Regulating oligopolies in electronic communications markets

Discussion paper prepared for Liberty Global

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Key findings of Oxera

- **Regulators should not be concerned by the rise of oligopolistic market structures, since these structures are primarily being driven by desirable infrastructure-based competition**—investment by infrastructure providers has increased competition and eroded the market power held by incumbents. Market outcomes for consumers in terms of prices and quality (e.g. broadband speeds) have improved significantly. With increased competition from cable networks, a growing number of fibre investment projects, and the advent of superfast mobile broadband from 4G and 5G mobile networks, the time seems right for regulators to step back and rely on competition law to address any oligopoly concerns (other than tacit collusion), as originally envisaged by the 1999 and 2002 EU regulatory frameworks.

- **Expanding the regulatory toolkit to include unilateral market power (UMP) or expanding symmetric access obligations will increase the risk of over-regulation, introduce uncertainty, and diminish investment incentives**—the proposals from BEREC and some Member States for UMP and the expansion of symmetrical access do not have a solid grounding in economic theory. UMP is also very different from the concept of unilateral effects in merger control. Finding objective criteria and an unambiguous threshold below which markets can be characterised as ineffectively competitive in the absence of significant market power (SMP) is fraught with theoretical and practical problems. Implementing such proposals would provide significant discretion for regulators to intervene in markets, reducing regulatory certainty and creating a more fragmented regulatory landscape across Europe. This seems the opposite of what is required to meet Europe's connectivity objectives.

- **The criteria for establishing joint SMP are sufficiently understood in case law and economic theory. An 'enforcement gap', if any, is small and does not need to be addressed by additional ex ante regulation such as UMP or expanded symmetrical access**. There are few competitive problems not covered by the current SMP and competition rules. Any enforcement gap is small (and the relevant policy question is in any event not whether such a gap exists, but what its optimal size is and whether the benefits of addressing it are outweighed by the costs). The apparent paucity of cases involving joint SMP is not due to a lack of understanding about how to implement the test. Rather, it reflects the fact that in many telecoms markets where there is no longer a single incumbent with SMP, competition tends to be effective and produce good consumer outcomes. Wholesale access still has a role to play in creating the conditions for effective competition where single-firm dominance continues to exist. The UMP proposal for dealing with oligopolistic market structures lacks justification.

The European debate on regulating oligopolies

This discussion paper, commissioned by Liberty Global, is Oxera's contribution to the current policy debate in the EU on whether and how to regulate oligopolies in electronic communications markets. The focus of our analysis is fixed telecoms markets, although we also cover mobile market developments where relevant.

The deployment of next-generation access (NGA) networks, technological convergence and a wave of M&A activity in the sector have contributed to the emergence of 'oligopolistic' markets: a small number of competitors using their own infrastructure, and offering bundles of fixed, TV and mobile services. In this context, the question has been raised as to whether the existing EU regulatory framework, which is based on the SMP framework, is suited for dealing with oligopolies. SMP traditionally covers single-firm dominance and joint dominance (tacit collusion).

BEREC, for example, is seeking to extend regulation to cover situations where two or more operators have what it calls 'unilateral market power' (UMP). BEREC defines this novel concept, which does not have any precedent in competition law or sector regulation, as a situation where firms are not coordinating their behaviour—and therefore do not have joint SMP—but have the unilateral incentives and the ability to behave in ways that lead to ineffective competition and poor consumer outcomes.

BEREC proposes that the UMP concept be incorporated into the EU regulatory framework either as an extension of SMP, or as a separate test alongside SMP. The European Parliament ITRE Committee has also included the UMP proposal in its draft report amending the European Electronic Communications Code.

There are other policy initiatives seeking to introduce greater regulatory oversight in oligopolistic markets. These include requests by some Member States in the European Council to extend the scope of symmetric access obligations beyond the first concentration point, irrespective of a finding of SMP. In addition, the European Commission's public consultation on updating the guidelines on market analysis and SMP is generating debate over whether the standard of proof to find joint SMP is too high, and how further guidance could assist national regulators in proving the existence of joint SMP.

The debate on whether and how to regulate oligopolies in electronic communications markets is of critical importance for the telecommunications industry. As the Commission has observed, reaching Europe's connectivity objectives is likely to require €500bn of investment, most of it from the private sector, and under current investment trends there is an estimated €155bn shortfall.[1] Closing this gap requires a stable and predictable regulatory environment to provide investor confidence.

In this report Oxera examines whether the calls for new regulatory tools outlined above are justified in light of these policy objectives. We address this from three perspectives:

- We review market developments over the past 5–10 years, to examine whether current market outcomes are a cause for concern and justify greater regulatory oversight. This analysis is conducted taking account of the trend

[1] http://europa.eu/rapid/press-release_IP-16-3008_en.htm, accessed 19 July 2017.

towards deregulation and the objectives of the proposed future European regulatory framework for telecoms.

- We assess whether the UMP test proposed by BEREC and the Parliament, and the Council's proposal to extend symmetric access obligations, are grounded in robust economic theory.
- We examine the application of the joint SMP/tacit collusion test in electronic communications markets, focusing on whether the 'Airtours criteria' are well understood, and whether they are sufficient to address possible harm.

Our analysis and findings are complemented by three country case studies, on the Netherlands, Belgium and Hungary.

From monopolies to infrastructure competition

Over the past 20 years many European telecoms markets have evolved from monopolies to markets with significant infrastructure competition, which is delivering considerable consumer benefits.

The EU regulatory framework of 1999, and its amendment in 2002, was designed to be a transitional arrangement aimed to kick-start competition in the market, with increasing reliance on general competition rules as competition became more effective. To a certain extent, regulators have lived up to this promise. In the regulatory framework, the number of relevant markets susceptible to ex ante regulation has fallen from 18 in 2002 to 7 in 2007 and 4 in 2014, all of them wholesale markets. Retail price regulation has been withdrawn in most of Europe, with regulation focusing instead on upstream bottlenecks.

The original rationale of the SMP framework for providing access to bottlenecks at different points in the incumbents' networks was to allow access operators to climb the 'ladder of investment', starting as resellers and building enough scale to gradually roll out infrastructure of their own, and one day make the final jump towards building their own networks. While successful at creating an access market, the framework has not quite delivered on the ultimate promise of infrastructure-based competition.

Nevertheless, the trend towards convergence and consolidation is reshaping the landscape. Technological innovation and convergence, and the continued growth in and consolidation of cable networks, are contributing to increased facilities-based competition in the broadband market. Overall, the market share of incumbents in the EU has decreased by 10 percentage points since 2006,[2] and in some countries (e.g. the Netherlands, Belgium and Portugal), the market share of infrastructure-based competitors has surpassed that of the incumbent's for some services.

Furthermore, all across Europe, new networks with very high capacity are being rolled out, relying on a variety of funding mechanisms and technologies. These include, for example, co-investments using the networks of other utilities, such as energy distribution. By the time the European Electronic Communications Code has entered into force and is transposed into national laws, the deployment of 5G mobile networks will be in full swing, capable of delivering speeds comparable to fixed broadband networks. Hence,

[2] European Commission (2017), 'Connectivity Broadband market developments in the EU Europe's Digital Progress Report 2017', slide 21.

competition between different network infrastructures is set to intensify even further.

These trends are consistent with the large body of empirical evidence demonstrating that infrastructure competition is the main driver of investment in NGA networks, increasing the penetration of high-speed broadband services, and leading to improvements in network coverage and speed, as well as lower prices for consumers.

The existing regulatory toolkit continues to be fit for purpose

Economic theory and empirical evidence show that oligopolies come in many flavours. Structural market features on their own cannot provide strong evidence on whether competition between oligopolists will be effective or not. Markets with just two operators competing with differentiated but substitutable products, different cost structures, and facing significant competitive constraints from external forces, such as online platforms and over the top (OTT) services, can produce significantly more competitive outcomes than markets with many operators but where products, cost structures and technologies are more homogeneous.

The key is whether consumers are receiving the benefits of competition through high-quality networks, innovative products and services, and competitive prices, given the underlying cost of the infrastructure. Where this is not the case, this can be indicative of ineffective competition—markets with limited churn, stable demand, few product and service innovations, limited investment in new technologies, and prices considerably in excess of the cost of production. In these circumstances, the conditions for finding tacit collusion under the 'Airtours criteria' (transparency around a focal point of coordination; effective punishment mechanisms; and no external destabilising forces) and hence joint SMP can be applied as in any other sector.

