrated, but substantially unregulated, firms (United States).[38] Although European policy on broadband may have felt uncomfortable and at times incoherent for those affected by it – particularly in the period 2008 to 2013 – the underlying approach to competition in Europe has in fact remained relatively constant for at least 15 years.

[38] By 'unregulated' we mean an absence of regulatory interventions to promote competition in downstream markets (as distinct from general competition law or regulations to protect consumers or serve other purposes).

The result of this is that European broadband policy has, to date, largely involved a series of relatively incremental attempts to improve the performance of the unbundling model, rather than any fundamental revision or replacement. These have generally involved seeking to encourage entrants to increase their level of commitment in owning rather than leasing network assets. At the outset, it involved encouraging those who had bought carrier pre-selection on a minute-by-minute basis to rent copper local loops on a monthly basis and invest in DSLAMs and other network equipment. More recently, it has involved efforts to encourage those who currently rent copper loops to build their own fibre loops, renting only the duct infrastructure through which those loops are to be deployed, or taking a co-ownership interest in these or other assets. At each stage, entrants are being required to increase their exposure to assets which involve fixed costs which are invariably sunk.

This approach appears logical if it is assumed that the key barrier to investment in broadband infrastructure is an absence of scale in the downstream retail market. To the extent that newer broadband providers have acquired retail market share, acquired greater financial resources and otherwise grown their businesses, we assume they are better placed today to commit to sunk investments with high fixed costs than was the case 10 or 15 years ago. Regulators have generally allowed the retail broadband market to consolidate where the opportunity arises – in contrast with recent battles in mobile markets - presumably in the belief that scale matters here. On the other hand, experience since 2002 casts at least some doubt on the assumption that a substantial pre-existing fixed broadband customer base is required before investments can be made. Much of the recent investment in high-speed fibre networks has been undertaken by firms who lack scale in the existing retail market, but who instead see opportunities to exploit one or more economies of scope.[39] Utility companies with existing customer relationships outside of telecoms, and other owners of duct infrastructure such as local authorities, have both seen opportunities to leverage other assets they control in order to enter the broadband market. Cable operators have, of course, always benefited from both economies of scope and also require economies of scale. 'Mobile only' operators are increasingly acquiring or building fixed high-speed broadband infrastructure, and cross-selling fixed broadband services to their mobile customer base. Allied to this has been a challenge to the assumption that competitors who have built scale in the DSL broadband market will also be the ones to drive competition in the next generation of broadband technologies. Thus, in addition to having no existing scale in broadband retail markets, many of the recent investors in fibre broadband networks have no existing investments in DSL technologies. Such developments were not necessarily anticipated by the existing model of competition.

Finally, we should note that whilst the unbundling model has commanded widespread support across the European Union for more than a decade, albeit with local variations in the way it was applied, it has recently come under challenge in a way which may lead to greater fragmentation in future. In some of the Member States which acceded to the Union after 2002, the copper

[39] A similar conclusion is reached by WIK et al, see p.202.

network was relatively less developed and the opportunities for competition using DSL technologies more limited. In many of these cases, competition has instead been provided by vertically integrated cable and, latterly, by vertically integrated fibre networks – a model that has more in common with the United States than the rest of Europe. The volume of unbundled copper loops in many of these markets remains minimal.

In Member States such as France, Spain and Portugal - where unbundling has been a significant feature of broadband competition in the past– the model has been adjusted to accommodate the transition from copper to fibre technologies - although we think the basic principles remain in place. In some cases, firms wishing to compete in the retail market for high-speed services have lost the opportunity to do so through 'resale' or 'bitstream' products which might formerly have allowed them to gain scale and climb the ladder of investment. Instead, they are required to utilise the regulated access that is provided to the passive infrastructure of the copper network owner, and in some cases to do this by 'co-investing' with other firms by making long term commitments to own shared capacity in the fibre network.

A quite different challenge to the traditional SMP model comes from the Dutch regulator, the ACM, who recently concluded that it could no longer find KPN, the copper network incumbent, as the only firm to hold SMP in the broadband retail market given the strong competitive position of the cable operator, Ziggo. It subsequently withdrew this analysis and reverted to a more traditional approach, finding that only KPN holds SMP in the wholesale market (and removing any analysis of the retail market from the notification) and then imposing a set of access obligations to promote competition in the downstream market. It is difficult, however, not to think that this is a precursor of challenges to come. Nobody knows today how we might apply the unbundling model to multiple vertically integrated firms at the same time or whether it is possible to do so at all. Again, this is a point we return to later.

We regard these various pressures and challenges to the model of competition as being inevitable consequence of the dynamism of telecommunications markets in Europe. The transition from narrowband to broadband and then from broadband to very high speed broadband networks has introduced choices about technology evolution and entry opportunities which did not exist in 2002 when the 15 Member States shared what was essentially the same starting point. Different Member States have increasingly adopted differing approaches to the promotion of competition in broadband markets as a result. There remains a distinctive European imprint, with its roots in the regulation of the vertically integrated incumbent copper network and in the unbundling of network assets, but this is becoming ever more difficult to discern in the decisions of individual national regulators.

A question for the Commission and for European policymakers in these circumstances is whether it remains necessary or possible to retain a common European approach to the promotion of competition in high-speed broadband markets. Part of the answer to this depends on institutional questions which are beyond the scope of this study – even if the Commission adopted a common approach, would it be capable of ensuring that it was implemented? In the

high-speed broadband era, we suspect the Commission is better at providing a clearing house for the sharing of best practice, allowing different Member States to explore different models of competition, and then embodying what appears to work best in its legislative proposals or recommendations. This is something it arguably did in both the 2010 and 2013 Recommendations and appears to be doing again in its latest legislative proposals for a new Code. The pursuit of a common approach instead appears to have been replaced by the adoption of a common set of targets for fibre network deployment. As we explain later, we are not sure this is necessarily a change for the better.

However, before considering the changes that might be required, we first need to consider how the competitive environment for high-speed broadband has evolved and might be expected to evolve over the next 10 years. We do this in the next section.

3. Changes to the broadband landscape

3.1. Variability of service quality within Member States

Demand for high capacity broadband services and the resulting transition from copper-based broadband technologies to products which rely upon alternative technologies such as GPON[40] and DOCSIS means that the quality of the infrastructure within Member States is becoming increasingly differentiated, even compared to DSL (which was itself more varied than traditional voice telephony services). The deployment of non-copper networks such as FTTH and HFC cable tends to be undertaken on a sub-national basis, either because the economics of deploying FTTH vary significantly by geography and/or because FTTH deployment by the SMP operator is being undertaken in response to competitive threats (e.g. from cable) which are themselves geographically limited, often to urban areas. One consequence of this is that when network competition is provided by rival FTTH or HFC cable players, it is unlikely to replicate the national scope of the traditional copper infrastructure, where DSL coverage has extended to 97% of European households.[41] In contrast, the current plans for fibre deployment by the key European operators suggests that most Member States will achieve 70% coverage by 2025, even if we assume significant levels of public subsidy.[42]

Thus, an important consequence of technology changes and the sub-national deployment of high-speed networks is that households within the same Member States are increasingly likely to experience greater variation in service quality in future. In areas where FTTH is deployed, households will obtain very high capacity connections on a very predictable and reliable basis. However, there is likely to be a 'cliff edge' drop in capability for households outside of those areas (who remain dependent upon ADSL or VDSL infrastructure or upon wireless provision). In Member States served by enhanced copper technologies such as G.Fast, the availability of high capacity connections is likely to be more extensive than for FTTH, but variations in the length of the copper (sub) loop mean that there could be quite dramatic variations in performance between individual households.

This greater variability of service quality over non-copper networks - not simply between urban and rural areas but also within urban areas - is, we think, likely to have consequences for telecoms policy not seen since public funds were used to support the deployment of copper networks in rural areas several decades ago. One possible response is for policymakers, including the Commission, to promote particular technologies, notably FTTH, in the belief that these technologies allow for a more consistent and predictable quality of service than those which are influenced by variances in the length and performance of existing copper pairs.

[40] Gigabit Passive Optical Network.
[41] WIK et al, p.56.
[42] Barclays Equity Research, Fibre wars: quantifying fibre upside, 16 June 2016, p.11.

Another response is for policymakers to set minimum performance targets, against which all networks irrespective of technology are expected to perform, recognising that there may be significant variances in performance above these minimum thresholds. This is an approach which the European Commission has taken since the adoption of the Digital Agenda targets in 2010, when it was proposed that all European households should be able to obtain broadband connections of at least 30 Mb/s by 2020, and that 50% of households would be connected at speeds of 100 Mb/s. In its latest 'Gigabit Society' proposals, the Commission proposes to extend the target to ensuring that all households have access to 100 Mb/s (with the capacity to upgrade to gigabit speeds) by 2025.

We recognise that such targets may have purposes other than addressing concerns about variances in the quality of broadband services available within Member States, such as the promotion of particular technologies or of higher levels of investment in general. We return to consider the role and advisability of targets later in this study.

The other obvious policy to be driven by concerns that competition will result in widening variation in broadband performance is the greater involvement of public subsidy or State Aid to ensure that the universal standards of the copper era are replicated in the fibre era and that the new targets are achieved. The likely amount of public subsidy required to fulfil the latest 'Gigabit Society' targets is one of the most striking features of the Commission's latest proposals and a topic we also return to later.

3.2. Technology transition from copper to fibre provides an opportunity for new entry and for greater horizontal integration

We have already noted how the transition from copper to fibre technologies has provided opportunities for new entry. Many of the entrants appear to be exploiting economies of scope that have arisen from their ownership of other non-telecoms assets (often civil engineering infrastructure) and which lower entry barriers when deploying new fibre networks. We noted that many of these firms had no prior position in the broadband retail market, suggesting that the need to gain scale in retail markets or to overcome demand uncertainty may be less important in the case of high-speed broadband networks than it was for earlier broadband services (or for other types of prospective entrants).

In many cases, these new entrants have been the first to deploy new high-speed networks in the Member State in question, with the result that between half and two thirds of all fibre connections in Europe to date have been deployed by new entrants who do not own existing copper assets[43] (although we also note that entrants account for 80% of all Fibre to the Building

[43] FTTH Council, excluding Telefonica, as at September 2015. The FTTH Council figures make no distinction between lines that have been deployed by firms with an existing presence in the broadband market (e.g. as providers of DSL services) and those who have no prior presence. This would be an interesting statistic to have, but we are not aware that anyone has produced it.

but only 40% of Fibre to the Home connections).[44] We suggested that an important consideration here is the 'replacement effect' which means that the owner of the existing copper network is likely to be reluctant to write off its copper assets if their economic life can be extended. The same considerations applied in the transition from narrowband to broadband DSL technologies, where policymakers assumed that those unbundling the local loops would also have stronger incentives to deploy new DSL technologies than the existing owners of the networks who had investments in predecessor technologies (such as IDSN) to recover.

The difference with high-speed broadband is that allowing new entrants to attach new electronic equipment to the existing copper plant is much more difficult and that, in any event, the results are perhaps less impressive than in the past. It is difficult because this kind of technology competition requires that competitors can unbundle the copper sub-loop at the street cabinet, a process which has proven both economically and practically much more challenging to implement than unbundling at the local exchange. Moreover, the ability of competitors to differentiate their services in a VDSL environment is further constrained by the introduction of 'vectoring' technologies which improve the performance (by reducing interference) of all lines served by a particular cabinet. Different models for promoting technology competition through VDSL 'unbundling' are still being pursued in some Member States – notably Italy and Germany – but in many other cases, where competitors instead rely on a 'virtual unbundled line access' or 'enhanced (fibre) bitstream' product, the opportunities for competitors to drive technology evolution over the copper network appear more limited than in the past. This may be another reason why some regulators have chosen to assign greater weight to the promotion of competition from separate, vertically integrated networks than from further unbundling of the copper infrastructure.

Another important consequence of entry arising through the exploitation of economies of scope is an increasing degree of horizontal integration in the market. In some cases, providers of energy or other services are able both to exploit their existing network assets when deploying the broadband network and then to bundle their broadband services with other products when retailing them. Cable operators have, of course, bundled pay TV, broadband and telephony services together for many years, but they have been followed in some case by satellite TV providers who see fixed broadband infrastructure as another distribution channel for their products, which are bundled alongside broadband internet access and telephony services. Mobile operators have also increasingly identified economies of scope between their 'mobile' infrastructure and fixed broadband networks, and opportunities to bundle fixed and mobile broadband products together in the retail market. Even when they have not previously held any significant share of DSL connections, mobile operators such as Vodafone have moved directly to acquiring HFC cable assets or deploying their own FTTH networks, apparently believing that there are sufficient cross-selling and bundling opportunities (and network cost savings) to merit the investment.

[44] WIK et al, p.320.

The existing copper network owners have responded by pursing horizontal integration strategies themselves, at least to some extent. Many have begun to bundle fixed and mobile products together, partly in response to competition and partly to exploit economies of scope not available to standalone competitors. BT, which did not own significant mobile assets in the UK, has recently (re)acquired them by buying EE. Many European operators, notably Telefonica, BT and KPN, are also increasingly active in the acquisition of TV and other content rights. Thus far, few operators, so far as we are aware, have extended into other utility sectors such as energy.

It will be apparent that we regard such horizontal integration as likely to be beneficial and supportive of greater competition (although of course there are circumstances under which it might entrench a dominant position in one or more of the relevant markets). Economies of scope realise efficiencies for consumers and, in the right circumstances enable entry, particularly, it seems, in high-speed broadband infrastructure. We recognise that there may be consequential concerns arising from the greater complexity of bundled products, or the possibility of higher barriers to switching. However, we consider these to be manageable and certainly not a reason to inhibit a tendency which we broadly consider ought to be permitted, subject to normal merger review safeguards.