The relative paucity of cases where regulators have found joint SMP (and which have survived scrutiny by the European Commission and national courts) is neither surprising nor a cause for concern. It is not surprising simply because telecommunications markets typically do not display the characteristics of markets that are prone to tacit collusion. Furthermore, there is no empirical evidence that oligopolistic market structures have been detrimental to consumer welfare, absent coordination. Hence, based on this evidence, the existing SMP test is fit for purpose.

It is therefore unclear what market failure the proposed UMP test is seeking to correct. UMP would require an arbitrary demarcation of criteria and market outcomes below which markets are allegedly not working effectively, but where this is not the result of single-firm SMP or tacit collusion.

The proposal to extend symmetric access obligations on infrastructure competitors beyond the first concentration point is also problematic from an economic perspective. Aside from the fact that the proposal is predicated on the factually inaccurate premise that passive and active network elements are essential facilities that cannot easily be duplicated, the proposal would bypass the market review process, allowing regulators to impose access obligations on any network owner regardless of their position on the market. Such a remedy is likely to have a negative effect on investment incentives. We also note that the Commission's 2014 Cost Reduction Directive already targets better access

to civil infrastructure facilities (of all utilities) and should therefore reduce the costs of network rollout.[3]

Concluding remarks

The relevant questions for the policy debate on regulating oligopolies would be: whether an enforcement gap exists; what its optimal size is; whether it should be addressed by additional ex ante regulation; and whether the benefits of additional regulation are outweighed by the costs.

In any unregulated market that is not perfectly competitive, there could be said to be an enforcement gap. This gives little guidance for meaningful debate on the optimal degree of regulatory intervention.

In this context it is important to consider that a large range of potential competition problems in electronic communications markets can already be dealt with under existing regulation and antitrust rules:

- the existing SMP standard in telecoms regulation covers both single-firm dominance and joint dominance based on tacit collusion;
- Articles 101 and 102 TFEU cover a variety of anticompetitive behaviours, including various forms of exclusion and discrimination;
- merger control deals explicitly with potential increases in concentration and the risk of coordination and unilateral effects as a result of mergers.

In addition, regulators can influence competitive dynamics by using consumer protection powers, as well as exercising regulatory discretion—for example, in relation to spectrum auction rules with a view to increase competition in the market. In all, Oxera considers any enforcement gap to be small.

The European Commission's connectivity targets are ambitious. By 2025, it envisages reaching 100% coverage of networks delivering over 100Mbps, with the capability of being upgraded to 1Gbps. Achieving this will require a stable and predictable regulatory environment. The analysis conducted by Oxera in this report shows that the calls for enhanced regulatory tools—UMP, expanding symmetric access, and the potential lowering of the standard of proof for finding joint dominance—will achieve the opposite. They risk introducing legal and economic uncertainty that will reduce investor confidence at a time when it is needed to boost investment in fibre broadband and deliver on Europe's ambitions for a gigabit society.

[3] European Commission (2014), 'Directive 2014/61/EU of the European Parliament and the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks', 15 May, https://ec.europa.eu/digital-single-market/en/news/directive-201461eu-european-parliament-and-council, accessed 19 July 2017

1 Introduction

1.1 Objective of the discussion paper

This discussion paper, commissioned by Liberty Global, is Oxera's contribution to the current policy debate in the European Union on whether and how to regulate oligopolies in electronic communications markets. The focus of our analysis is fixed telecoms markets, although we also cover mobile market developments where relevant.

Over the past few years national regulators and the European Commission have shown increasing interest in how best to regulate oligopolistic markets structures in the sector.

In fixed markets, such structures have arisen as the traditionally dominant incumbent networks face increasing infrastructure competition from other networks—in particular, from cable and a growing number of fibre investment projects. The advent of superfast mobile broadband from 4G and, soon, 5G mobile networks means that mobile networks also increasingly compete with fixed networks. A wave of merger and acquisition (M&A) activity in the sector has further contributed to the emergence of oligopolistic markets: a small number of competitors offering fixed, TV and mobile services using their own infrastructure.[4]

In this context, the question has been raised as to whether the existing EU regulatory framework, which is based on the significant market power (SMP) framework, is suited for dealing with oligopolies as well as with markets where one network is dominant.

Milestones in this policy debate include the following.

- The Body of European Regulators for Electronic Communications (BEREC) 2015 report on oligopoly analysis and regulation, which highlighted concerns about 'tight oligopolies'.[5]
- The European Commission proposals in September 2016 for a new European Electronic Communications Code, which includes significant changes to the existing EU telecoms regulation framework, and is aimed at encouraging investment in high-quality connectivity.[6]
- BEREC's internal report of October 2016 on oligopoly analysis and regulation, progressing the debate further.[7]

[4] The term 'oligopoly' refers to a market with a small number of competitors. In theory, it has neither a positive nor a negative connotation. In such market structures, the degree of rivalry cannot be determined a priori, and market outcomes can vary anywhere between highly competitive and highly collusive. As further discussed in this report, competition law (and in particular merger control) is primarily concerned with oligopolies tacitly colluding, not with oligopolies as such.
[5] BEREC (2015), 'Report on oligopoly analysis and regulation', BoR(15) 195, 27 November, http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/5581-berec-report-on-oligopoly-analysis-and-regulation, accessed 19 July 2017.
[6] European Commission (2016), 'Proposed Directive establishing the European Electronic Communications Code, 14 September, https://ec.europa.eu/digital-single-market/en/news/proposed-directive-establishing-european-electronic-communications-code, accessed 19 July 2017.
[7] BEREC (2016), 'Follow-up Internal BEREC Report on Oligopoly Analysis and Regulation', BoR(16) 172, 6 October, http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/6489-follow-up-internal-berec-report-on-oligopoly-analysis-and-regulation, accessed 19 July 2017.

- The European Commission expression of interest, issued on 23 March 2017, for expert advice with the objective of assessing the extent to which the SMP Guidelines need to be amended.[8]

- The Commission public consultation and questionnaire on the SMP Guidelines issued on 27 March 2017.[9]

Oxera has been involved in this debate since 2015. In January 2015, we submitted a response to BEREC's questions on oligopoly analysis and regulation, and organised a roundtable in Brussels in July 2015 on competition policy and regulation in converging telecoms and media markets. Since then we have been involved in a number of regulatory market reviews (e.g. in the Netherlands on the retail Internet access market) and merger reviews where questions about oligopolistic competition and joint dominance have been at the forefront.

Liberty Global asked Oxera to produce a discussion paper to inform the debate from an economic perspective. The aim is to explore whether, and in what market circumstances, the regulation of oligopolies in electronic communication markets might be appropriate.

1.2 About Oxera

Oxera is a leading economics consultancy with offices in Berlin, Brussels, London, Oxford and Rome, specialising in competition, finance and regulation. We have an extensive track record in electronic communications markets in the EU and beyond, and have been involved in all the major policy and regulatory debates in the sector over the past 35 years, ranging from vertical separation and universal broadband service to access regulation and net neutrality.

Oxera advises both national regulatory authorities (NRAs) and operators in a large number of market and SMP reviews across Europe. We have also acted as economic experts in many merger and antitrust cases in fixed and mobile telephony, media and digital platforms.

We have also provided training courses on the economics of regulation and competition to corporates, regulators, law firms and national judges for more than 20 years. We have an extensive network of academic associates in the fields of industrial organisation, corporate finance and econometrics, which includes the Oxera Economics Council. With these academics, we work on cases and explore key policy issues, such as the current one on regulating oligopolies.

1.3 Structure of the paper

- Section 2 looks at how electronic communications markets have evolved from a monopoly market structure to oligopolistic competition between infrastructures; what the benefits this infrastructure competition brings; and how European regulators are prioritising infrastructure competition as a way to achieve the Commission's aims for a 'gigabit network'.

[8] European Commission (2017), 'Review of the Significant Market Power (SMP) Guidelines', 23 March, https://ec.europa.eu/digital-single-market/en/news/review-significant-market-power-smp-guidelines.
[9] European Commission (2017), 'Public Consultation on the Review of the Significant Market Power (SMP) Guidelines', 27 March, https://ec.europa.eu/info/content/public-consultation-review-significant-market-power-smp-guidelines_en, accessed 19 July 2017.

- Section 3 reviews oligopolistic competition in general and notes that this is a common market structure in many sectors and not a unique feature of electronic communications markets. We then review the concepts of 'tight oligopoly' and UMP as a basis for regulating oligopolies, as put forward by BEREC and in the draft report by the European Parliament ITRE Committee amending the European Electronic Communications Code. We also consider the proposals by some Member States in the European Council to expand the scope of symmetric access obligations beyond the first concentration point, irrespective of a finding of SMP.
- Section 4 explores the existing SMP framework in EU telecoms regulation; how it can be used to address any concerns about tacit collusion in an oligopolistic market structure; and whether any there is any significant enforcement gap.
- Section 5 concludes on the existing and proposed standards for intervention, and the optimal regulatory enforcement regime for markets with competing infrastructure operators.
- Appendix 1 presents country case studies on oligopolistic infrastructure competition in the Netherlands. Belgium, and Hungary.
- Appendix 2 provides references to the literature reviewed by Oxera on the empirical evidence on the relative benefits of infrastructure competition and wholesale access regulation, as well as other references relied on in this discussion paper.

2 Infrastructure competition as an enabler of network investment, innovation and consumer benefits

This section provides evidence demonstrating that, rather than being a cause for concern, the present situation that has given rise to the debate on regulating oligopolies is, in fact, a success story. Infrastructure-based competition is now a reality, driven by cable network upgrades and expansion.

The section starts by discussing the origins of the current wholesale access regulation regime, and the successful growth of infrastructure competition (section 2.1). We then describe how regulators currently advocate more infrastructure competition and aim to incentivise network investments (section 2.2); and we lay out the body of empirical evidence indicating that infrastructure competition drives investment and delivers good outcomes for consumers (section 2.3). Section 2.4 concludes.

2.1 Wholesale access regulation is regarded as a temporary measure

2.1.1 The ladder of investment as a basis for wholesale access regulation

One of the core tenets of telecoms sector regulation, following the 2002 EU regulatory framework, is the ladder of investment. Originally introduced by Professor Martin Cave, this concept describes how wholesale access regulation can provide the means to promote infrastructure competition.[10]

The idea is that potential entrants to the broadband market can invest in their networks incrementally, rather than build a network from scratch. An entrant could start offering services by simply reselling broadband (using bitstream wholesale access), build up a customer base, and then move up the ladder and provide broadband services using wholesale local loop access, which requires the entrant to make some investment at the local exchange level. In theory, this incremental investment path, up the ladder of investment, should reduce the entry barrier for potential entrants, and encourage entrants to develop their own networks gradually.

As the European Regulatory Group stated in 2004:[11]

> new entrants can decide on their investment in a step-by-step way and can establish a customer base (critical mass) before they go to the next step of deploying their own infrastructure. In those areas where infrastructure based competition is feasible, such interventions have as their long-term objective the emergence of self-sustaining effective competition and the ultimate withdrawal of regulatory obligations.

This conceptual understanding of network investment as an incremental progression has historically provided the intellectual underpinning for much of the focus on wholesale access regulation by European NRAs.

The ultimate aim of providing wholesale access regulation to promote the ladder of investment is to achieve infrastructure competition, with the access seeker

[10] See Cave, M. (2006), 'Encouraging infrastructure competition via the ladder of investment', *Telecommunications Policy*, **30**, pp. 223–37.
[11] European Regulators Group (2004), 'ERG common position on the approach to appropriate remedies in the new regulatory framework', ERG (03) 30 rev. 1. European Regulatory Group A. The European Regulators Group for electronic communications networks and services was established as an advisory group to the Commission in 2002; it was replaced by BEREC, established by Regulation (EC) No 1211/2009 of the European Parliament and of the Council of 25 November 2009, as part of the Telecom Reform package. See http://berec.europa.eu/eng/about_berec/what_is_berec/, accessed 19 July 2017.

investing in its own last-mile infrastructure—i.e. effective competition between different networks, such that reliance on wholesale access to retail providers is no longer required.[12] A shorter-term aim of wholesale access regulation has been to achieve more competition over existing networks, thereby providing greater choice and lower prices to consumers at the retail level.

2.1.2 The ladder of investment has been only partially successful

The evidence from European countries suggests that the primary aim of the ladder of investment—the stimulation of infrastructure competition—has not been fully met. Infrastructure competition would mean competing networks with their own end-to-end infrastructure—e.g. an incumbent copper/FTTx network,[13] a cable operator's DOCSIS 3.0 network, or an alternative operator's FTTx network. Only in some countries has such competition arisen, but not primarily through the ladder of investment.

Most wholesale access seekers have not made it to the top of the ladder—i.e. they have not invested in their own end-to-end infrastructure. There is some consensus that the concept has worked for the lower rungs of the investment ladder—in particular, the move from simple resale (selling the incumbent's products under a different brand) to bitstream access—but not for the higher rungs. As stated by Briglauer, Cambini and Grajek (2015, p. 5) based on a literature review and case studies from Europe and the OECD:

> More than a decade of broadband access regulation in Europe has shown, however, that the ladder-of-investment hypothesis works mainly for the lower rungs of the investment ladder. This calls for comparatively low investment requirements, especially, for moves from resale to bitstream access. Empirical evidence suggests that mandatory local loop unbundling has not led entrants to ramp up access network infrastructure as expected. In fact, unbundling might have even reduced total industry investment, meaning that investment by entrants has not been sufficient to offset the unrealised investments of incumbents.

Econometric analysis of semi-annual panel data for 15 EU Member States from July 2002 to July 2010 by Bacache, Bourreau and Gaudin (2014) also finds no empirical support of access seekers transitioning from LLU to new access facilities across the EU.

The regulation of wholesale access can actually have a negative influence on the incentives for new entrants to climb the ladder. Briglauer's (2014) econometric analysis of 2004–14 panel data for 27 EU Member States shows a 'replacement effect' in first-generation broadband infrastructure—low wholesale access charges actually reduce the incentive for new entrants to invest in infrastructure. Econometric impact analysis by Neumann et al. (2016) of 2009–14 panel data from 27 EU Member States also finds a non-linear relationship between local-loop-unbundling access charges and investment in FTTx (with higher LLU prices having a positive impact on FTTH investment at low LLU prices, but only up to a certain level of prices), indicating a replacement effect.

Apart from the question of whether the ladder of investment has materialised, there are questions about whether activities on lower rungs of the ladder provide as much benefit to consumers and overall welfare as infrastructure

[12] European Regulators Group (2004), 'ERG common position on the approach to appropriate remedies in the new regulatory framework', ERG (03) 30 rev. 1. European Regulatory Group A.
[13] FTTx (fibre to the x) is the generic term used to describe broadband networks that use fibre in the last mile of the network. FTTx thus incorporates the terms fibre to the home (FTTH) and fibre to the premises (FTTP).

competition does. The evidence in the literature on consumer benefits from wholesale access regulation is mixed. As regards retail markets, the evidence points to access seekers having a positive impact, although this diminishes over time and with an increasing number of access seekers.

An econometric study by Smith, Northall and Santamaría (2013) based on 2008–11 annual panel data from 27 EU Member States suggests that increased market shares for LLU entrants tends to result in lower prices and higher broadband speed, but increased bitstream or resale market share do not have this effect. In contrast, infrastructure competition is found to result in a decrease in retail prices similar to LLU, but a much larger positive effect on broadband speeds (see Table 2.1).

Table 2.1 Effect on consumer outcomes from different forms of competition

Effect of a 10% increase in market share on:	Simple resale	Bitstream access	LLU access	Infrastructure competition
Retail prices	None	None	-1.9%	-1.6%
Average broadband speed	None	None	+12%	+20%

Note: The impact on retail prices of LLU and infrastructure competition is not statistically different at the 15% significance level.

Source: Smith et al. (2013).