Issues may arise if, as a result of horizontal integration, firms control new kinds of upstream input markets (such as TV content rights) to which rivals require access if they are to compete effectively in the downstream high-speed broadband market. With limited exceptions, these concerns have generally arisen in relation to specific transactions, rather than prompting the development of an ex ante regulatory regime for content rights. For example, when network operators have acquired media assets, as in the acquisition by Telefonica of Canal+ in Spain and the acquisition of De Vijver Media by Telenet in Belgium, during 2015, competition authorities have required that TV content is supplied to downstream competitors as a condition of approval.[45] Similarly, the European Commission's Competition Directorate has imposed conditions when football rights are being jointly sold by organisations such as the British Premier League, the German Bundesliga and by UEFA, amid concerns that the exclusive control of key rights might otherwise be used as leverage in downstream TV distribution, including broadband markets. The nature of the concerns continue to evolve, with competition authorities increasingly concerned that vertically integrated owners of content rights may be able to disrupt rival 'over the top' service providers by, for example, restricting their access to content or the capacity that is available at internet interconnection points to support their services.[46] Only in the UK has the UK regulator, Ofcom, sought to apply an ex ante wholesale regime to Sky (a vertically integrated satellite and broadband provider) in relation to the supply of certain TV sports content since 2010.

[45] European Commission, Press Release Database, 'Mergers: Commission clears Liberty Global's acquisition of controlling stake in De Vijver Media, subject to commitments' (http://europa.eu/rapid/press-release_IP-15-4481_en.htm)

[46] See, for example, the conditions applied by the European Commission in relation to Ziggo/UPC at http://europa.eu/rapid/press-release_IP-14-1123_en.htm.

Cable operators have gained a significant competitive position in broadband markets in all Member States where they are present. In the previous section we explained that HFC cable networks have generally been excluded from the competition analysis and from the resulting application of regulatory remedies. At the same time, it is important to note that the DOCSIS 3.X standard – which has allowed for upgrades in network capacity to be made at a lower incremental cost than either FTTH or VDSL networks - and the availability of economies of scope (including access to existing TV content for IPTV services) has allowed cable operators to obtain a stronger competitive presence over the past decade. Cable represents about 20% of all broadband connections in Europe today, although substantially more than that in the areas (representing about 45% of all European households) where HFC cable networks are present.

Again, we note that one consequence is this is that although unbundling/resale of the copper network was intended to be the primary method for delivering competition in the 2002 framework, it has been of marginal significance in some Member States (notably the Scandinavian region, many CEE markets, Austria, Netherlands, Portugal and Belgium, in all of which ULL has less than 10% share of the broadband market). The primary competitive constraint in these Member States has been provided by cable, suggesting either that entry by firms relying upon regulated ULL products may have been 'crowded out',[47] or that regulators in those markets felt less inclined to battle to overcome the many challenges that arose in seeking to implement the unbundling model, described in the previous section, because the competitive benefits were considered less necessary.

Looking ahead, two interesting questions arise in relation to cable. The first is the extent to which its geographic footprint might change (i.e. expand) over time. In some Member States, such as the Netherlands or Belgium, coverage is already close to 100%. However, in many others, including Germany, the UK, Spain, Ireland, Sweden, Denmark, geographic expansion of cable networks has not been seriously considered by policymakers, at least to date. There are signs that this is changing, with Liberty Global announcing plans for a quite significant (4 million or more households) expansion of their networks in the UK and Germany. In some areas this involves the extension of the existing HFC infrastructure to households, but in others it should be better regarded as the deployment of a new FTTP (fibre to the premises) infrastructure. Aside from excluding cable from the relevant wholesale market and thereby resisting the calls of some quarters to impose wholesale access obligations on HFC infrastructure owners, it is not clear that the European Commission or national regulators have had any particular policy objectives in relation to investments by the existing cable operators, although their efforts to promote NGA network deployment in general are also likely to be supportive of cable.

The second issue relates to the impact of cable competition on the approach to regulating the copper network. As explained in the previous section, the approach to date has been to recognise the competitive constraint imposed by cable (or by other networks) when applying

[47] WIK et al also note a negative a negative correlation between infrastructure based and access based competition, see p. 243.

access remedies. Only one Member State (Romania) has regarded the presence of competition from cable (and, in that case, significant FTTH competition as well) as a basis for removing an SMP designation and dismantling the wholesale access regime entirely. However, the Portuguese regulator, ANACOM, has also recently proposed to include cable as being a direct competitor in the wholesale market, despite the absence of a wholesale HFC product.[48] It may be that others follow in future.

Another scenario leads to the opposite conclusion. In this case, growing competition from cable may be such as to lead regulators to find evidence of tacit co-ordination in either the downstream retail or upstream wholesale market. We have already referred to the Dutch regulator's proposal, subsequently withdrawn, to find joint dominance between KPN and Ziggo in the downstream retail market (but to find only KPN as having SMP in the upstream market). Earlier attempts (in 2005) by the Maltese regulator to find joint dominance between Maltacom and the cable operator, Melita, were also withdrawn following notification to the Commission. However, past experience may not be a good guide to future performance in this context. By this we mean that cable's success in broadband since the mid-2000s is, at least to some extent, attributable to significant cost advantages that HFC networks have enjoyed when upgrading to higher speeds using the DOCSIS technology. This has resulted in significant cost asymmetries and time to market advantages which can be expected to promote dynamic competition and inhibit tacit co-ordination amongst firms. There is, however, a question of the extent to which such cost asymmetries will persist into the future as fibre is pulled ever closer to the home and the network architectures of HFC and FTTH networks increasingly come to resemble each other. We make no judgment as to either the timescale over which this might arise or the likelihood or capacity of firms to engage in tacit co-ordination in either retail or wholesale broadband markets as a result, other than to note that this issue may have greater prominence in future.

It is also important to distinguish concerns about tacit co-ordination from the concerns about 'tight oligopoly' that have been voiced by BEREC in recent papers and submissions to the current Commission review of the Framework.[49] As we understand it, BEREC is concerned that competition in high-speed broadband markets (although we note that similar concerns may also apply to mobile markets) may develop in such a way that a small number of firms can earn and sustain 'excessive' profits without having to engage in the kind of tacit co-ordination to which we referred in the previous paragraph. In such circumstances, BEREC is concerned that regulators will be unable to find the copper network operator or any other individual firm as having SMP (given competition between the network provider) and nor will they be able to establish tacit co-ordination and joint SMP, since a 'tight' oligopoly can arise and be sustained

[48] A view that has been challenged by the Commission under the Article 7 process, see https://ec.europa.eu/digital-single-market/en/news/european-commission-opens-depth-investigation-regulatory-forbearance-proposed-portuguese.

[49] BEREC, Report on the public consultation of the Report on Oligopoly analysis and regulation (http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/5580-berec-report-on-the-public-consultation-of-the-report-on-oligopoly-analysis-and-regulation).

without such co-ordination. BEREC regards the prospect of being unable to intervene (as a result of being unable to find SMP) as being problematic, given its view that the persistence of 'excessive' profits constitute evidence of consumer detriment.

The first point to note here is that neither tacit co-ordination nor 'tight oligopoly' is necessarily associated with the competitive position of HFC cable networks. Similar concerns could equally arise in markets consisting only of competing FTTH networks. We do not therefore intend to suggest that cable operators are particularly susceptible to tacit co-ordination, only that the debate has arisen in Member States where the competitive position of the cable operator has been the point at issue.

Second, BEREC's model of competition is necessarily rather stylised at this stage. No specific examples are given to illustrate how consumers might be being harmed by such arrangements. It is not very clear to us how regulators would conclude that a market was sustaining 'excessive' profits (or how a 'tight oligopoly' might differ from the kind of differentiated Bertrand competition which most economists would regard as being a necessary feature of markets with high fixed and sunk costs) – although this is a challenge which it shares to some degree with other concepts, such as joint dominance. Nor is it very clear how a market would evolve, or firms might be expected to behave, to establish such a 'tight' oligopoly, or what they might do to escape it. Important conditions for BEREC's theory include the presence of high barriers to switching (which might arise, for example, from the bundling of products) and the existence of capacity constraints. The latter condition, in particular, seems rather unlikely to be applicable in high-speed broadband markets where the majority of network investments are fixed and the incremental costs of connecting additional households that have already been passed, whilst not trivial, are nonetheless relatively small.[50]

3.3. More complex and varied oligopolistic market structures

Although the rise of cable may challenge a number of existing regulatory assumptions for broadband regulation, the combination of cable and the opportunities for new entry identified previously raise wider issues too.

To date, regulators have imposed access obligations on vertically integrated firms who, it is assumed, otherwise have no incentive to supply their downstream rivals. No operative wholesale markets for products such as ULL or virtual unbundled line access existed prior to the imposition of regulatory obligations. Wholesale markets, at least in fixed broadband, are thus an (artificial) construct of the regulatory process.

We have also noted that, despite attempts by regulators to encourage entry at various intermediate points in the value chain, the number of firms who have actually engaged in

[50] We recognise that expansion of network coverage (as opposed to connection of additional households already passed) involves significant additional costs, but these represent barriers to entry into the market rather than being constraints on expansion once present.

wholesale 'competition' under current regulatory arrangements (and so offered wholesale services on a truly 'commercial' basis) is actually very limited. We are aware of some historic cases in the Netherlands and Germany, but firms buying unbundled loops or duct from the SMP operator have tended to sell directly onto the retail market rather than choosing to wholesale (e.g. bitstream products) to other firms. European regulators may, therefore, have succeeded in promoting competition in the retail market, but we have yet to see competition take hold at other points in the value chain.

The emergence of a number of competing vertically integrated networks – as well as the presence of large retail competitors who might now be buyers of wholesale inputs (but who did not exist in 2002) - creates the possibility that intermediary wholesale markets might begin to develop and function without regulatory intervention in future. This issue has already begun to be examined when KPN, the Dutch copper network owner, offered to maintain existing wholesale supply even if its SMP designation (on which its existing obligation to supply was based) was withdrawn by the Dutch regulator. In that case, the regulator retained the SMP finding. We also understand that Orange, an FTTH provider in Spain, has recently announced its intention to supply wholesale fibre services on a commercial basis when Orange does not itself have SMP in the Spanish broadband market and so has no regulatory obligations to do so. These strike us as being potentially very important developments, similar in nature to the emergence of wholesale offers in mobile markets in the 2000s. Indeed, the availability of wholesale offers for fixed broadband services on reasonable commercial terms is, in our view, likely to be the key linkage between duopolistic or oligopolistic networks on the one hand, and effective competition in the downstream retail market – and consequent opportunities for regulatory withdrawal - on the other. We noted earlier that cable operators have so far not generally participated in wholesale markets and the Commission has excluded them from consideration on the grounds that HFC networks have technical limitations which may restrict their capacity to do so. However, DOCSIS based wholesale data products are now beginning to emerge in some Member States (notably France, Denmark and Belgium) and it may be that cable operators may be more willing to supply on commercial terms in future if the question about their technical capacity to do so is no longer in question.[51]

Additional high-speed broadband networks will likely increase competition in the downstream retail market, although in some cases the new FTTH network might also represent a new, vertically integrated monopoly provider. Given the traditional focus on regulating the vertically integrated copper network owner, many of these new networks, some of which may be very localised and rather small, are not currently subject to any form of regulation. This may matter

[51] It has been put to us that uncertainty about whether HFC cable networks would be regulated under the existing framework if 'technical' obstacles to supplying wholesale services were set aside has inhibited the supply of wholesale services on commercial terms, since any voluntary supply would only demonstrate that such technical obstacles could be overcome. There is no way to test this proposition but, so far as we are aware, wholesale supply by cable in the United States is not very common, despite there being little prospect of regulation in that market.

less if they are still to be subject to competitive constraints from the national copper infrastructure. However, this may not persist in the future. That would raise the prospect of a much more fragmented landscape in which a large number of local monopolists require effective regulatory oversight. Many regulators are resisting the suggestion that they should undertake discrete market analyses in order to establish SMP in each case, prior to imposing access obligations, and are suggesting that easier to implement rules, such as 'symmetric' obligations, might be adopted instead.

Even if new networks emerge that hold a monopoly position within a given geographic area, it may be that reciprocal access arrangements between them can substitute for traditional 'one way' regulated access obligations. We have already seen some examples of firms (Vodafone and Portugal Telecom) seeking to extend their geographic reach in the retail market by entering into reciprocal access agreements with each other in order to do so. Each uses wholesale inputs provided by the other to compete in the downstream market, but the terms are the result of commercial negotiation between firms in a 'two way' bargaining situation. In other cases, 'co-investment' or cost sharing arrangements between similarly placed parties have been facilitated, or at least overseen, by the regulator themselves. This has been the case in France, where the three major fibre network operators have entered into mutual arrangements to co-build FTTH facilities.

These developments raise important questions about how access arrangements might be arrived at in future. In the traditional, single vertically integrated firm model, there has been a rather binary distinction between regulated access, the terms of which are imposed by the regulator on both parties, and voluntary access, which has generally not been provided at all.[52] The position in future is likely to be much more complex, with the possibility of parties negotiating commercial arrangements amongst themselves, but doing so 'in the shadow of the regulator'. The regulator will then need to consider what sort of shadow it wishes to cast.

3.4. Greater variation between Member States, with growing differences in market structure, technologies adopted and regulatory approach

We noted earlier in this section that the transition from copper unbundling to VDSL and fibre is producing greater variability of services within individual Member States, leading to policy responses such as broadband targets and greater reliance on State Aid. However, the technology transition is also driving ever-greater fragmentation between Member States. This is illustrated by the differences between those Member States who promote FTTC/VDSL

[52] This is a slight simplification, the 2010 Recommendation sought to promote 'volume discounting', 'risk sharing' and other arrangements that might be concluded between the parties. Some access providers have sought to offer such models, notably Deutsche Telekom in Germany, but their application to date across Europe as a whole appears to have been rather limited.

technologies (with competition being secured through traditional access remedies on the copper network) and those Member States promoting FTTH, often with network competition provided by new vertically integrated entrants exploiting economies of scope.

In the former camp are UK and Germany, where there is rather limited FTTH deployment by non-incumbent firms (although cable is significant in both) but almost nationwide deployment of VDSL/FTTN over the copper network by BT and DT. Ofcom is currently undertaking a review of its regulatory strategy and appears likely to move towards a more pro-FTTH approach.

In the latter camp, France has adopted a 'symmetric' regulatory model to promote FTTH. All (three) major FTTH providers are subject to the same regulatory conditions in which shared ownership is preferred to traditional regulated access to these networks. In Spain, Telefonica has deployed Europe's largest FTTH network and there is significant network competition from other FTTH and cable providers, enabled by regulated duct access but also with restricted access to traditional access remedies. The situation in Italy is more uncertain at this stage, but appears likely to result in significant FTTH deployment and some network competition, as well as some reliance on VDSL/FTTN.

These variations reflect a number of factors. First, there is clearly a strong element of 'path dependency'[53] which means that the choice of current model will be informed by the assets and conditions already existing (over which policymakers have little direct influence). There appears to be some positive correlation between FTTH deployments and the availability of more modern (or better maintained) and more extensive duct infrastructure (although this is still a controversial topic), and between VDSL/FTTC deployments and shorter average lengths of copper sub-loops. An important consideration also appears to be the position of other (private sector) competitors, which differs significantly amongst Member States. In France and Spain, significant integrated fixed and mobile competitors, each with significant infrastructure assets, have developed on a national basis (ownership of mobile assets tends to be associated with fixed broadband competition on a national basis). In the UK and Germany, competitors have significant retail share, but have limited network assets and minimal mobile presence. In the Scandinavian region and Romania, competitors may have significant assets within local markets. In some Member States, utility companies have become significant players in broadband network provision, whilst in others they have not.

However, it would also be a mistake to take too deterministic a view of events. Policymakers in France and Spain, and in the UK and Germany, have also taken deliberate decisions to pursue different approaches to regulation in the pursuit of different outcomes.[54] The French approach,

[53] Ofcom, International Case Studies, 10 July 2015, (http://stakeholders.ofcom.org.uk/binaries/consultations/dcr_discussion/annexes/International_case_studies.pdf).

[54] This is discussed in Cave and Shortall (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2705380) and by Feasey

in particular, favours access to passive infrastructure over active access, and co-ownership over rental. In contrast, the UK has historically favoured active remedies and rental arrangements.

3.5. Greater role public finance in the telecoms sector

The privatisation programme of the late 1990s resulted in a withdrawal of public authorities from the ownership and financing of telecom infrastructure in Europe (although some Governments retained a significant stake in the former monopoly copper networks after that point). The establishment of independent regulators (another core feature of the 2002 Framework) also tended to depoliticise the sector, with the result that Governments largely withdrew from overt intervention in the sector after 2002.

The transition to high capacity networks has begun to reverse this trend. Most Member States, encouraged by the Commission and other international institutions, now have their own 'broadband plans' which invariably include targets for the deployment of infrastructure at a national level similar to those adopted by the Commission in its Digital Agenda. In most cases these targets are not expected to be achieved, or achieved quickly enough, by the private sector alone, with the result that we have seen Member States begin to mobilise public funds to support broadband infrastructure deployment in rural areas,[55] with many having even more ambitious plans for the future. This has occurred despite Member States earlier rebuffing the attempts of Commissioner Kroes to obtain support for a proposed €9 bn 'Connected Europe Facility' in 2013. The papers accompanying the Commission's most recent proposals indicate that the Commission is likely to make further attempts to secure additional funding in support of the 'Gigabit Society' targets: the total costs of which (for fixed high-speed broadband to all households) are likely to amount to around €250 billion, of which around only €80 billion is expected to be met by the private sector on a commercial basis.[56] Previously, ETNO had anticipated that one in every 4 euros (€22bn) invested in NGA infrastructure would be provided by public rather than private funds.[57] If the Commission's latest proposals were to be adopted and pursued, it would be more than one in every two euros (although it seems highly unlikely to us that European Member States would ever agree to a commitment of this magnitude).

In some Member States, notably France and Sweden (and potentially in Germany), the provision of State Aid involves ownership of the infrastructure by the public authorities themselves

(https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxmZWFzZXl3YWxlc3xneDozN2ViZWQ3YzQzMmQ3ZWJk).

[55] As well as subsidies to promote broadband adoption in all areas.

[56] European Commission, Digital Single Market, Digital economy and Society, Communication – Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society, Staff Working Paper, p.29 (https://ec.europa.eu/digital-single-market/en/news/communication-connectivity-competitive-digital-single-market-towards-european-gigabit-society).

[57] The Boston Consulting Group, "Five priorities for Achieving Europe's Single Digital Market (https://etno.eu/datas/publications/studies/FINAL_BCG-Five-Priorities-Europes-Digital-Single-Market-Oct-2015.pdf), p.17.

(although not normally the national Government).[58] Perhaps the most significant example of this is the new Italian broadband plan, which will be entirely Government funded and owned.[59] In other cases, the State has undertaken a 'gap funding' model in which a private operator receives a public subsidy to enable the project to proceed. It is difficult to assess the effectiveness or implications of the different models at this stage.[60]

The Commission developed guidelines for the application of State Aid to NGA broadband networks, but their application has been controversial in some cases. At present, State Aid can only be provided for networks which represent a 'step change' in performance (this has historically been interpreted as a requirement that the proposed network be capable of delivering at least 30 Mb/s) and which undertake to offer 'open access' to their facilities, although these are generally on similar terms to the access obligations that are already applied to SMP operators.[61] The guidelines have been conceived so as to safeguard competition if the funds are taken up by vertically integrated network providers, often the existing SMP firm, and to prevent the crowding out of private sector investment (and consequent misuse of public funds). No obvious linkage has been established with other aspects of the Framework or with the promotion of particular models of competition.

Another interesting aspect of State Aid that is worth noting relates to the use of the tendering process (required by the Guidelines) to inject 'competition' into the process. The way in which public funds are employed may depend heavily on the competitive conditions already prevailing in the commercial market. Thus, in some Member States – for example the current tender process in Ireland – the presence of several credible bidders is likely to 'bid up' the terms and has allowed the Government to propose ambitious rural roll out plans for FTTH. In that case, the consequence may be that households in areas benefiting from State Aid (chiefly parts of rural Ireland) obtain access to better networks than those in areas subject to private sector competition (such as Dublin and Cork). In that case, public funds are not being used to raise those living in rural areas to the level of those in urban areas, but to allow them to leapfrog them. The consequences of this policy (and the new gaps in broadband performance which it will create for the country) are difficult to anticipate at this stage.

[58] It is also possible to have a 'build/operate/transfer' model in which the operator owns the assets for a period of time but they are subsequently transferred to the State at the end of the period. The French national programme allows for this, although we are not aware of any example of such a model being applied in practice. It is also being contemplated by the Irish Government for their National Broadband Plan.

[59] European Commission, C(2016) 3931 final, (http://ec.europa.eu/competition/state_aid/cases/264095/264095_1764969_101_2.pdf).

[60] Although there have been various case studies, we are not aware of any systematic attempt to assess the efficacy of broadband State Aid to date.

[61] An interesting debate has developed between the British Government and Commission in relation to BT, where the access obligations imposed by Ofcom and those required by the Commission for State Aid differ in relation to access to dark fibre.

In other Member States, such as the UK, the Government remains heavily dependent upon the copper network provider to implement the State Aid programme, since there are few other credible independent network providers.[62] In such cases, the Government uses the subsidy to extend the same technologies and performance to a greater proportion of the population.

Greater network competition therefore appears to allow the public authorities to pursue more ambitious programmes when dispensing public funds, and perhaps to achieve a better return from them. If public subsidy is to play a very significant role in the future, then having effective competition between credible bidders for those funds becomes an important objective.

3.6. Continuation of the copper network

The future of much of the copper network in Europe appears uncertain and the debate about 'copper switch off' does not appear to be very far advanced in most Member States. This contrasts with quite aggressive plans to switch off or decommission copper in other parts of the world, notably the US, Australia and New Zealand. In France, where widespread FTTH deployment is envisaged by 2022, the Government has undertaken detailed studies (and trials), but discussion of copper decommissioning at the European level appears rather limited to date, even in those markets where the copper network owner is deploying FTTH or other technologies.[63] Most European network operators appear instead to envisage an extended period of duplication or co-existence.

Since the 2002 Framework and its subsequent revisions were largely forged under conditions when copper was the pervasive technology, it is unsurprising that the future prospects for copper have important implications for the way in which the model would operate. One concerns the question of whether copper-based DSL retail products continue to be regarded by consumers as substitutes for high-speed FTTH or HFC cable-based products. In some Member States there is evidence that this may no longer be the case and that, whilst households will readily switch from copper connections to FTTH or HFC, they will not switch back to the copper DSL network, even if they were to be offered significant price discounts to do so (this is known as 'one way' substitutability). In this case, the broadband market could be said to 'bifurcate' into a 'high-speed' market and a 'standard' broadband market, with the boundary defined not by the nature of the user (e.g. business or consumer) but by the technological characteristics of the underlying network.

We explained in the previous section how existing broadband NGA regulation is, following the 2013 Recommendation, founded on the assumption that copper-based products (ULL) provide a

[62] Cable operators having thus far proven reluctant to bid for public funds.
[63] Article 78 of the proposed Code anticipates the retirement of copper networks and seeks to that competition is not unduly disrupted in the process.

competitive constraint to the pricing of NGA wholesale products - the 'anchor product' theory.[64] If copper-based products were no longer to provide such a constraint, it is not clear whether the pricing model established by the Recommendation would hold in some Member States, nor what would replace it if it did not. At present, it appears that the regulator would be required to set prices in areas where there are no competitive constraints from other networks, which would represent a significant re-regulatory development. At the time, it was assumed that copper products, chiefly ULL, would provide competitive constraints until at least 2020. However, the evidence today is rather less certain.

The question of substitutability also has important implications for the definition of relevant markets and the SMP market review process. Modifications have been made to the definitions in the revision of the List of Relevant Markets in 2013, but the assumption that copper, fibre and HFC cable-based products all compete for the same 'broadband' households has remained essentially unchanged. As a result, the entry of firms building their own FTTH networks and the emergence of HFC cable as a powerful network competitor to the existing copper network have invariably increased network competition in the relevant market (all else the same). If, however, the existing copper network (even if upgraded) no longer constrains these alternative networks and has to be excluded from the analysis, competition in a new market for very high capacity services would be confined to FTTH and HFC cable networks. This may result in either more or less competition than prevailed before high-speed broadband services were introduced. If the new FTTH or HFC cable networks are not themselves subject to access obligations to support downstream competition (as is invariably the case today), then it seems quite likely that competition will actually be diminished as the broadband market bifurcates. Again, we take no view as to whether or not this would be a cause for concern or necessitate further intervention (e.g. to apply wholesale access obligations to the new FTTH or HFC cable networks), but we assume it would be a matter which the regulator would want to examine carefully. Regulators who have hitherto relied upon the imposition of wholesale access obligations on the copper network to promote competition in downstream markets would no longer be able to do so if a separate high-speed broadband market which excluded copper were to emerge.

The substitution of copper by HFC cable and fibre also has implications for the development of wholesale markets. From late 2015, the total number of unbundled copper loops in Europe has begun to fall, following a decade or more of growth. Given the centrality of unbundling to the European regulatory model of competition, this is an important, if unremarked upon, milestone. Most analysts anticipate that the wholesale market for ULL will continue to contract in many Member States in the coming years. The contraction of the ULL market is associated with three factors: the migration from ULL to other wholesale products, most notably VDSL virtual unbundled access (in Germany and the UK), the migration from ULL to provision through other, vertically integrated networks – for example, by migrating DSL customers to HFC cable networks

[64] A constraint which is sufficiently strong to allow for pricing flexibility but not sufficiently strong to void a finding of SMP.

or to FTTH (in France, Spain and Italy) and a contraction of retail market share of the unbundlers in some Member States (notably in the UK).

As we noted in the previous section, the relative significance of the unbundling model and of wholesale markets has always varied between Member States, some of whom have accorded greater significance to network competition from HFC cable or other local network providers. Nonetheless, ULL connections have typically accounted for 30-40% of the retail market in each of the UK, France, Germany and Spain. This has ensured that unbundling has remained at the core of the Commission's policies to promote competition since 2002 and has sustained a European consensus around the model for the past 15 years.

This position is, however, changing quickly. Wholesale markets in France and Italy are each expected to contract by around 2 million lines over the next 5 years (from 12 million and 9 million lines respectively today) as demand migrates to alternative vertically integrated networks (rather than from ULL to other VDSL-based wholesale products on the same copper network).[65] The importance of unbundling policy and its associated challenges – notably the regulation of prices (including the application of margin squeeze tests) and the prevention of non-price discrimination – may be of increasingly marginal significance to some larger Member States. As that happens, it is reasonable to expect that the Commission's focus will need to reorientate towards the issues that arise from oligopolistic competition between a small number of vertically integrated networks.

3.7. The role of mobile remains uncertain

For many years, analysts debated whether mobile telephony would substitute for fixed line provision. The proportion of 'mobile only' households has grown in many Member States and explains fixed line loss in some, but the more significant trend has proven to be the decoupling of services from the provision of the underlying access facilities and the substitution of voice telephony services by VOIP and OTT messaging providers. Access line substitution by mobile has had a limited impact on the regulatory landscape, save for the inclusion of mobile broadband in the wider broadband market in Austria some years ago. Recent developments, which have seen mobile operators such as Vodafone acquire substantial fixed line assets and cable providers such as Liberty Global acquire mobile assets, would indicate that mobile and fixed services are expected to remain complementary rather than substitutional products. If that is the case, then regulators may regard existing mobile operators as potential entrants into the broadband market, particularly if they are able to exploit network economies of scope (for example, through the shared use of backhaul infrastructure for both fixed and mobile services) which we identified as being important enablers of entry in the previous section.

The development of 5G services adds uncertainty to this debate. The CEO of Verizon, for example, is reported to have described 5G as being primary a fixed line replacement technology

[65] Barclays (2016), p.27.

(with high capacity mobile and IoT applications being secondary opportunities). We recall that similar claims were made in relation to 3G technologies a decade ago, and it is clearly too early to assess whether mobile technologies will provide substitution opportunities. However, renewed interest in wireless-based technologies (with Google Fiber reportedly investigating wireless alternatives to its FTTP plans) suggests that further technological innovation in high capacity access networks – with significant consequences for competition - may be in prospect in the next period. If that is the case, then European policymakers may need to be careful not to arrive at hasty or irreversible judgements about the extent to which certain broadband assets may or may not prove to be replicable in future. A key merit of the 2002 Framework, in our view, was that sought to regulate the market conditions which prevailed rather than regulating particular technologies. This has provided the European Framework with a degree of flexibility in the face of uncertain technological developments which regulatory frameworks elsewhere in the world often appear to lack. It has allowed the Framework to evolve in order to accommodate new technologies such as VDSL and FTTH without the risk of regulatory failure or collapse. It is tempting for European policymakers to conclude that fibre-based technologies now represent the 'end game' for broadband connectivity and that technology uncertainty in the sector has now significantly reduced or no longer matters. We are not of that view.