The findings of a 2015 study by WIK for Ofcom looking at market outcomes in various European and OECD countries reinforces the importance of infrastructure competition as the main driver of improvement in network infrastructure. It finds that the main driver of next generation access (NGA) deployment is infrastructure competition—primarily from cable, and in some cases from independent FTTH investors. It also finds that local access regulation has led to positive outcomes in terms of consumer choice and pricing (especially in the UK, the Netherlands and Sweden), but that, in general, regulatory factors appear to have had less influence over coverage of NGA networks and take-up than market-based factors such as infrastructure competition or online video.[14] The study concludes that:

> There is a strong case for maintaining a focus on promoting competition (and specifically infrastructure-based competition) as it is a key driver for fast broadband. This should remain a key objective for national regulatory authorities at EU and national level. Access-based regulation may remain an important tool to ensure consumer choice where infrastructure-based competition alone would be insufficient.

The European Commission in its recent proposals has also identified that the lack of investment in NGA networks is partly driven by the existing regulatory framework. In this context, the Commission points out:[15]

> the level of uncertainty due to price regulation; deterrent effect to incumbent first movers because non-discriminatory access requirements mean they cannot differentiate on the basis of their investments, whereas competitive pressure on them is often insufficient to force investment, especially in less dense areas; access-based alternative operators often have insufficient scale to invest alone.

[14] WIK-Consult (2015), 'Competition & investment: An analysis of the drivers of superfast broadband', study for Ofcom, July, p. 3.
[15] European Commission (2016), 'Proposed Directive establishing the European Electronic Communications Code, 14 September, https://ec.europa.eu/digital-single-market/en/news/proposed-directive-establishing-european-electronic-communications-code, accessed 19 July 2017.

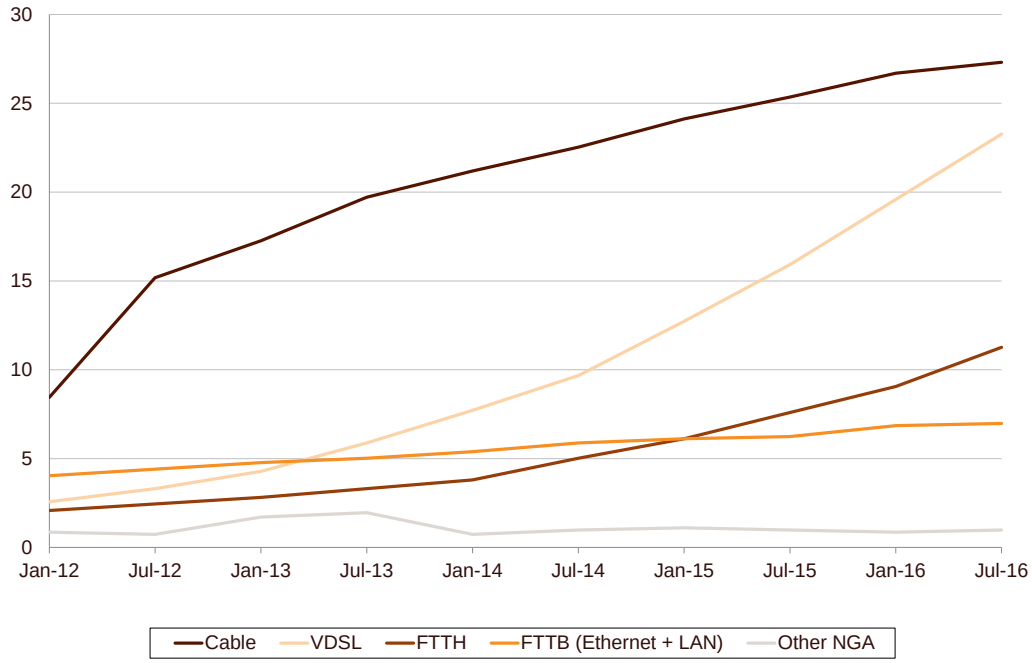
2.1.3 There is increasing infrastructure competition (driven by market factors other than wholesale access regulation)

Infrastructure competition in broadband markets has been increasing in Europe, and is expected to continue to do so. This is due not to wholesale access regulation promoting the ladder of investment, but rather to competition from cable and alternative FTTx networks, and increasingly also from hybrid fixed-mobile networks. Other market developments driving this infrastructure competition include the growth in demand for bandwidth leading to competitive investments to upgrade networks, and the convergence of networks and online platforms/content providers. There is evidence of these trends (infrastructure competition and market trends) in Europe, as illustrated by the evidence presented below and in the Netherlands, Belgium, and Hungary, the countries reviewed in Appendix A1.

Competition from cable and alternative FTTx networks

Competition among fixed networks has increased over the last five years, as shown in Figure 2.1. Cable networks and alternative fibre networks increasingly compete with legacy copper networks, which themselves are in the process of being upgraded to fibre—i.e. the replacement of copper with fibre in (some parts of) the last-mile connections from local exchanges to the customer premises. The number of NGA cable subscriptions across Europe has risen, from under 10m in 2012 to over 25m in 2016—more than that provided by any other technology throughout the period.

Figure 2.1 NGA penetration in the EU (≥30Mbps) by technology (millions of subscriptions)



Source: Communications Committee, cited by European Commission (2017), 'Connectivity Broadband market developments in the EU Europe's Digital Progress Report 2017', 27 April, slide 20.

For example, starting with different regional cable networks in early 2000, today Liberty Global's cable network passes approximately 49 million households in total across 12 countries in Europe (see Table 2.2).

Table 2.2 Liberty Global cable network coverage in Europe

Country	Brand	Number of homes passed (million)	% of total homes passed	Maximum current Internet speed (Mbps)
Austria	UPC	1.4	36	250
Belgium	Telenet	3	64	200
Czech Republic	UPC	1.5	32	300
Germany	UnityMedia	12.9	32	200
Hungary	UPC	1.7	41	500
Ireland	Virgin Media	0.856	50	240
Netherlands	Vodafone/Ziggo	7.1	92	300
Poland	UPC	3.2	22	600
Romania	UPC	2.9	39	500
Slovakia	UPC	0.589	32	500
United Kingdom	Virgin Media	13.6	47	200

Source: Liberty Global (http://www.libertyglobal.com/our-companies.html) and Ziggo websites (https://www.ziggo.nl/internet/) for number of homes passed and maximum speed (accessed 10 July 2017) and Eurostat for total households in each country to estimate percentage of homes passed.

Examples of some alternative FTTx deployments include the following.

- **Ireland**: SIRO, the joint venture between Vodafone and the Electricity Supply Board, was launched in 2015 and its FTTP network has so far covered 70,000 premises. The coverage of SIRO's wholesale open access network will reach 500,000 premises by the end of 2018.[16]
- **Italy**: Enel Open Fiber is engaged in the construction, management and maintenance of fibre optic network using FTTH technology based on Enel's existing electricity network. The company was founded in 2015 and its ultra-fibre-optic broadband is available in 11 major cities nationwide, and will soon be extended to more cities, including Florence and Genoa.[17]
- **Hungary**: Invitel, one of the alternative cable operators competing with the Magyar Telekom and UPC, has been investing extensively in its networks in the last couple of years. In May 2015 it announced a €30m investment plan to expand its footprint to more than 500,000 households in 98 cities.[18]
- **Portugal**: there is intense infrastructure competition in Portugal, with the incumbent, Portugal Telecom Portugal (MEO), investing in FTTH and new fibre entrant, Vodafone, also expanding FTTH coverage. This is partly driven by passive infrastructure-sharing (duct and pole access) between MEO and Vodafone, which significantly reduces rollout cost (the ducts are also of high quality, which further reduces costs). In addition, cable coverage is over 70% of the population and exerts strong competitive pressure on MEO.[19]

[16] http://siro.ie/more-about-siro/, accessed 19 July 2017.
[17] http://openfiber.it/, accessed 19 July 2017.
[18] https://www.telecompaper.com/news/invitel-starts-eur-30-mln-network-development-programme--1081287, accessed 19 July 2017.
[19] BEREC (2016), 'Challenges and drivers of NGA rollout and infrastructure competition', BoR (16) 171, 6 October, p. 171.