In both this section and the previous one we have identified a wide range of challenges and issues that have emerged as Europe moves from a copper-based DSL broadband environment, with unbundling of the vertically integrated incumbent network at the heart of European regulatory policy, to a high-speed environment founded upon a much more extensive range of technologies and providers, giving rise also to a greater variety of models to promote competition. In the next section, we attempt to bring together historic lessons and current trends in order to identify what we consider to be the core set of issues which any revision to the current European regulatory framework will need to address.

4. Implications for future European policy towards competition in broadband markets

4.1. A renewed focus on promoting network competition

We have seen that the traditional unbundling model sought to promote competition by enabling new entrants to attach their own electronics to the existing copper loops of the vertically integrated network owner. These new DSL technologies – and ongoing developments in the DOCSIS standards for HFC cable - drove the broadband market forward. Although sometimes disputed, we think it likely that the deployment of new DSL technologies by entrants is also responsible for the more rapid deployment of the technology by the incumbent copper network owner as well (although we recognise that other factors, notably competition from HFC cable, has also been an important driver in this regard).[66]

This model does not, however, appear to work, or work as well, in the transition from DSL broadband to very high-speed broadband. It would seem more difficult for entrants to install distinctive or new technologies independently of the network owner so as to offer VDSL or vectored VDSL services (than was the case for DSL). Perhaps these challenges will be overcome and the 'unbundling' model will continue to have some application in some contexts, but we would not expect it to be such a central feature of European regulation in future. We expect most competitive VDSL and G.Fast services to instead be provided using 'virtual unbundled access' products, for which the opportunities to differentiate services in the downstream market may be more limited.

More generally, further improvements in broadband services require not (only) the introduction of new electronics at either end of the copper loop but the replacement of (some or all of) the copper loop itself. One way to promote this, consistent with the model of competition which Europe has pursued since 2002, is to unbundle the underlying ducts, poles and other civil engineering infrastructure from the copper loops. This would allow competitors to install their own loops, presumably consisting of fibre, just as they previously installed their own DSLAMs. This has been the approach to promoting high-speed network competition which the Commission first adopted in the 2010 Recommendation but which has yet to be applied in earnest in many Member States.

4.2. Passive access

Experience suggests that there are a number of issues with the use of such 'passive' remedies. First, it may be a mistake to assume that the civil engineering infrastructure of the existing copper network is the only infrastructure suited to the deployment of high-speed fibre

[66] See footnote 23.

networks. Indeed, in some Member States the telecoms infrastructure may be poorly suited to this approach, for example because cables may have been directly buried without first being encased in ducting which others might use. We noted earlier that many of the new fibre networks have been deployed by firms outside of the telecoms sector who instead use infrastructures which have hitherto been used for other purposes. The Commission recognised this opportunity in its Broadband Cost Reduction Access Directive of 2014, which establishes a framework under which firms can obtain access to the existing civil engineering facilities of other utility providers and transport networks.[67] Even if other utility providers do not exploit these assets to deploy broadband networks themselves, they might be expected to have strong incentives to make their facilities available to others who wish to do so (since they have no presence in the downstream market to defend). This ought to reduce the challenges of regulating for non-price discrimination or margin squeeze which would no doubt otherwise arise if entrants were to rely upon the civil infrastructure of the incumbent telecoms operator. It is too early to tell whether this Directive will have the impact which the Commission hopes for, but its effective implementation could be an important element in the promotion of network competition in the next 10 years.[68]

Second, it is not clear that entry into high-speed network markets require or is necessarily facilitated by a pre-existing customer base, as was assumed in the DSL 'ladder of investment' hypothesis. Those with existing investments in DSL technologies may have good reasons to be reluctant to deploy fibre (the replacement effect), whereas those firms without existing commitments, but with some cost advantage derived from economies of scope, may be more likely candidates to enter. Some of these firms plan to generate sufficient retail demand over their network by wholesaling it to others. If that is right, then policies which aim to help existing firms build their retail market share through the resale of wholesale products in anticipation that they will then deploy their own fibre infrastructure may be misdirected. Competition

[67] The Broadband Cost Reduction Directive also applies to SMP operators who may also be required to provide access to ducts under the Framework. It has been suggested that this may lead to some unhelpful duplication in the regulation of the SMP firm, although we note that a vertically integrated telecoms operator with interests in the downstream retail market may require greater oversight (under the relatively more detailed provisions in the Framework, which include equivalence and other obligations that do not apply in the BCRD) than a utility company or transport network with no such retail interests.

[68] Analysys Mason model sensitivities about duct re-use when calculating the costs of meeting the Commission's Gigabit Society targets. They suggest a 10% increase in duct re-use reduces total deployment costs by around €40bn – a huge saving on total costs of circa €210 bn., see p.69 at http://bookshop.europa.eu/en/costing-the-new-potential-connectivity-needs-pbKK0116744/?CatalogCategoryID=CXoKABst5TsAAAEjepEY4e5L. WIK et al report that the French regulator considers that 17% of households could be served by competing FTTH networks using duct sharing (p. 265), whilst Analysys Mason, in a separate report for BT, estimate that between 4% and 7% of UK homes could be served by competing FTTH networks using duct sharing, see http://www.analysysmason.com/PageFiles/54213/Comparatable-analysis-of-UK-broadband-market-Analysys-Mason-REPORT.pdf. All of these estimates appear highly sensitive to certain key assumptions, suggesting that the scope for FTTH network competition within a given Member State is likely to remain very difficult to predict.

through resale may still have its place, but a sharper focus might be given to policies which allow new firms to identify and exploit economies of scope. This might, for example, include economies of scope between mobile and fixed infrastructure as 5G mobile networks depend increasingly upon dense fibre networks to support them. It might also include economies of scope in the marketing and delivery of bundled products, such as between TV services and broadband.

A likely consequence of the view that entry may occur directly through the reuse of civil engineering assets is that this should also create opportunities for a significant simplification of the regulatory regime for active access products. As we explained in previous sections, attempts to establish competition in intermediary markets, or 'rungs' on the 'investment ladder', have largely been unsuccessful. Instead, most broadband providers buy or sell a single wholesale product – unbundled copper loops or VDSL bitstream – and operate as a vertically integrated firm, selling the entirety of its own wholesale demand into the retail market (or serving the whole of its retail demand through its own wholesale products). The efforts to create competition in wholesale as well as retail markets have instead meant that regulators create complex multi-level margin squeeze tests and require the SMP operator to offer a large portfolio of different wholesale products, some of which were rarely used.

Our objection to continuing with such arrangements does not rest on the direct costs to the SMP firm of maintaining them, which we suspect are relatively modest (provided the proliferation of access products is kept within sensible bounds). Rather, our concern is that complex regulation is likely to distort market behaviour and inhibit the development of properly functioning, commercial wholesale markets. It is very difficult for the regulator to set appropriate prices (either directly, or through specification of the appropriate margin) for a wide range of interdependent products. Mispricing them will distort investment incentives and lead to inefficiency (on the part of both incumbents and entrants). Removing wholesale products is likely to support attempts to promote competition through the provision of passive access to ducts, by removing alternative regulated access options, and so promote network competition. Dismantling intermediary margin squeeze tests may allow the SMP operator to better meet competition from other, vertically integrated competitors, such as cable networks or FTTH providers using passive remedies. As network competition increases, so complex regulation of intermediary markets becomes ever less appropriate.[69]

Although we advocate removing much of the 'intermediary market regulation' that is applied under the existing Framework, we do not suggest that there is no role for regulated 'active' wholesale products in those geographic areas where there is no prospect of network competition or of the development of wholesale supply on a commercial basis (or where such supply does not, in fact, emerge). We have noted elsewhere that substantial areas of Europe are

[69] We are not persuaded by the argument that these arrangements should be retained so as to constrain the SMP firm so that it competes with 'one hand behind its back'. We see no reason to promote inefficient entry in this way.

likely to require public subsidy to finance the provision of even a single fibre network, and that such a network is likely to displace the existing copper network in time. In such cases, the safeguarding of competition in the retail market will continue to require appropriate wholesale access regulation, including appropriate regard to the incentives of the network owner to maintain and upgrade its network infrastructure when setting prices. We noted in the previous section that these are issues that have already been debated at length in recent years, and on which the current 2013 Costing Recommendation is intended to provide guidance until at least 2020. We therefore do not address them further in this study.

4.3. Co-ownership

If the acquisition of scale is of less importance in the future, regulators may need to worry less about fixed costs as a barrier to entry. A number of regulators, notably the French, have already proposed that firms be required to buy and own fibre assets, rather than lease them, if they wish to participate in the high-speed broadband market. That requires firms to commit to sunk, fixed costs at the outset of the project, rather than being able to mitigate risk by renting. The idea that competitors might jointly own network assets, rather than one leasing from another, represents an interesting development in European broadband regulation. To date, firms have rented loops or other facilities, but have never had the opportunity to take over the ownership of the assets themselves.[70]

There are several questions to ask about co-ownership or co-investment. The first is whether co-ownership or co-investment would make much difference to the way competition works. It might, but much depends, in our view, on the details of the arrangement in question.

For example, we see joint ownership of the underlying duct infrastructure as potentially having many attractive properties. In such a case, the owners of the infrastructure have a joint interest in investing so that they may jointly exploit the assets. This would appear to contrast with the incentives of a single vertically integrated owner, who may have little interest in improving the utilisation of assets (e.g. by unblocking ducts or otherwise repairing them) so that rivals can better deploy their own networks over them.

Joint ownership of active assets is less straightforward. This is likely to require and to lead to co-ordination of technology decisions and upgrades and reduce opportunities for differentiation. Much will depend upon the details of the co-ownership arrangements and the unilateral freedoms accorded to the different parties. Much also depends on the relevant counterfactual, which may be several, competing independent networks using either common duct infrastructure or separate facilities on the one hand, or which may be a single vertically integrated network provider or no provider (of high-speed services) at all, on the other. The

[70] Operators such as Verizon in the US have sold some of their local copper assets in order to focus on other technologies. So far as we are aware no European operator has yet done so.

former is more plausible in urban areas, the latter in more rural areas. The more difficult cases are likely to arise when the scope of the co-invested project encompasses both.

We recognise that there may also be opportunities for each of the owners to compete more effectively in downstream markets and/or for regulators to withdraw from the kind of detailed regulatory oversight required when overseeing a single, vertically integrated, firm. For example, joint ownership and control of an asset might remove concerns about the possibility of discrimination or other practices otherwise associated with vertical integration and downstream rivalry. For this reason, co-investment arrangements may well promote network competition relative to a counterfactual in which operators otherwise rent active wholesale products from the vertically integrated SMP operator, but it may be less obvious that it will always be superior to a situation in which the operators would otherwise rent passive assets.

It is, in other words, not obvious that simply owning rather than renting an asset automatically increases competition – or that wholesale input prices will necessarily be set at efficient levels as a result. There is considerable experience of co-ownership amongst operators in the mobile sector, normally in the form of 'network sharing' joint ventures and similar corporate arrangements. Some appear to have worked well, others not. Although shared ownership of assets should be encouraged, we think it would be naive to assume that co-ownership would necessarily eliminate all of the issues which have arisen when firms otherwise rent assets from each other.

Thus, our tentative conclusion is that whilst co-ownership is likely to have some advantages over renting, that it might result in more effective competition in downstream markets and more extensive deployment of high-speed broadband infrastructure (than in the absence of such arrangements), these are claims that have to be demonstrated rather than assumed. We explain later in this section that we consider wholesale supply to third parties is likely to be important, if not decisive, when there would otherwise be only two vertically integrated networks. Similar considerations apply under co-ownership, and we would expect competition authorities to want to ensure that co-ownership of the assets is not a mechanism for restricting or otherwise co-ordinating supply into downstream wholesale or retail markets.

Similar points have arisen in the past in relation to the assessment of horizontal agreements between potential mobile competitors in relation to network sharing. They have also arisen, in a rather different context, in relation to 'co-bidding' arrangements amongst operators for certain content rights. In each case, there are potential trade-offs to be made and safeguards to be put in place.

If regulators are to promote co-ownership as a new regulatory remedy, the next question is how that might be done.

One approach, which appears to be favoured by the Commission (see Article 74 of the proposed Code), is to introduce incentives for parties to share assets, but without obliging them to do so. On this model, renting access to assets would remain the default model, but an SMP operator

(whether currently or prospectively) may benefit from more favourable regulatory conditions if they instead offer to share ownership. Under the Commission's proposals, for example, an SMP operator building a new fibre network would not be subject to access obligations (at least in relation to the new products which it was able to supply by virtue of the new technology) if it offered others an opportunity to co-invest in the project.[71] This also has the effect of encouraging (obliging?) other parties to participate, since they would no longer otherwise have access to certain rented products.

The approach just described considers co-ownership as an option for the SMP firm if it wishes to exercise it. It is not an obligation that is imposed by the regulator. There are many advantages to this approach, notably that it allows firms considerable freedom to determine for themselves who they contract with and on what basis.[72] However, it is important to recognise that it also leaves the decision about whether co-investment will arise to the SMP operator. If that operator determines that the incentives are insufficient to exercise the option, then there is (as far as we can see) no way in which other parties would be able to make it happen (with the SMP operator).[73]

An alternative approach would be to consider co-ownership as being a quite separate remedy, which regulators could impose under certain conditions. This would remove control from the SMP firm, who would then find themselves obliged to share facilities. It would therefore carry the risk that the SMP firm would decide not to invest at all in the new network, if co-investment were the only basis on which it could do so. On the other hand, it would also remove options for the potential entrants as well. Instead of being assured regulated wholesale access on conventional terms in the absence of co-investment, they would now face the choice of either co-investing or having no access to the new infrastructure.[74] This approach might therefore be

[71] The Code seems to envisage the co-investment provisions as generally applying ex ante to new deployments of high speed networks. In our view, there is no reason why the provision should not apply to an existing network, in which case an SMP operator may be able to remove existing obligations if it were to share ownership of existing assets with other parties. The Commission's focus on new networks reflects, we think, its view that co-investment is a means of extending deployment of new high speed infrastructure (with the reduction of regulation as an incentive) rather than as a means of reducing regulation per see. We think both goals are admirable.