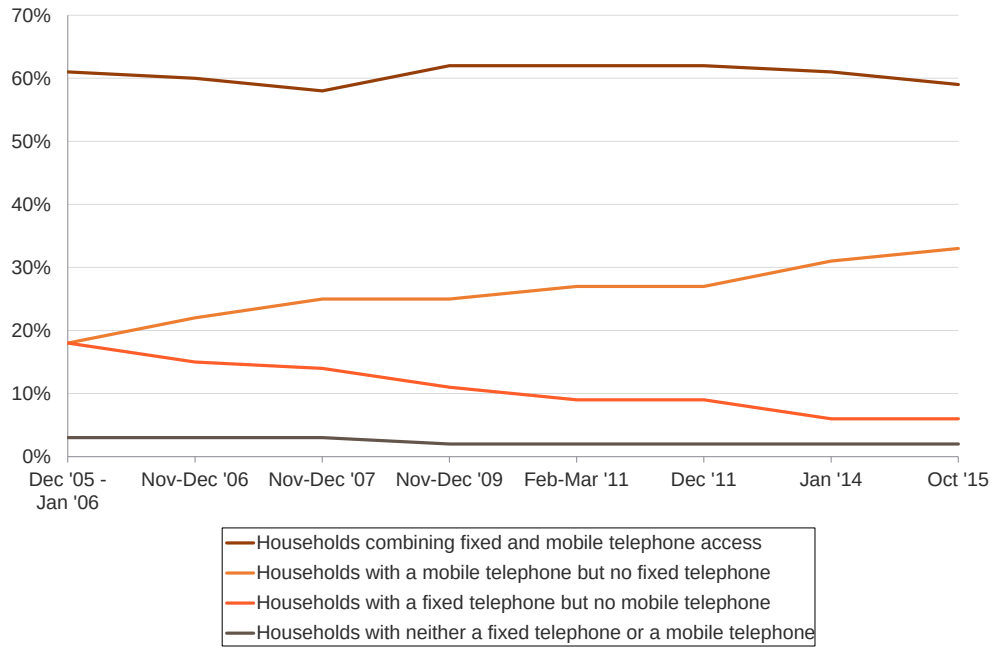
- **Romania**: new entrant, RCS&RDS, has rolled out an extensive FTTP network and is the market leader in fixed broadband.[20] RCS&RDS continues to invest in its network, with regular speed upgrades (the lowest-speed package is now 300Mbps download).[21]
- **Sweden**: the legacy of having municipal broadband networks has driven fibre deployment in Sweden. The municipalities' networks are a key driver of infrastructure competition, and 58% of fibre lines are on these local networks.[22] The new entrant, IP Only, has been deploying fibre in key cities and rural areas. By 2020, it will have invested €15 billion in its fibre network, of which €7 billion will be in sparsely populated and rural areas.[23]

The importance of alternative fibre networks is likely to increase in the short to medium term (over the next regulatory review period) as these alternative operators further expand their networks.

Competition from mobile networks following the rollout of 5G

Competition has also been increasing from mobile. Fixed-mobile substitution has existed for some time, but is expected to increase even further. Figure 2.2 shows that the proportion of households with a mobile telephone but without a fixed telephone rose from 18% in 2005/06, to 33% in 2015. Meanwhile, the proportion of households with a fixed telephone but without a mobile telephone has fallen to 6%. Figure 2.3 shows that the number of households with mobile Internet access but no fixed Internet access is rising. This is partly due to increasing 4G coverage—96% of homes in Europe are now covered by at least one 4G operator.[24]

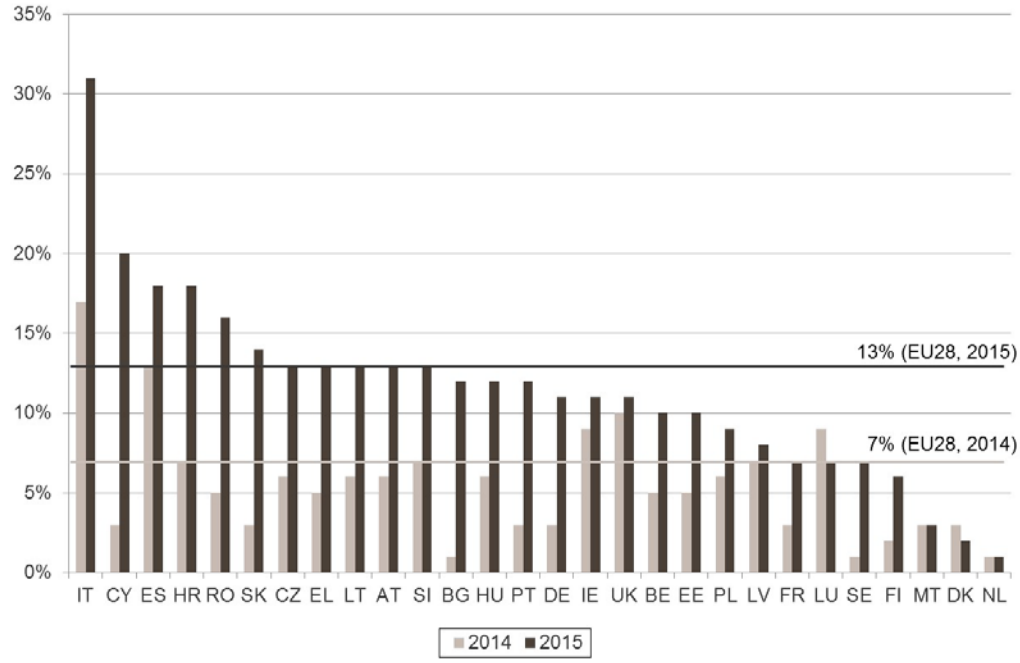
Figure 2.2 Telephone access by technology (EU average)



[20] https://seenews.com/news/sp-upgrades-romanias-rcs-rds-to-bb-stable-outlook-566632, accessed 19 July 2017.
[21] For example http://www.rcs-rds.ro/comunicat?id=547, accessed 19 July 2017.
[22] BEREC (2016), 'Challenges and drivers of NGA rollout and infrastructure competition', BoR (16) 171, 6 October, p.125.
[23] http://www.ip-only.se/kommun/, accessed 19 July 2017.
[24] European Commission (2017), 'Connectivity Broadband market developments in the EU Europe's Digital Progress Report 2017'.

Source: European Commission (2016), 'E-Communications and the Digital Single Market: Summary', Special Eurobarometer 438, May.

Figure 2.3 Households with mobile Internet access and no Internet connection at home



Source: European Commission (2016), 'E-Communications and the Digital Single Market: Summary', Special Eurobarometer 438, May.

Regulators have started to recognise these trends. Indeed, the Austrian regulator, RTR, has included mobile in the Austrian broadband retail market since 2009.[25]

Given the rollout of 5G networks, we would expect that this competition from mobile networks and the convergence of fixed and mobile networks is likely to intensify over the next two regulatory review periods (approximately 6 years), which may be the time for the Communications Code to be transposed into national laws. These networks will in effect be hybrid fixed-mobile networks. According to the European Commission: [26]

> There is an emerging consensus among industry players and investors that in the medium and long run, fixed and mobile networks converge: for instance, it is expected that 5G connectivity providers will rely on (nearly) ubiquitous VHC [very high capacity] network infrastructures coming very close to users' premises (i.e. to the building, to the small cell), to support their business.

The speeds achieved by 5G networks are expected to rival those of fixed networks. For example, a collaboration between Orange and Ericsson in France recently achieved peak speeds greater than 10Gbps.[27]

[25] BEREC (2011), 'BEREC Report on impact of fixed-mobile substitution in market definition', BoR(11) 54 Draft, 8 December, http://berec.europa.eu/doc/berec/bor/bor11_54_FMS.pdf accessed 19 July 2017.
[26] European Commission (2016), 'Commission staff working document accompanying the Communication 'Connectivity for a Competitive Digital Single Market – Towards a European Gigabit Society'', SWD(2016) 300 final, p. 16, 14 September.
[27] Ericsson (2017), 'Ericsson and Orange demonstrate speeds beyond 10Gbps in live 5G field trial', 25 January, https://www.ericsson.com/en/news/2017/1/ericsson-and-orange-demonstrate-speeds-beyond-10gbps-in-live-5g-field-trial, accessed 19 July 2017.