[72] We recognise that, under the proposed Code, the participants in a co-invested network are required to make a public offer to any third party that wishes to join at a later date. However, the 'founding' partners, rather than regulator, will set the terms that are offered and these are likely, in turn, to influence who might be in a position to take it up. We do not expect those terms to be comparable to those agreed between the founding partners.

[73] We recognise that co-investment arrangements could also arise amongst non-SMP firms, who may collaborate in order to better compete with the SMP operator. Such arrangements are likely to be less problematic, both in terms of incentives to participate and in terms of the potential impact on competition. Each needs to be considered on its merits.

[74] The position under the Commission's proposals is a little more complex than this, since it appears the SMP firm only has to make an 'offer' in order to benefit from the relief under Article 74, and not have to have it taken up (i.e. it is not a 'pre-pack' remedy of the kind sometimes required in mergers). We suspect, however, that national regulators will be reluctant to accept co-investment offers as 'reasonable' if there

expected to increase the prospects of co-investment arrangements being concluded, but it carries much higher risks (chiefly in terms of the SMP firm withholding investment) if they are not. We are not attracted by it, and it is not clear to us whether this approach is envisaged by Article 59 of the Commission's proposals. This is a point we return to later.

4.4. The consequences of greater network competition

It is one thing for policymakers to promote network competition as the market transitions from copper to high-speed broadband networks, but it is also important to understand the opportunities and risks that arise as a result. In this section, we consider both.

The benefits of network competition for consumers are well known and we do not revisit them here. Instead, we are concerned with the opportunities that arise for regulators as a result of being able to oversee competition between vertically integrated firms rather than seeking to regulate only one such firm. Many of these have been mentioned earlier in the study. The first, and to our minds most important, is that it creates the possibility for the emergence of a properly functioning (i.e. competitive) wholesale or intermediary market in the supply of broadband services. It is important to note that we focus here on wholesale rather than retail markets not because we consider that wholesale market competition is an end in itself, or because we think that effective retail competition can never be obtained without wholesale market competition. On the contrary, we recognise that effective retail market competition (and the resulting benefits for consumers rather than firms) should be the primary concern of regulation. If retail competition is sufficient, then there is no need to concern ourselves with upstream markets.[75] However, we focus on wholesale markets because we also think that there will be many cases where there will be insufficient competing networks – perhaps two – and insufficient prospects or evidence of further entry at the network level to then be confident that competition in the downstream retail market would be effective without wholesale supply. The question is then whether wholesale supply can develop on a commercial, competitive basis when there are two networks, or whether we will remain trapped within a regulatory framework which was largely designed for a single, vertically integrated network monopolist. This is why we think that the development of genuine competition in wholesale supply is likely to be a necessary condition for the withdrawal (rather than just simplification) of most of the existing regulatory architecture in European broadband markets. This would be a very significant, and in our view desirable, step (and consistent with the level of ambition expressed by the industry, the Commission and others for the outcome of the current review), and hence ought to be one to which both regulators and firms should devote considerable effort in the next period.

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were no foreseeable prospect of take up. In such circumstances, it would amount to deregulation of the SMP firm which would continue to own the network on an exclusive basis.

[75] We therefore welcome the Commission's proposal to restate this principle at Article 65(4).

4.5. Wholesale markets

Could firms be incentivised to behave in way which ensures the development of a well-functioning wholesale market for broadband services without the need for regulation? A banal precondition for the establishment of such a market is that there needs to be more than one prospective supplier, although it is not necessary for there to be more than one actual supplier provided there are no limitations on entry or expansion. The promotion of network competition, or the entry of firms into the market irrespective of such efforts, is therefore a necessary first step.

There is an argument to say that, aside from promoting entry, there is little more a regulator can or should do. Vertically integrated firms will respond to competitive rather than regulatory pressures in determining whether or not to make wholesale offers. They should not be 'rewarded' for responding to such competitive forces. Firms will generally have strong collective incentives not to enable new downstream competitors but may, in the absence of co-ordination, have unilateral incentives to do so (e.g. if they have sufficient capacity and/or believe that the downstream firm is more likely to cannibalise sales from its rivals than itself). On this view, firms will supply if they expect rivals to do so and if the market is competitive, but will not do so otherwise.[76]

We find this an overly simplistic view. It is clear to us, for example, that regulatory outcomes are likely to be one factor influencing the unilateral incentives of a firm ('the shadow of the regulator' referred to earlier). Sometimes, decisions about whether to supply are finely balanced, and the regulator may be able to tip that balance (we referred earlier, for example, to claims that cable operators may have been reluctant to supply on a voluntary basis given uncertainty about how regulators would react to evidence that such supply was technically feasible). It is also the case that wholesale markets may evolve in stages. By this, we mean that firms may initially attempt to withhold supply but that, once this barrier is broken, there may be robust competition and no prospect of supply subsequently being withdrawn. This appears to have been the case with wholesale markets in the European mobile sector, many of which began to develop after an initial phase of market growth had been completed and the vertically integrated network providers then sought alternative retail distribution channels to expand their output. We are also mindful that the regulatory backdrop is likely to influence the conduct of potential buyers in the wholesale market, as well as influencing the sellers. There is a danger of a 'hold up' problem, which we have observed in mobile wholesale markets, where buyers may delay signature in the hope that a failure to conclude an agreement will be viewed by a regulator as grounds to intervene and impose more beneficial (to the buyer) terms. We think regulators should be mindful of these risks too (although we see no obvious solutions to them).

[76] We ignore capacity constraints in this context, since they are unlikely to be a consideration in high speed fixed broadband networks.

It is relatively easy to see how SMP firms might be encouraged to offer wholesale access on 'commercial' terms. In its latest proposals, the Commission frequently reminds regulators that they will need to take account of such commercial offers when assessing whether additional regulatory measures are required to safeguard competition.[77] It has also sought to clarify that a non-integrated wholesale provider (i.e. a network owner who did not participate in the downstream retail market other than through third parties) would not be subject to price controls, non-discrimination and similar obligations.[78]

It is important to stress that the Commission's view of a 'commercial' wholesale offer appears to differ from ours. The Commission seems to anticipate that an operator with SMP can nonetheless be induced to conduct itself on a 'commercial' basis to avoid or reduce regulation of its wholesale activities. Our view of 'commercial' offers is, rather, that they are the product of competitive interactions between rival suppliers of wholesale products. On that basis, commercial offers and 'competitive' wholesale markets emerge as network competition is extended, although of course we have already noted that the conduct of firms, even in competitive markets, will also be influenced by the regulatory environment within which those firms then operate (at least at the margin and often well beyond that). This is why we would consider wholesale supply as evidence of an absence of SMP and that the availability of supply on reasonable terms would trigger not simply a withdrawal of other regulatory remedies but a withdrawal of the SMP status itself.[79] As we noted earlier, when discussing the impact of cable competition on the SMP operator, regulators have thus far tended to translate evidence of competitive constraints into moderation of remedies rather than removal of SMP. There are, however, arguments in favour of the latter approach (provided regulators can be confident that offers were the result of genuine competitive interactions and would not be subsequently withdrawn or modified once regulatory obligations were removed).

The Commission seeks to provide some guidance to regulators in recital 177 of its proposed Code:

"Where at least one of the network operators offers wholesale access to any interested undertaking on reasonable commercial terms permitting sustainable competition on the retail market, national regulatory authorities are unlikely to need to impose or maintain SMP-based wholesale access obligations, beyond access to civil infrastructure, therefore reliance can be placed on the application of general competition rules. This applies a fortiori if both network operators offer reasonable commercial wholesale access. In both such cases, it may be more appropriate for national regulatory authorities to rely on specific monitoring on an ex post basis. Where on a forward-looking basis, three access network operators are present or are expected

[77] See Article 71(2).
[78] See Article 77.
[79] Although we recognise that the nature of the test is different and that cable may provide a sufficient competitive constraint to justify different remedies without providing a sufficient constraint to ensure that the market is effectively competitive. Part of our concern is that the former test appears rather subjective.

to be present and to sustainably compete in the same retail and wholesale markets (e.g. as can be the case for mobile, and as can occur in some geographic areas for fixed-line networks, especially where there is effective access to civil infrastructure and/or co-investment, such that three or more operators have effective control over the necessary access network assets to meet retail demand), national regulatory authorities will be less likely to identify an operator as having SMP, unless they make a finding of collective dominance."

In this case, the Commission appears to propose that commercial offers would be considered grounds for adjusting remedies in the case of provision by one or two networks, but that SMP might be removed if there were three competing networks. This seems to us a rather restrictive analysis, since we think it possible to envisage circumstances under which wholesale supply by two firms might provide evidence of effective wholesale competition (and hence removal of SMP) whilst wholesale supply by one firm in a duopoly might not. It seems to us inappropriate to seek to address such complex and important issues in recitals rather than within a revised (and more expansive) set of SMP Guidelines.[80] We consider some of the issues those Guidelines might address later in this report (see Chapter 4.6).

Aside from creating incentives for potential suppliers to make wholesale offers, the other challenge is to encourage access seekers or potential buyers to accept such offers, rather than rely on obtaining better terms from the regulator if they refuse to deal. This is less of a concern if there are several buyers and concluding terms confers some first mover or other commercial advantage on the buyer that does so. Regulators ought, in our view, to ensure that such arrangements are not inhibited by overly prescriptive non-discrimination rules. There may be other ways to encourage buyers to accept reasonable offers, such as allowing the vertically integrated firm to launch in the downstream market even if there are no buyers of the wholesale product. On the other hand, there are obvious risks that the lack of an agreement reveals that the terms being offered are unreasonable, or that the price would precipitate a margin squeeze. Regulators may have to end up forming their own views as to 'reasonableness', which is a very challenging task (although one undertaken by the Commission and other competition authorities when assessing the merits of undertakings offered by parties pursuant to a merger). As far as we can see, the Commission has made no proposals in the latest review which might address this difficult issue of incentives of buyers.

Another, but different, form of commercial arrangement to emerge as entrants have developed their own FTTH networks is the two-way reciprocal access agreements to which we referred in

[80] We understand that Article 15 of the Framework Directive requires that such guidelines be 'in accordance with the principles of competition law'. Later in this study we discuss some of the changes that we consider are required in order to allow NRAs to tackle the challenges of network oligopolies and to otherwise achieve the other objectives which we identify. We consider that our proposals are consistent with the way in which both NRAs and the Commission have applied competition law principles to oligopolies (and to tacit co-ordination) in (mainly mobile) telecoms markets to date. To the extent that the guidelines needs to be more expansive than existing case law in order to be useful, then we suggest that Article 15(2) be amended to allow for this.

the previous section. These are not strictly a product of network competition, since they involve bi-lateral bargaining between owners of monopoly networks who do not compete directly with each other. Third parties are generally excluded from such arrangements.

Again, we see some merit in such reciprocal access agreements – which the Commission appear to characterise as 'co-investment' (but which we think have rather different economic characteristics) – to the extent that they remove the need for the regulator to set the terms of such arrangements. However, in comparison with the one-way commercial arrangements discussed above, we suspect they may have more limited applicability. Nor do we think it is likely to be necessary for the regulator to incentivise the conclusion of such arrangements. Both parties would appear likely to have mutual incentives to deal.

This is, indeed, one of our concerns. Whilst we worry that commercially negotiated one-way access arrangements might prove difficult to conclude in practice,[81] we worry that two-way agreements might be too easy. That is, both parties may have incentives to conclude such arrangements to exclude rivals or otherwise to dampen competition in the downstream market. This could occur, for example, if the wholesale prices in the agreement were set at a level which allowed both parties to shelter profits whilst earning normal margins in the downstream market. Similar concerns have arisen in relation to bi-lateral wholesale international roaming arrangements, with which there are strong similarities, in the past.[82] We assume that such vertical agreements would generally be subject to review by the competition authorities and there may be merit in DG Competition providing early guidance on how it might assess such arrangements, as it has previously done, for example, with respect to infrastructure sharing by mobile operators.

4.6. Oligopolies

We identify two sets of challenges arising from the emergence of network competition in high-speed broadband markets. The first, and one which has attracted considerable attention in recent years, recognises the fact that whilst the transition to high-speed broadband may move markets from a situation in which there was a single vertically integrated monopoly network provider to one in which there are several such providers, it is unclear whether it is or will be sufficient to ensure effective competition in the downstream market without the need for further regulatory intervention. Such uncertainty has given rise to concerns amongst regulators that the resulting 'tight oligopoly' would be sufficiently competitive to require the removal of the existing SMP designation from the copper network owner, but insufficiently competitive to

[81] Although we note the commercial offers made by KPN and referred to in para XXX were subsequently taken up by other parties in the Dutch market.

[82] European Commission, DG Competition, Working Document on the Original Findings of the Sector Inquiry Into Mobile Roaming Charges, (http://ec.europa.eu/competition/sectors/telecommunications/archive/inquiries/roaming/working_document_on_initial_results.pdf).

function satisfactorily. In such circumstances, regulators would be required to infer tacit co-ordination and/or joint SMP to intervene. Many regulators (as represented by BEREC) claim that such a threshold is unattainable in practice and that Europe risks being left with poorly performing, but nonetheless unregulated, broadband markets. In an attempt to avoid this, BEREC has proposed that Europe adopt a new 'tight oligopoly' test, to supplement that applied under the existing SMP framework, to which we referred in the previous section of this study.

The first point to note is that the characterisation of competition in high-speed broadband markets depends upon the assumptions that are made about the geographic scope and the products to be included in the market. To date, as explained in previous sections, European regulators have tended to define broadband markets in national terms, to designate the national copper network as having SMP, but to recognise geographic differences in competitive constraints by varying remedies. As competition from new high-speed networks invariably develops on a localised, sub-national basis, it is increasingly difficult to justify this approach. It may be sustainable whilst the national network owner retains nationally averaged common prices, but it is also unclear how long this can be sustained as geographic differences in competitive conditions become more acute and as vertically integrated competitors set prices according to local conditions rather than off the back of nationally averaged regulated wholesale rates.[83]

More focussed geographic market definitions raise two concerns for regulators. The first relates informational requirements and costs, as regulators will need to gather data in order to understand differences in competitive conditions (e.g. the availability of competing networks) at a much more granular level. Moreover, these conditions could change quickly within a particular locality, which means that regulators are likely to need to update their market analysis more (not less) often than is the case today[84]. The Commission, rightly in our view, devotes significant attention to the need for regulators to now develop databases with geographic information of network deployments, to be updated at least every 3 years (proposed Article 22). The second concern is that sub-national geographic market definitions are likely to make it harder to establish that a single firm has SMP, and more likely that many markets will consist of a number of competitors with significant market shares and clear evidence of rivalry.

[83] 'In many countries there are now competing infrastructures only in parts of the country, typically in urban areas. In both of the above mentioned scenarios the result may well be that competitive dynamics vary significantly across a country. Where this is the case, an NRA could, in principle, find sub-national geographic markets.', EC Explanatory Note Accompanying List of Relevant Markets 2014, (https://ec.europa.eu/digital-single-market/en/news/explanatory-note-accompanying-commission-recommendation-relevant-product-and-service-markets), p.13.

[84] Contrary to the Commission's proposal to extend the period between market reviews from 3 to 5 years (proposed Article 65(5)(a)). Although we recognise that this proposal has merit in some cases, the current pace of superfast broadband network deployment, and the uncertainty that often exists about where it might occur next, means that these markets are likely to require more frequent reviews if regulation is to keep pace with market developments over the next 5-10 years.

In our view, the Commission is right to push regulators to undertake more sophisticated market analysis, and to insist that they assemble the tools to do so. Not only does this seem to us to be the correct methodological approach, but it also improves the prospects of removing the SMP designation from firms in relation to those geographic markets where they face effective competition. To repeat, the aim of the Framework is not simply to moderate the application of remedies in the presence of competition, but for regulators to withdraw from the field altogether if competition allows.

The other aspect of market definition relates to the products to be included. In previous sections, we already discussed the possibility that the pricing of new high-speed FTTH and HFC networks might no longer be constrained by DSL products offered over the copper network. If this were to be the case, then the impact of new FTTH or HFC cable networks on competition may be more complex than first appears. Such networks clearly introduce additional competition for the existing providers of DSL services, since there is clear evidence of substitution from the latter to the former. The market for 'standard' broadband services is therefore more competitive as a result of new network entry. On the other hand, the new FTTH or HFC networks may also monopolise the market for high-speed products if copper-based products are excluded from that market. In that instance, entry may offer new functionality to users, but not necessarily more competition. It seems likely that, in such circumstances, the new FTTH or HFC cable monopolist would be found to have SMP within the relevant (i.e. local) geographic market.

It is clear, therefore, that various competitive scenarios are possible and that it is not necessarily the case that the entry of new FTTH or HFC networks results in oligopolistic market structures. The question that remains is what to do if they do?

We are not attracted by BEREC's proposal for a new 'tight oligopoly' threshold, in part for the reasons explained in the previous section which we do not repeat here. We note that the Commission shares our view. We are also less persuaded than BEREC that the application of existing competition law, and of joint dominance concepts in particular, is as doomed as they appear to suppose. At the least, regulators have yet to test the existing tools to destruction. Only two attempts have been made to find joint dominance in fixed broadband markets since the SMP framework was introduced 2002 (in Malta and the Netherlands, both discussed previously). The fact that neither succeeded does not lead us to conclude that the concept is unable to address the challenges which we have identified. An important consideration, in our view, will be how the Commission proposes to update the SMP Guidelines, which have not been revised since their original issue in 2002. If the Commission is to persuade BEREC and Member States that 'tight oligopoly' proposals are unnecessary, we suspect it will need to explain how revisions to SMP Guidelines will assist them in their task.

If the Commission is to do this, we think the revisions to the SMP Guidelines would need to involve substantially more than an updating to reflect developments in the case law (which are likely to have been rather modest). The new Guidelines would need to command confidence

amongst national regulators that there are clear principles that can be effectively applied and appropriate thresholds met, whilst also providing guidance to firms whose conduct in the supply of wholesale products is likely to be influenced by their expectations as to how the regulatory rules will be applied and the extent to which regulators remain committed to them over time.

It is beyond the scope of this study to provide a full account of what such a revised set of Guidelines might contain. However, we would envisage that it might, for example, include a set of presumptive guidelines. A share of just 40% of a relevant market establishes a presumption of dominance under European competition law today. Such presumptive rules would not be intended to be applied mechanistically or without regard to the relevant facts, but they would be intended to provide regulators and firms (and courts) with a clear indication of how to approach the matter at hand.

In this case, presumptive rules or guidelines would clearly be required for the assessment of wholesale supply, as the Commission itself has recognised in framing recital 177, which we discussed earlier. Wholesale supply has been an important factor, often the most important factor, when assessing joint SMP in the (limited number of) mobile telecoms cases which we are familiar with. The presumption has generally been that the presence of wholesale offers on reasonable commercial terms is strong evidence of both effective competition in the downstream retail market and of an absence of tacit co-ordination and hence SMP amongst firms in the relevant upstream wholesale market. Given our focus on wholesale supply throughout this study, we also consider that it should occupy a central position in any revised Guidelines.

Our starting point would, like the Commission, be that the presence of three or more vertically integrated network competitors would generally be sufficient to ensure effective competition in the retail market irrespective of any wholesale supply. Similarly, we would assume that a single monopoly network would be unlikely to ever offer wholesale services on terms which would ensure effective competition in the downstream retail market, if they were to offer to supply at all. We would therefore propose that there be a presumption of effective competition/no SMP in the former case, and a presumption of single firm SMP in the latter.

The interesting and difficult case – but also the one which we think likely to be relatively commonplace in very high-speed broadband markets– concerns wholesale supply in the presence of two vertically integrated network competitors (with no clear prospect of further network entry). Again, we suggest there is a presumption of effective competition if both firms are supplying in the wholesale market (and such offers are being utilised by at least some downstream competitors), and a presumption of joint SMP if neither firm is supplying. This leaves the position in which one firm is offering to supply on a wholesale basis, but the other firm is not.

We think the revised Guidelines might usefully consider the various factors to be considered in such circumstances. One firm may, for example, face capacity constraints of some kind or other

technical obstacles. The specific nature of demand (which may relate to historic arrangements or switching costs) may be such that one firm supplies and not the other. Understanding these constraints will be important when assessing whether the firm that chooses to supply faces sufficient competitive constraints to do so on terms which are likely to ensure effective competition in the downstream market. Our starting point is likely to involve a degree of scepticism on this point, meaning that we would need good evidence to convince us that supply by a single firm was nonetheless being undertaken on a genuine competitive basis (as opposed to a 'commercial' offer being made to avoid regulation) and so was evidence of a properly functioning market rather than regulatory oversight.[85] The Guidelines would then need to consider how any finding of joint SMP would be applied in such circumstances, our presumption being that both firms would then be subject to wholesale access obligations (and not simply the firm that had withheld supply).

The intention behind presumptive rules such as these is that they would encourage firms in duopolistic markets to engage in wholesale supply on a competitive rather than a regulated basis. Both firms will know that effective competition both downstream and upstream will be presumed if both supply, but that joint SMP is the more likely outcome if either one of them withholds such supply. This means that no individual firm is likely to benefit in regulatory terms from withholding supply, relative to the position of both firms withholding supply. The individual firm will only benefit, in regulatory terms, if it supplies on reasonable terms. This is in contrast with the position which many claim applies today and under which some firms may believe that they can avoid regulation if they refuse to supply, but that they would attract regulation if they chose to do so. If this is right, then today's arrangements create a very odd set of incentives.

4.7. Asset regulation

Some commentators have proposed that wholesale access obligations might be imposed on vertically integrated firms in oligopolistic markets by means of 'symmetric' regulation, rather than using the SMP framework as discussed above.

It is worth taking a few moments to explain what 'symmetric' regulation might mean in this context, and how it might be applied, since it has rather limited application by Member States to date (chiefly by the French and Spanish regulators). Although the term 'symmetric' does not appear in the current European Framework, it is commonly used to refer to the provisions of Article 12 of the Framework Directive. These provisions allow regulators to require firms to share certain assets or 'facilities', including ducts and other assets, without having to make a formal finding of SMP. The grounds for doing so are in some cases that there are environmental, planning or public health considerations that should prevent attempts to duplicate the asset or, in the case of wiring (both inside and outside the building), that duplication would be

[85] The conventional question in the SMP assessment is to ask ourselves how the firms would behave in the absence of regulation or the shadow of regulation.

'economically inefficient or physically impractical'. The provisions are sometimes referred to as 'asset regulation' because the obligation to share arises from the nature of the asset itself, and not from any consideration of the market position of the owner of that asset.

We think one way to understand these provisions is to view them as an attempt to define the limits of network competition. The test is not that of an 'essential facility' which cannot be economically replicated (although 'physical impracticability' seems to come pretty close), but the softer test of replication being undesirable on the grounds of economic efficiency. This is, of course, difficult territory since almost all forms of competition involve an element of 'inefficient' duplication, the costs of which are deemed to be more than offset by more efficient pricing and the dynamic efficiency benefits which flow from competition over the longer term. Nonetheless, it is reasonable to suppose that the benefits from some forms of duplication are rather small, whilst the costs might be quite large. The internal wiring that connects an individual household to a high-speed broadband network might well fall into this category, since householders may resist or dislike the disruption associated with duplicating internal wiring, whilst the benefits of doing so may be minimal.

If this is a correct view of the intent of Article 12, then it is difficult to see how it might be extended to the regulation of access networks in oligopolistic market conditions. The scope of the assets to be regulated would, we suspect, have to be much greater than is envisaged by the regulation at present, and the oligopolistic structure would reveal that many of these assets patently could be, and indeed already had been, duplicated.

We suppose it is possible to argue that, even if assets have been duplicated in the past, it is not desirable that they should be in the future.[86] It is also possible to argue that the 'symmetric' obligations should only apply to new networks, in which case there is no historic basis on which to assess replicability and it is simply assumed (this is the way in which the French regulator appears to have applied the provisions). However, if 'symmetric' remedies can only be applied prospectively to new infrastructure build, its applicability in Europe would appear to be significantly limited.

These points aside, we have significant reservations about any significant extension of 'asset regulation' beyond the relatively narrow case of in-building wiring where its application seems clearly justified and where the alternative of attempting to define individual household markets to otherwise find SMP seems to us impractical and unnecessary. These reservations arise from the fact that 'asset regulation' requires the regulator to define where the boundary between what is to be competitive and what is to be a shared monopoly infrastructure is to lie. In view of our earlier comments about technological uncertainty in telecoms infrastructure markets, we are not convinced that regulators are well placed or should be doing this. The great merit of the SMP regime, it seems to us, is that it allows regulators to move the boundary between regulated

[86] There may be a more subtle argument, namely that the fact that duplication has occurred in the past ensures that assets cannot be duplicated in future – that existing networks have 'crowded out' new ones. We find this a very slippery slope on which to tread.

monopoly and competition as markets develop over time. Asset regulation is a far less flexible, more prescriptive, approach in which the regulator determines which assets should, and which should not, be duplicated. For this reason, we think its application should remain confined to those elements of the network where replication is unambiguously problematic.

In this context, we note that the concept of asset regulation has been substantially extended by the Commission through the adoption of the Broadband Cost Reduction Directive, to which we have already referred. In that case, any utility, telecoms operator or transport network provider is obliged to share their civil engineering assets with a requesting party that intends to use them to deploy a high-speed broadband network, without any regard for the position in any particular economic market. The only grounds on which access can be denied are technical in nature (lack of space, interference, etc.). It seems to us reasonable that duct and other civil engineering infrastructure might also be regarded as undesirable to replicate. However, the same conclusions need not apply to the other assets held by broadband network providers in oligopolistic markets.

We are unsure whether the Commission, whilst promoting the use of asset regulation through the Broadband Cost Reduction Directive (yet to be implemented by most Member States), proposes also to use the new Article 59 to extend the scope of asset regulation. Article 59(2) of the proposed text retains the same 'economically inefficient or physically impracticable' test in relation to wiring to the first concentration point (which may be inside or outside of the building, but will be close to it). It also allows for access obligations to be imposed beyond this point, but only in rather carefully constrained circumstances: 'to the extent strictly necessary to address insurmountable economic or physical barriers to replication in areas with lower population density.' However, Article 59(3) then appears to go further again. We reproduce the full text below:

"Member States shall ensure that national regulatory authorities have the power to impose on undertakings providing or authorised to provide electronic communications networks obligations in relation to the sharing of passive or active infrastructure, obligations to conclude localised roaming access agreements, or the joint roll-out of infrastructures directly necessary for the local provision of services which rely on the use of spectrum, in compliance with Union law, where it is justified on the grounds that,

> (a) the replication of such infrastructure would be economically inefficient or physically impracticable, and
> (b) the connectivity in that area, including along its main transport paths, would be severely deficient, or the local population would be subjected to severe restrictions on choice or quality of service, or on both."

This would appear to allow regulators to impose access obligations on any firm, irrespective of market position, in relation to any asset (not restricted to wiring or to passive assets) provided replication of the asset was deemed inefficient and 'connectivity would be severely deficient' or

there would be 'severe restrictions on choice of quality of service'. However, some commentators have suggested that these provisions are intended to apply only to 'mobile' assets and that this provision is intended to support the Commission's Gigabit Society targets for the widespread deployment of 5G coverage in urban areas and along major transport links. We find it difficult to derive that conclusion from the text as currently drafted, but this is something the Commission may wish to revisit. In any event, this points to the difficulties in applying asset regulation and in drafting obligations in such a way as to limit their scope appropriately.

4.8. The limits of competition

The discussion of asset regulation above brings us to another challenge of high-speed broadband policy, namely what to do in those circumstances where network competition proves unviable. Various aspects of the Commission's latest proposals concern this issue.

If network competition is unviable, the only alternative is network monopoly. The question which then arises is whether there are models of competition other than the traditional vertically integrated network monopolist which we discussed in the first section of this study. One option is a non-integrated monopolist who operates a network but does not participate in the downstream market. This removes many of the regulatory challenges associated with vertical integration, but appears likely to be of limited applicability in Europe unless policymakers are prepared to consider much more radical models, such as forced structural separation of assets. As we noted in our introduction, this appears unlikely, and it is not in any event clear that such actions would contribute to the achievement of other European objectives, such as the more rapid deployment of high-speed infrastructure.