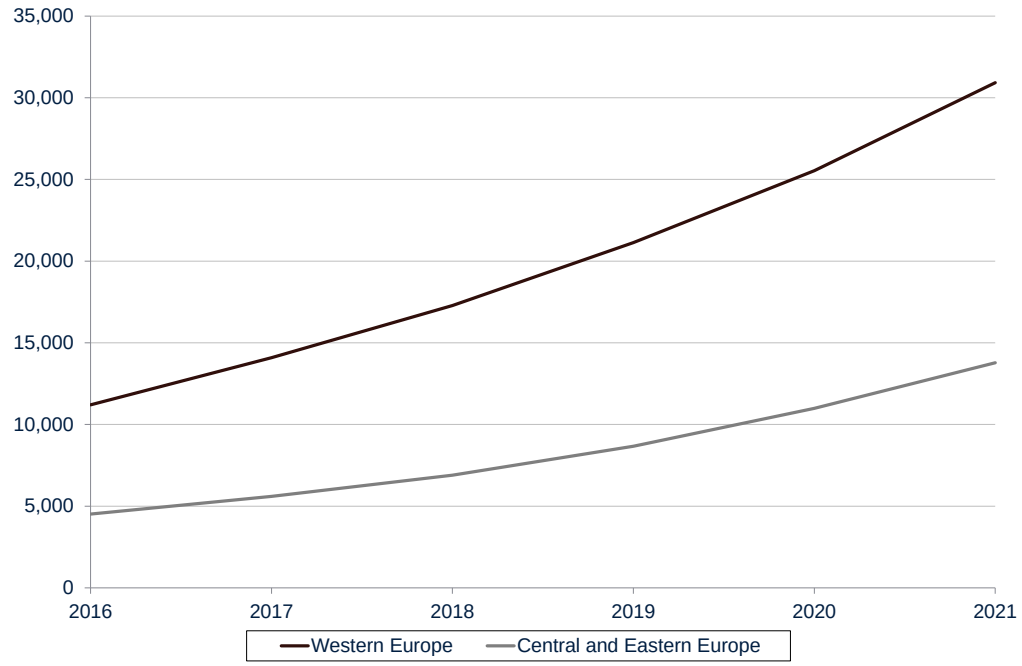
This evolution towards greater speeds has also been demonstrated by improvements to existing 4G networks. For example, EE has started deploying new technology (4x4 MIMO and 256QAM) to existing 4G sites in the UK—a move which will increase peak speeds above 400Mbps.[28]

We also note that the extra demand for fixed backhaul connectivity for 5G may drive competition between existing fixed networks to provide this connectivity. It may also encourage existing mobile network operators (MNOs) to build their own alternative fixed-backbone networks.

Demand for bandwidth will drive investment competition

The demand for bandwidth is expected to increase nearly threefold over the coming five years, as shown in Figure 2.4. More consumers are accessing the Internet and consumers are using more data-heavy services, partly driven by over-the-top (OTT) content provision.

Figure 2.4 Consumer IP traffic forecast (Petabytes)



Source: Cisco (2017), 'Cisco Visual Networking Index: Forecast and Methodology, 2016–2021', 6 June.

This increase in demand for bandwidth will drive competition among fixed and mobile infrastructure operators to invest in new technologies, each of which has a different upgrade path and timescale. This leads to increased incentives to invest because each network can gain a clear competitive advantage from an investment to serve the requirement of ever-increasing demand for bandwidth.

This important technology asymmetry forms part of the more general asymmetry between hybrid cable-fibre, copper-fibre, solely fibre, and fixed-mobile networks. This in turn results in more intense competition because

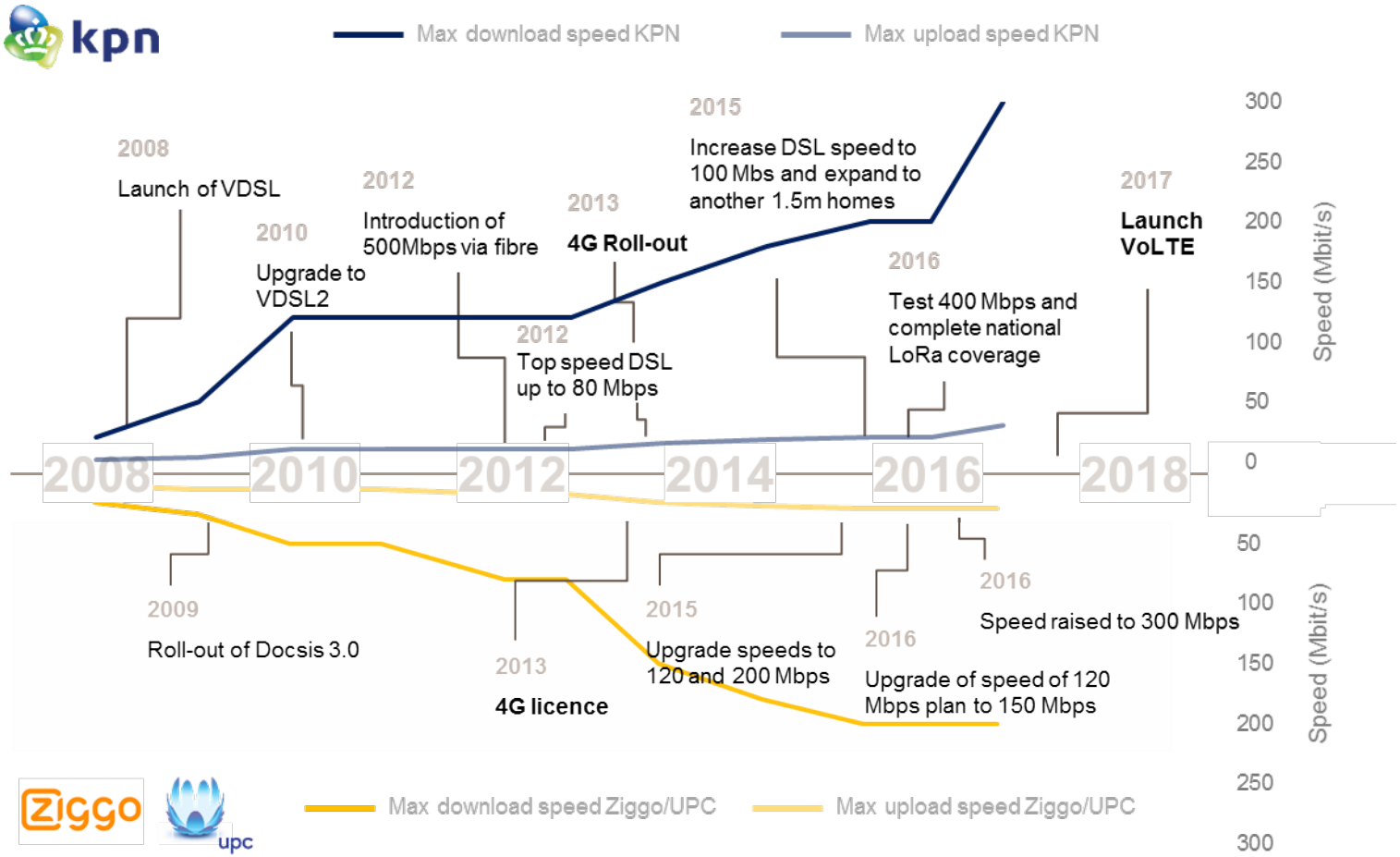
[28] EE (2017), 'The EE network just got even faster - Sony's Xperia XZ Premium and EE combine to reach more than 400Mbps real world download speeds', 6 June, http://newsroom.ee.co.uk/the-ee-network-just-got-even-faster---sonys-xperia-xz-premium-and-ee-combine-to-reach-more-than-400mbps-real-world-download-speeds/, accessed 19 July 2017.

incentives are less aligned than they would otherwise be, making coordination less likely.