Another model to which we have already referred is the 'co-investment' model. The Commission clearly envisages that 'co-investment' might reasonably be expected to extend the deployment of high-speed infrastructure to areas which would not otherwise be viable for competitive, parallel network deployment but which might also be too risky for a single firm to undertake on its own. We can envisage circumstances under which this might be the case, but also note that the Commission's rather expansive definition of co-investment would also seem to include other models, such as two access arrangements and arrangements in areas which might otherwise be served by competing networks, which have more ambiguous public policy benefits and which may indeed serve to inhibit competition. We find that the proposed Annex IV to the Code, which describes the conditions to be met by 'qualifying' co-investment arrangements, seems unconcerned about the relevant counterfactual or the precise nature of the assets which are to be co-owned. These may be matters better left to review by the competition authorities (with DG Competition taking the lead in early cases, as they did in relation to early mobile network sharing proposals), but we think it important they are addressed somewhere.

There may also remain areas in which private sector investment, whether undertaken on a competitive or collaborative basis, is unlikely to deliver the high-speed infrastructure, at least in

the foreseeable future. This leads us, in the final section, into consideration of targets and the role of the State.

4.9. Targets

We introduced and discussed the Commission's adoption of targets for high-speed broadband deployment earlier. It is useful to remind ourselves that European broadband policy proceeded for many years without having any explicit targets at all. Regulation was concerned with promoting competition where possible, which is a process which rarely leads to predictable or common outcomes. The Digital Agenda targets were introduced in 2010, apparently as part of a broader political project by the Barroso Commission to stimulate investment following the global financial crisis, although they also address another very important feature of the transition from copper-based networks to high-speed FTTH and HFC cable networks, namely the growing variability of performance experienced by households and businesses within Member States (as well as between them). It may also be that, as regulatory approaches to the promotion of competition in high-speed services (or 'inputs') have increasingly diverged, targets (or 'output') have become the primary means by which the Commission seeks to promote greater harmonisation.

It is not clear to us that very much thought was given to the 2010 targets for broadband network deployment. Neelie Kroes appeared to regret some of them later.[87] We are sceptical about the merit of targets, even if they prove well judged.[88] There is always a danger that they become the 'tail that wags the dog' – that good policymaking is distorted by the need to meet particular targets which may be either unachievable or, if achievable, ill advised. This is particularly the case if, as with the current proposals from the Commission, targets are used to influence the conduct of firms operating in and the outcomes of competitive markets, as opposed to simply informing the nature and scope of any public intervention in areas where private provision is deemed insufficient. In general, we are not persuaded that the quality of European policymaking in broadband issues has improved since 2010 as a result of the adoption of targets in that year.

The fundamental (and insufficiently debated) issue, in our view, is that a Framework which relies upon the promotion of competition, and in particular network competition, to deliver benefits for consumers is very unlikely to be able to fulfil the political aspirations that are embodied in the targets. Network competition for high-speed broadband services will develop on a sub-national basis, whilst the existing national network provider is unlikely to be able to deploy a high-speed broadband network of uniform capability across the entirety of the geography.

[87] "I will stand up here and say that if I had my time as Digital Commissioner again, I would have set fewer targets", European Commission, Press Release Database, Neelie KROES, "Two Europes or One Europe?", 22 October 2014, (http://europa.eu/rapid/press-release_SPEECH-14-710_en.htm).

[88] It is important to note we are concerned here with targets which regulators set for the industry to achieve. Targets which regulators set for themselves (e.g. to make available a certain quantity of spectrum for a particular category of services within a particular timescale) are a different matter.

To date, concerns about geographic variations in competition have largely arisen in relation to the differences in the performance of networks, and less in relation to the prices charged. That is because the national copper network owner has generally chosen, and sometimes been obliged, to offer its broadband retail services at uniform, geographically averaged, tariffs (and competitors have been obliged to purchase wholesale inputs on a similarly uniform basis). Network competition in urban areas has therefore served to constrain the prices charged to households in rural areas. There is no reason, however, to suppose that such uniformity can be sustained indefinitely into the future. As network competition develops, the national copper network provider is likely to come under pressure to react to differences in the prices offered by different local competitors who do not depend on regulated inputs. This could reveal significant geographic differences in the prices paid for high-speed broadband services (reflecting significant differences in the costs of provision), as well as differences in quality.[89]

The Commission's approach is to recognise the limits of competition and to envisage that beyond that boundary, there will be some private sector monopoly deployment (where it is inefficient to replicate) and, beyond that, publicly subsidised deployment (where it is inefficient for a privately funded firm to deploy). This seems to us the right framework, but the challenge is to determine where the boundaries might lie. The Commission has rightly observed that the existing State Aid arrangements may create incentives for firms to attempt to influence the Government or regulators' views as to where these boundaries lie. Firms may wish to exclude areas which might otherwise be candidates for State Aid if they fear their rivals may receive the subsidy. They may do this by indicating that they intend to deploy a privately funded network in that area during the market consultation process that is required by the Guidelines, but in fact have no intention of doing so. The opposite incentive may also arise, with firms reluctant to commit to areas which they could viably finance themselves in the belief that this will increase the subsidy they can obtain from the taxpayer. We note that the Commission's latest proposals contain provisions which are intended to sharpen the incentives for firms to disclose their true intentions and to impose sanctions if they do not.[90]

It is surely the case that the boundary between network competition and monopoly, and between unsubsidised and subsidised monopoly, will be constantly shifting as the technologies and costs associated with deployment of high-speed broadband networks evolve (and as new opportunities for entry may arise from new economies of scope between telecoms and non-telecoms activities). This is one of the reasons why we have reservations about the extension of 'symmetric' regulation which assumes that the regulator can determine, at a single point in time, where that boundary might lie and where 'severe restrictions' on choice might be expected to persist.

[89] There is another aspect to this, namely that current regulated wholesale prices are invariably set by regulators on a nationally averaged basis. This supports a nationally averaged retail price structure. If unregulated wholesale markets emerge, as discussed earlier (see XXX), then this constraint would also be withdrawn.
[90] Article 20.

As already noted, the existing State Aid guidelines seek to determine the boundary by requiring that public authorities consult with the industry in order to establish the latter's roll out plans for the next 3 years. This has proved problematic in some instances, given the fast-moving and uncertain nature of high-speed broadband deployment. In some instances, firms have realised that certain areas are viable, but have been deterred from investing because they have already been included within the intervention area for which State Aid has been allocated to another firm. This is, it seems to us, an inevitable feature of the process insofar as Governments must proceed to identify areas on some basis and cannot wait until all private sector investment opportunities have been exhausted (since this is a point which is never likely to be reached in practice). We do not, therefore, suggest that public authorities should delay their efforts to promote broadband deployment. This is not politically feasible nor, do we think, necessarily desirable.

On the other hand, we do think there needs to be a serious evaluation of, and debate about, the way in which State Aid is currently being used, and is expected to be used, in the promotion of high-speed broadband deployment over the next 10 years. Given the billions of euros that could be spent to meet the Commission's proposed targets, this is an urgent matter and a debate which is long overdue in Europe. The Commission targets assume that a common, uniform level of performance (of first 30 Mb/s, then 100 Mb/s then gigabit speeds) is required across the European geography. The costs of extending FTTH from 80% to 100% of the population are, according to the Commission's advisers, €120bn, which represents a doubling of the total costs of deployment.[91] It is likely that all €120bn would have to be met by the taxpayer. A similar target was set by the Australian Government some years ago, with what are now widely accepted as very unsatisfactory consequences. If the Commission is serious, it seems likely that achieving this would cost the European taxpayer many tens of billions of euros. As noted earlier, we remain sceptical as to whether Member States will in fact be prepared to make such commitments, but even if the Commission's ambitions are drastically curtailed, it is still likely that there will be significant calls upon the taxpayer to finance high-speed broadband deployment in Europe in the years ahead. At the least, there seems to us to be disconnect between the Commission's setting of targets, which determine the size of any potential public subsidy, and the fact that it is the Member States that are likely to be the ones providing the funds to meet the funding gap. It seems to us that those providing the funding ought also to be those who set the targets which determine the size of funds required. We suspect this will be the case in practice in any event.

There is a dissonance here between the language of the market, which will deliver variable outcomes for different households, and the language of the 'public utility', which is expected to deliver the same outputs irrespective of geography or other considerations. This did not really

[91] Costing the new potential connectivity needs (http://bookshop.europa.eu/en/costing-the-new-potential-connectivity-needspbKK0116744/;pgid=GSPefJMEtXBSR0dT6jbGakZD0000g8YHuarz;sid=gzRWO9zRojNWAosmfaXInL70Ifcqa9sChec=?CatalogCategoryID=CXoKABst5TsAAAEjepEY4e5L) p.61.

arise for the first 15 years of telecoms liberalisation, whilst the existing national copper network (and national averaging of prices) ensured that the 'public utility' goals continued to be fulfilled without significant additional intervention or public subsidy.[92] However, the transition to 100 Mb/s + high-speed broadband will bring these issues into sharp relief. European policymakers need, in our view, to recognise this challenge and address it clearly and directly, in a way which they have not done to date.

The second issue is that if very large public subsidies are to be directed into the telecoms sector, more thought might be given as to how they are applied. This is where 'targets' are relevant in determining what 'gap' the public subsidy is seeking to fill. In such a case, the target should be concerned with the ensuring that public subsidy improves the relative position of those in areas not otherwise served by competitive provision, something which does not necessarily mean that everybody would obtain the same service or utilise the same technology. It may be sensible also to have regard for the relative performance of broadband networks in Europe as compared with other regions of the world with whom we compete, rather than setting targets independently of such considerations. The current State Aid guidelines impose a number of conditions which are intended to ensure that funds are allocated on a fair basis, that the resulting network represents a 'step change' in broadband performance, and that competition is ensured through the requirement to offer 'open access' on terms very similar to those applicable to a privately financed network run by a vertically integrated SMP operator. These strike us as sensible provisions, but we wonder if they could not be expanded so as to add support to the new competitive models which the Commission is seeking to promote through its other revisions to the Framework.

For example, we think it would be desirable for Member States to be able to allocate public funds to the improvement of civil infrastructure if, by doing so, this would enable greater network competition in high-speed broadband. The Broadband Cost Reduction Directive already assumes that it is undesirable to replicate such assets, and so targeting State Aid at them ought not to be problematic. As we understand, for example, the German Government has done since 2008.[93] This would allow Aid to be used to promote network competition on a national basis rather than being limited, as currently, to extending monopoly into rural areas. This might in turn help legitimise the very large sums which taxpayers, many of them living in urban areas, will be required to contribute if the Commission's targets are to be realised.

The State Aid guidelines might also be employed to promote other policy objectives, such as co-investment arrangements (or particular types of pro-competitive co-investment arrangements) or, potentially, structurally separated wholesale only networks. Neither should be a mandatory

[92] We recognise that Universal Service obligations were activated in many Member States, but the quantity of subsidy required to sustain universal service availability was relatively small and certainly nothing like the billions of Euros that would be required to achieve similar outcomes with high speed broadband.
[93] WIK et al p.194.

requirement for State Aid, since there may be circumstances where neither is feasible or desirable or where we want to encourage competition from firms who do not wish to adopt such a business model. This is particularly so since we believe that competition for public funds is more likely to produce a better outcome for taxpayers than any attempt by the regulators to predetermine how the resources should best be deployed.

Alternatively, or in addition, approval of Member States projects under the State Aid guidelines might be withheld if the Commission had evidence that other aspects of the Framework or measures such as the Broadband Cost Reduction Directive had yet to be implemented properly or fully. The Commission might argue that public subsidy should be limited to supporting investment in those areas which competing operators, or a single monopolist, are unable to reach. If a Member State has failed to take all the steps envisaged by the new Framework to promote such competition, or to support co-investment, then there is a clear risk that public funds will be inefficiently applied. The Commission may be justified in withholding approvals in such circumstances.

5. Summary of Recommendations

This section provides a brief summary of our main findings and recommendations, making reference to provisions in the recent proposals from the European Commission where appropriate.

Our starting point is that Europe remains on a journey towards competition in telecoms markets which it began in the late 1990s. This remains the right path to travel, although we recognise that changes in technology give rise to new opportunities as well as rendering old policies redundant along the way. **The current review should therefore focus on how we promote competition over the next 10 or more years.** The Commission's proposals for paragraph 2 of Article 3 in the new Directive retain a commitment to the promotion of competition in both networks and services, whilst adding a requirement to promote the deployment and take up of very high capacity data connectivity consistent with their new proposed targets.

The reference to promoting widespread deployment of high-speed broadband infrastructure reflects the current and proposed targets that have been adopted by the Commission. We think these are problematic. In our experience, targets have generally not improved the quality of policymaking in the telecoms sector. Australia is a cautionary example and policymaking in Europe has not noticeably improved since the first targets were adopted in 2010. In the current context, we think the focus on targets has had the unfortunate effect of suggesting that the Commission's chief objective is the widespread deployment of FTTH networks, and that competition is regarded as incidental to the achievement of that objective. We think this a mistake in both presentational and substantive terms. **A better approach is for the Commission to reaffirm that competition, and specifically network competition, is the primary objective, and that the Commission expects investment in and deployment of the FTTH networks which end users want to be a consequence of the successful pursuit of that aim.**

We think European policymakers generally also need to recognise that the transition to high-speed broadband represents the first major challenge to the 'utility model' of uniform and universal service provision since the liberalisation of the telecoms sector in the late 1990s. The combination of competitive dynamics and the intrinsic characteristics of the technologies being employed mean that high-speed broadband performance will vary widely across Europe. We cannot know how large these differences will be, given uncertainty about future technologies, but it is reasonable to assume they will be significant.

Given this, there then needs to be a serious debate about how much public subsidy should be directed at the telecoms sector to reduce, or perhaps even eliminate, such variations and thereby meet the targets which the Commission proposes (or alternative ones, which might be determined by the Member States who will be expected to provide the subsidy required to meet them). **It is not at all obvious to us that a uniform pan-European high-speed broadband capability is either achievable or desirable.** The public subsidy required to deliver the

Commission's proposed new 'Gigabit Society' targets appear to be in the tens of billions of euros. **Already one in four euros invested in broadband is expected to come from the taxpayer. However, under the Commission's proposals, perhaps the majority of the investment in the infrastructure – more than one in every two euros – might be provided by the State. We do think a serious debate, of the kind Europe has not had thus far, is required before such targets are accepted.** We regret that we see no evidence that such a debate has been undertaken, or is contemplated, by the current Commission's proposals.

If public subsidies are to be allocated on this scale, it is critical that the private sector recipients participate in a competitive tender. That is another strong reason, in our view, for policymakers to seek to promote credible network competitors in high-speed broadband markets in Europe. **Without sufficient credible bidders for public funds in the years ahead, the European taxpayer risks receiving poor value for money.**

We recognise that new models are required to promote competition in high-speed broadband markets. These will differ from the traditional 'unbundling' model which promoted entry via a variety of access products, including the rental of copper loops and the attachment of new electronic equipment in order to deliver broadband services, although it will still involve 'unbundling' the assets of the vertically integrated firm. The model needs to evolve for many reasons. First, the extension of the unbundling model into sub-loop unbundling and vectoring to promote competition in VDSL services appears very challenging and is unlikely to provide the main way forward. Higher performance broadband will more likely be provided by firms who are replacing or displacing the entire local loop rather than attaching new forms of electronics to a copper facility. Second, the unbundling model assumed that establishing scale in the retail market was critical to being able to invest in network facilities. It now appears, in relation to new high-speed broadband networks, that economies of scope with non-telecoms assets may have an equally (if not more) important role. Third, the existing vertically integrated SMP operator may not have strong incentives to invest in new fibre networks if it can continue to make a return from its existing copper network assets. The same may be true, of those firms who have unbundled local exchanges. Investment may be more likely to come from firms with no existing copper assets, but who are in a position to exploit economies of scope with other businesses. Finally, the unbundling model has been revealed to have formidable implementation challenges which we have yet to overcome and which other models might avoid. This is particularly the case in relation to policing and prohibiting non-price discrimination.

We also recognise that HFC cable networks have made a very important contribution to competition in broadband markets, where such networks exist, and that this has occurred despite rather than because of the regulatory framework and the unbundling model. The presence of cable infrastructure does not, however, mean policymakers can ignore the need to promote more network competition, including from cable operators seeking to extend their footprint.

The most important lever to promote network competition in high-speed broadband markets is likely to be 'unbundled' access to civil engineering infrastructure of both the existing vertically integrated SMP operator and owners of such assets outside of the telecoms sector. The former requirement has been promoted since at least 2010, when the Commission issued its first NGA Recommendation, but implementation to date has been rather patchy. The latter requirement is established by the Broadband Cost Reduction Directive which few Member States have yet to implement at all. **We therefore welcome the Commission's proposal to reaffirm the obligation of an SMP firm to provide access to civil engineering infrastructure in Article 70. We also welcome and support the Commission's proposal that access to passive assets should be considered the intervention of first resort, and that the application of additional obligations to provide active wholesale products should then be considered at the second stage, as proposed in Article 71 (although we also recognise that such active wholesale products will continue to perform an important role in some areas, such as where passive access in not feasible). This will represent a reversal of the 'polarity' in many Member States, where active product obligations have in the past been prioritised over the implementation of passive access and where competition in services has been prioritised over competition in networks. This reassertion of the primacy of the network competition objective is a very important and welcome feature of the Commission's proposals (although we recognise that there will also continue to be a role for active product obligations in many areas).**

We anticipate that entry which exploits new economies of scope will increase the degree of horizontal integration in the sector. Firms already in the broadband market may respond by themselves venturing into adjacent markets. We regard such activities as generally pro-competitive and to be encouraged (although they should be subject to appropriate scrutiny to prevent unfair leveraging). At the same time, we would place rather less reliance on network entry achieved through the building of economies of scale and abetted by the simultaneous availability of multiple access products, in the manner adopted by some regulators implementing the 'ladder of investment' in the past. Experience suggests that attempts to introduce competition into 'intermediary wholesale markets' in the value chain (as well as into final retail markets) have generally failed and that competitors only buy wholesale input to support their own retail sales. This leads us to **propose a significant reduction in the number of intermediary wholesale 'markets' and corresponding regulated products that the vertically integrated SMP operator has to supply.** Complex multi-layer margin squeeze tests would, as a result, also be dismantled since they are not needed to support entry and may inhibit the capacity of SMP firms to meet competition.

Network competition, both from HFC cable and new FTTH, is already more significant in high-speed broadband markets than it ever was for narrowband or standard broadband services. Policies to promote more entry may extend this further. However, the existing regulatory model is largely founded on the assumption that the network infrastructure is supplied by a single, vertically integrated SMP firm. A number of consequential regulatory changes are therefore

required, some representing opportunities and some risks, if these assumptions are no longer valid.

One question is whether network entry and competition is promoted by encouraging the co-ownership with, rather than the renting of assets from, the SMP firm. This is sometimes referred to as co-investment, and is generally viewed favourably by the Commission in its latest proposals. We see a move from renting to owning assets as consistent with the 'ladder of investment' approach and as having some merit, but we take a more cautious view on co-investment than the Commission does in the proposed Code.

We think that co-invested networks have many desirable properties, including the possibility that they extend high-speed network coverage to areas that might not otherwise be served by a single firm monopolist, that they may allow for investment in and improvement of the underlying passive infrastructure, and that they may allow the regulator to withdraw from detailed oversight of access arrangements between competitors (and between such competitors and other wholesale customers). On the other hand, horizontal agreements between competitors are not without risks and challenges, and in some cases individual ownership of the assets may yield better competitive outcomes. **We also think the Commission's current definition of co-investment is far too broad (it includes, for example, two-way access arrangements which may have very different characteristics) and that the conditions to be met under Annex IV are too narrow. What is required instead is careful review on a case-by-case basis, having regard both to the nature of the assets that are co-owned and the areas in which co-ownership occurs (both of which influence the counterfactual). We therefore propose that DG Competition review early cases of co-investment in high-speed broadband networks – as they did previously in relation to network sharing arrangements between mobile operators – in order to provide further guidance to both the industry and to regulators.**

The Commission proposes, in Article 74, to encourage co-ownership by allowing SMP firms to avoid certain wholesale access obligations if they make reasonable offers of co-ownership to other parties. This approach relies upon the SMP firm having sufficient incentive to make such offers and, to be effective, for other parties to have sufficient incentive (provided through the withdrawal of other means of accessing the network) to participate. **This approach leaves the initiative with the SMP firm. If the offer was not taken up, it could also mean the deregulation of an SMP firm without any change in competitive conditions, which would seem difficult to justify.**

An alternative approach would allow regulators to instead impose co-ownership obligations upon the SMP firm as the default remedy, perhaps with the SMP operator then being required to demonstrate why such an arrangement is unviable. We are not attracted by this approach, since it is likely to lead to hold up problems and delay investment. We highlight below our concerns about Article 59(3), which may be sufficiently broad and sufficiently ambiguous to allow regulators to impose such obligations (even if this is not the Commission's intent).

However, **we think other steps could be taken to promote co-ownership (both of new assets and, importantly, of existing assets which would otherwise be subject to more onerous regulation). One option would be to clarify in the State Aid guidelines that bidders who employ such arrangements will be preferred over individual firms.**

Perhaps the most important opportunity to arise from the expansion of network competition in high-speed broadband markets is that it creates the conditions under which functioning, competitive wholesale markets might finally develop in Europe. To date, wholesale markets for broadband inputs (and the products themselves) have generally been the product of regulatory design rather than commercial practice, and it is difficult to describe what we have today as 'competitive'. That could change with sufficient network competition in future.

Not only is the development of competitive wholesale markets desirable, we think it is also likely to be essential if we are to see a further significant withdrawal of regulation from the sector, as we hope to see. This is because competition between two vertically integrated firms is unlikely to be sufficient to allow for the withdrawal of wholesale regulation in Europe (as it has been in the US). Retail duopoly is unlikely to be considered sufficient in Europe, even if a network duopoly is commonplace. In such cases, wholesale supply will be needed to deliver sufficient competition in the downstream retail market to ensure both effective downstream competition and regulatory withdrawal from the market.

We therefore think European policymakers should do everything they can to encourage the emergence of wholesale offers on commercial terms in the telecoms sector (whilst recognising that the firms themselves are ultimately responsible for the decisions they make).

We find the Commission's proposals to promote 'commercial offers' rather modest and it reflects, we suspect, a belief that an SMP operator will make a 'commercial' offer in order to avoid regulation rather than because they face any competitive incentives to do so as a result of competition in the wholesale market. On the Commission's view, a monopolist might make a 'commercial offer'. This contrasts with our view of 'commercial' offers, which is that they should arise from genuine competitive interactions between duopolists, albeit interactions that will be influenced by regulation. The Commission proposes that regulators be required to take such commercial arrangements into account when assessing which remedies to impose. However, **we think commercial offers (and of conduct more generally on the wholesale market) should be evidence for the SMP assessment. If there was evidence that firms had made reasonable commercial offers of access, this might be taken as evidence of competitive constraints in the wholesale market and, thus, as grounds for finding both the downstream retail and the upstream wholesale markets as being effectively competitive and removing any SMP designation in consequence. We think guidance on this important but complex issue should be provided in the revised SMP Guidelines, and not, as at present, in recitals to the proposed Code.**

We recognise that more thought should be given to the risk that buyers may have incentives to refuse reasonable commercial offers in the hope that the regulator will continue to provide a better option.

The deployment of new networks by new firms also introduces the prospect of other commercial arrangements, such as two-way access arrangements between monopoly networks, each of whom seeks access from the other. We view these as offering potential opportunities for regulatory withdrawal but as nonetheless requiring close scrutiny by the relevant authorities, particularly since these are likely to involve 'active' rather than 'passive' access arrangements. **Again, early guidance from DG Competition here might assist all parties.**

Throughout this study, we have noted that network competition in high-speed broadband markets is developing on a localised basis. Some parts of a Member State may enjoy several, parallel high-speed networks, other parts may have one, and others none at all. However, **the existing market review process has, we think, an unfortunate bias towards retaining a national geographic market definition which is increasingly inappropriate given the reality of changes (literally) on the ground.**

This bias may arise in part because national regulators lack the analytical tools and data which would enable them to assess competition on a proper, more granular basis. The Commission's proposals that regulators now assemble the tools and data to enable them to do so is therefore welcome, although we think regulators will need to accelerate rather than reduce the rate at which they review sub-national broadband markets (i.e. less than every 3 years rather than more), at least during the next period as these networks get built out. However, a more plausible explanation is that regulators have been reluctant to define sub-national markets because they fear that, in so doing, they will no longer be able to find a single firm having SMP in some of those markets.

We think this approach is at odds with the intent of the Framework and with good regulatory practice. Network competition, whether in local areas or on a national basis, ought to provide a basis for considering regulatory withdrawal. That need not always be the case, but **the presence of significant competitive constraints between vertically integrated firms ought to lead not simply to a moderation in the remedies applied in those areas (as is the case today) but to a withdrawal of SMP and a declaration that the market, properly defined, is effectively competitive.**

A question remains as to how markets with several vertically integrated competitors – so called 'tight oligopolies' – should then be regulated. **We believe the existing SMP framework, with the concept of joint dominance or joint SMP is adequate to the task**. We are therefore in agreement with the Commission, who have declined to adopt BEREC's proposals for a new 'tight oligopoly' standard. **This noted, we also think the Commission will need to work harder than it appears willing to do at present to persuade BEREC and many Member States that this is the case. The proposed and long overdue revision of the SMP Guidelines provides that**

opportunity, although regulators will also need to test the concept by seeking to apply it where it is appropriate to do so, something which they have been too reluctant to do in the past.

In particular, a revised set of SMP Guidelines ought to aim to create incentives under which firms have some confidence that they may obtain better (i.e. less invasive) regulatory outcomes if they engage in wholesale supply, than if they do not. It is not clear to us that it is the position today, and the opposite may actually be the case in relation to wholesale supply by HFC cable networks. We suggest that the new Guidelines contain a set of presumptive rules, focussed on the regulatory treatment of wholesale supply, in order to provide greater clarity to both regulators and firms. It should be clear, in particular, that if two firms in a duopolistic wholesale market both make reasonable wholesale offers then the presumption is that SMP (and hence access regulation) would be withdrawn. The position is more complex if only one of the firms makes such an offer.

We also remain resistant to proposals to regulate oligopolistic markets through an extension of 'symmetric regulation'. We think 'symmetric' or 'asset' regulation has its place, which is chiefly to allow for the imposition of access obligations on assets where a market-by-market analysis would be impractical and where the desirability of avoiding replication of those assets is uncontroversial.

We are concerned, however, that any significant extension of 'symmetric regulation' –as appears to be proposed by Article 59(3) – would require regulators to specify, in advance, where the boundary between replicable and non-replicable assets should lie. We see the case for ducts and other civil engineering assets, and support the Broadband Cost Reduction Directive (which we think is an important and potentially underestimated tool for the promotion of high-speed network competition in the next period). However, given the rate of technological change in the industry, we think that extending 'symmetric regulation' to assets higher in the network is a hazardous undertaking and not one which European regulators need or should undertake. We think Article 59(3), as currently proposed, carries the risk that European regulators may again be tempted to trade off the longer-term opportunity for network competition in order to meet short-term demands for greater choice, undermining both the SMP framework and other efforts to promote network competition in the process.

Finally, we draw attention to the fact that many of our proposals relate to actions which we might expect to be led by DG Competition rather than DG Digital Economy. These include the revision of the SMP Guidelines (to take into account the impact of commercial offers on the SMP assessment and to update guidance on the application of joint dominance to broadband markets more generally), guidance on Relevant Markets (to consider the circumstances under which copper networks may no longer provide competitive constraints on high-speed services), scrutiny of proposed co-investment agreements and revision of the State Aid guidelines to align them more closely with aspects of the Code (such as promoting wholesale-only networks or co-investment). **We consider that the early involvement of DG Competition in the framing and**

subsequent application of the 2002 Framework was a significant strength and that its subsequent withdrawal after about 2009 (when officials from DG Competition withdrew from the Article 7 process) was a mistake which ought now to be corrected. We therefore urge DG Competition to engage more fully and more directly in the current review and in the application of the Framework to broadband markets (and have identified various ways in which this might occur).