This competitive ‘leapfrogging’ and competitive upgrades of cable and copper networks are illustrated for the Netherlands in Figure 2.5. As shown, the speed upgrades of the cable and copper networks are asynchronous; they jump over each other, rather than in parallel with each other. This is also the case for mobile, which follows a separate (and largely unrelated) technology upgrade path (i.e. HSPA, HSPA+, LTE, LTE-A). Figure 2.6 illustrates this for Belgium. We note that this leapfrogging in technology is also accompanied by rapid product innovation, as discussed in section 4.3 and illustrated in Figure 4.7 and Figure 4.8 for the Netherland and Belgium respectively.

Mobile operators in Belgium, Hungary and the Netherlands are also likely to rollout 5G over the next two regulatory review periods (approximately 6 years), and 5G will be able to provide subscribers with speeds comparable to next generation fixed networks.

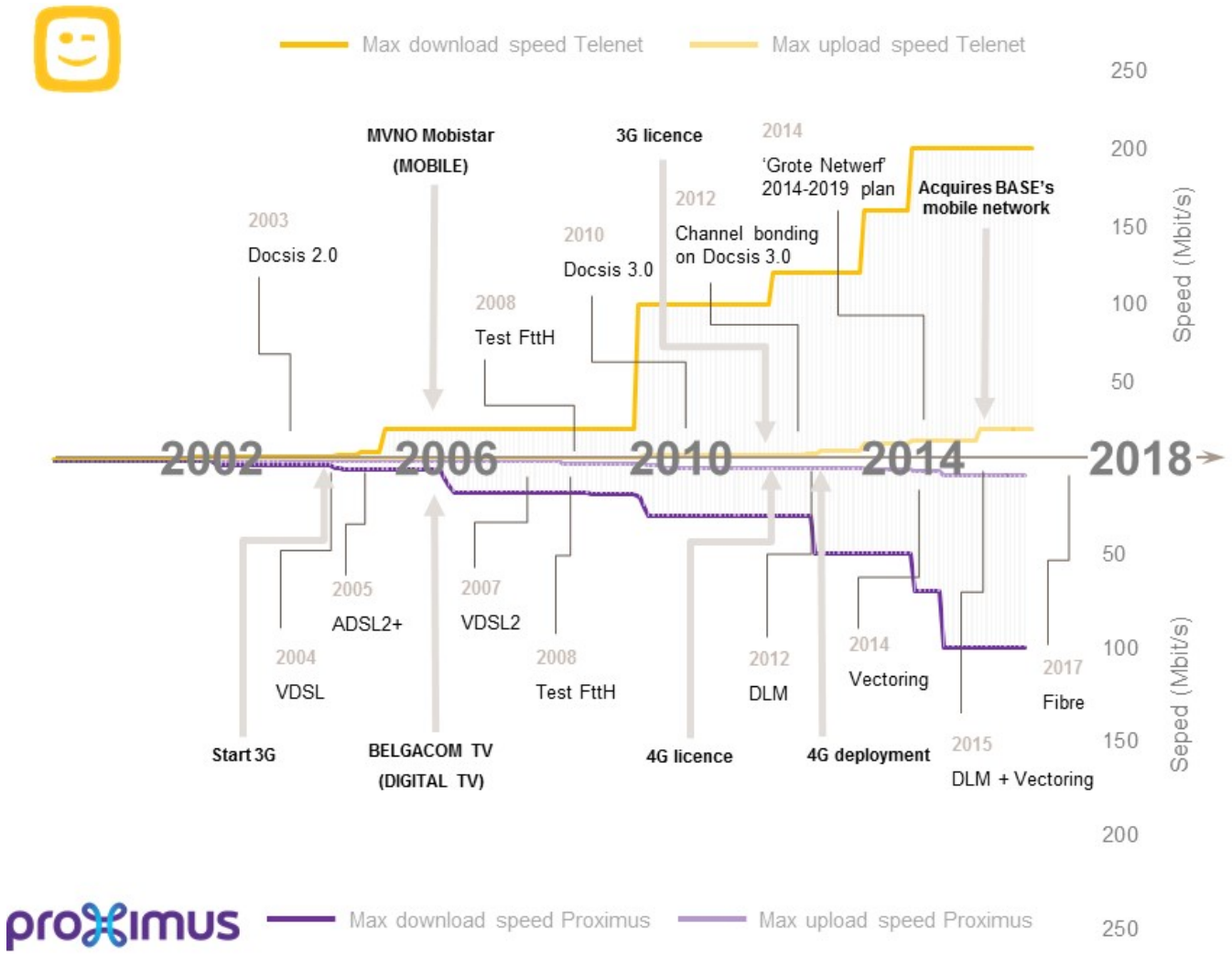
Figure 2.5 Leapfrog effect between cable, copper and mobile networks in the Netherlands



Note: Download and upload speed data includes 11 data points from December 2008 to April 2016, and might therefore not capture all speed upgrades over the period.

Source: Liberty Global.

Figure 2.6 Leapfrog effect between cable, copper and mobile networks in Belgium



Source: Van der Wee, Verbrugge and Laroy (2014).

Convergence in networks and online platforms/content providers

The convergence of networks and online platforms/content providers may increase infrastructure competition.

First, online platforms/content providers face strong incentives to maximise Internet access and speeds in order to maximise their reach and potential customer base. This may increase infrastructure competition through online platforms building their own networks. There are already high-profile examples of platforms such as Google and Facebook investing in fibre and wireless connectivity.[29] Furthermore, a credible threat of online platforms building their own networks would act as a competitive spur to existing network operators in rolling out high-quality connectivity.

Second, convergence may also provide a greater incentive for existing network operators to invest in networks. The demand for broadband access is derived from the services provided over the network. So, for example, the ability to provide high-quality OTT content offerings adds another incentive to offer high-quality connectivity (so that consumers can better enjoy the content).

2.1.4 The role of competition law given the increase in infrastructure competition

The EU regulatory framework for electronic communications has traditionally viewed ex ante sector regulation as mostly temporary—part of a transitional framework towards greater competition and better consumer outcomes. In 1999 the Commission stated that it:[30]

> sees the new regulatory framework structured along the following lines […] greater reliance on the general competition rules of the Treaty, allowing much of the sectoral regulation to be replaced as competition becomes effective.
>
> Competition Law will become increasingly important in this sector and replace much of the sectoral regulation once competition becomes established on the market.

The objective was to achieve infrastructure-based competition through short-term access regulation: [31]

> The imposition by national regulatory authorities of mandated access that increases competition in the short-term should not reduce incentives for competitors to invest in alternative facilities that will secure more competition in the long-term.

Similarly, the 2002 framework and subsequent Directives regarded ex ante regulation as applicable only where competition law was insufficient. As restated in the 2014 Directive: [32]

> Ex ante regulation should only be imposed where competition law remedies are insufficient to address the competition problem identified. As such, ex ante regulation and competition law serve as complementary instruments in achieving

[29] See https://info.Internet.org/en/story/connectivity-lab/ and https://x.company/loon/ and https://fiber.google.com, accessed 19 July 2017.
[30] European Commission (1999), 'A new framework for electronic communications services', COM(1999) 539 final, 10 November, http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=LEGISSUM:l24216&from=SK, accessed 19 July 2017.
[31] European Commission (2002), 'Directive 2002/19/EC', L108/7, 7 March.
[32] European Commission (2014), 'Commission staff working document explanatory note accompanying Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC', SWD(2014) 298, 9 October.

> their policy objectives in the electronic communications sector and in dealing with lack of effective competition.

Wholesale access regulation was originally intended to address a monopoly situation—a situation that European telecoms markets have evolved away from over the past 20 years. In the regulatory framework, the number of relevant markets susceptible to ex ante regulation has fallen from 18 in 2002 to 7 in 2007 and 4 in 2014, all of them wholesale markets. Regulators have deregulated many relevant markets, in whole or in part. Retail price regulation has been withdrawn in most of Europe, with regulation focusing instead on upstream bottlenecks. If ever there was a time for regulators to deliver on the promise of stepping back and relying on competition law, it is now (at least in some countries and for some markets).

Indeed, European regulators have recognised this, in moving towards an approach that promotes infrastructure competition more directly than relying on the ladder of investment. The intended consequence of this push for infrastructure competition is to incentivise investment in NGA networks achieving gigabit speeds, as discussed below.

2.2 Regulators have traditionally advocated more infrastructure competition, and continue to do so

One of the main public policy objectives of regulators and policymakers in Europe is more investment in networks—in particular, NGA networks that will deliver gigabit speeds. Recent regulatory reviews by NRAs reflect this priority. There is also a large body of empirical evidence which suggests that infrastructure competition is the main driver of investment and innovation, as discussed further in section 2.3.

2.2.1 Infrastructure competition in the European Commission's proposed Code

The Commission's European Electronic Communications Code (EECC) proposals have explicitly added a new objective for NRAs: investment in NGA networks, as shown below (proposed addition in bold):[33]

> National regulatory authorities shall […] encourage and where appropriate ensure, in accordance with the provisions of this Directive, adequate access and interconnection, and the interoperability of services, exercising their responsibility in a way that promotes efficiency, sustainable competition, **the deployment of very high capacity networks**, efficient investment and innovation, and gives the maximum benefit to end-users.

In recognising that incentivising investment is of critical importance, the Commission has proposed new regulations that encourage investment and co-investment:[34]

> while the key principles of the framework remain valid, significant adjustments are necessary to provide necessary incentives for both incumbents and competitors to make economically viable investments or co-investments in future networks that are in principle capable of providing very high capacity connectivity to every citizen and business in Europe.

[33] European Commission (2016), 'Proposal for a Directive of the European Parliament and of the Council establishing the European Electronic Communications Code (Recast)', COM(2016) 590 final/2 2016/0288 (COD), Article 59 amending 2009/140/EC Art.2.3(a), 12 October, p. 191.
[34] European Commission (2016), 'Proposal for a Directive of the European Parliament and of the Council establishing the European Electronic Communications Code (Recast)', COM(2016) 590 final/2 2016/0288 (COD), 12 October, p. 11.

Thus, the Commission proposed an approach that would attempt to 'foster infrastructure competition'.[35] As it also stated in May 2017, in the context of its Digital Single Market mid-term review:[36]

> The regulatory framework has successfully promoted and fostered retail competition in the telecom sector, but not enough 'infrastructure' competition has emerged in fixed-line networks, except in very densely populated areas, where cable networks were already present, or where local authorities have been active.

2.2.2 BEREC's emphasis on infrastructure competition

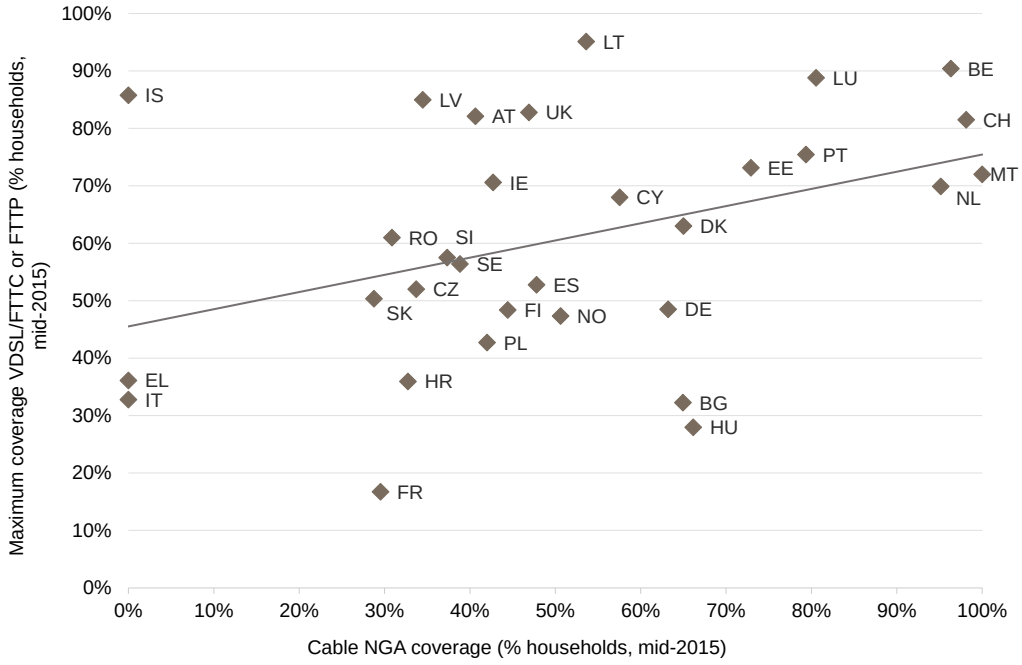
In October 2016, BEREC published a study into the drivers of NGA rollout which examined the role of infrastructure competition, and demand- and supply-side factors.[37] Examining broadband markets across Europe, BEREC found that infrastructure competition played a role in driving NGA rollout in 12 European countries,[38] and determined that:[39]

> Infrastructure based competition, most frequently from upgraded cable networks but also from other FTTP networks, is a main driver for NGA investments where such networks exist.

BEREC presented data from the European Commission on cable coverage versus VDSL/FTTC or FTTP coverage. This Commission data is shown in Figure 2.7. There is a clear positive correlation between cable NGA coverage and non-cable NGA coverage (as illustrated by the upward-sloping line of best fit).

[35] European Commission (2016), 'Impact assessment accompanying the document Proposal for a Directive of the European Parliament and of the Council establishing the European Electronic Communications Code (Recast)', Commission staff working document, SWD(2016) 303 final, 12 October, section 4.1.5.1, p. 85.
[36] European Commission (2017), 'Commission staff working document accompanying the document Communication on the Mid-Term Review on the implementation of the Digital Single Market Strategy', COM(2017) 228 final, 10 May, section 2.2.8, p. 15.
[37] See BEREC (2016), 'Challenges and drivers of NGA rollout and infrastructure competition', BoR (16) 171, 6 October.
[38] These are: Belgium, Switzerland, Cyprus, Spain, Malta, the Netherlands, Portugal, Croatia, Lithuania, Latvia, Romania, and Sweden.
[39] BEREC (2016), 'Challenges and drivers of NGA rollout and infrastructure competition', BoR (16) 171, 6 October, p. 30, http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/6488-berec-report-challenges-and-drivers-of-nga-rollout-and-infrastructure-competition, accessed 19 July 2017.

Figure 2.7 ≥30Mbps coverage: cable vs copper fibre



Note: NGA defined as ≥30Mbps download speed. Cable NGA includes DOCSIS 3.0.

Source: European Commission (2016), 'Study on broadband coverage in Europe 2015 Mapping progress towards the coverage objectives of the Digital Agenda', Final dataset, 30 September. https://ec.europa.eu/digital-single-market/en/news/broadband-coverage-europe-2015, accessed 19 July 2017.

Hence, countries with a high coverage of cable NGA broadband are likely to have high coverage of copper-fibre NGA broadband.

Also relevant in this context is that BEREC pointed to the limitations of access regulation in driving NGA network rollout: [40]

> An important insight from the analysis is that the main factors [explaining NGA investments] identified and discussed are factors which are largely or completely exogenous to regulatory interventions by NRAs. Hence, SMP regulation is only one factor among many and its ability to promote NGA rollout or particular types of NGA rollout need not be overstated.

2.3 Empirical evidence indicates that infrastructure competition drives investment and delivers good consumer outcomes

A large body of empirical evidence demonstrates that infrastructure competition drives investment, improves coverage and increases penetration of fixed broadband services. Consumers have also benefited from lower prices and higher broadband speeds as a result of infrastructure competition. In comparison, wholesale access regulation has delivered more limited consumer benefits and resulted in lower investment overall.

In this section we give an overview of the evidence on how infrastructure competition:

[40] BEREC (2016), 'Challenges and drivers of NGA rollout and infrastructure competition', BoR (16) 171, 6 October, p. 7, http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/6488-berec-report-challenges-and-drivers-of-nga-rollout-and-infrastructure-competition, accessed 19 July 2017.

- drives investment, whereas wholesale access regulation is likely to reduce investment by regulated operators and this shortfall in investment is unlikely to be made up by wholesale access seekers;
- delivers good outcomes for European consumers.

2.3.3 Infrastructure competition drives investment

Infrastructure competition increases investment because network operators have to invest more in order to win customers—customers are not captive; they are able to choose alternative networks if these alternatives offer more attractive services. Literature reviews by Cambini and Jiang (2009) and Briglauer, Cambini and Grajek (2015) demonstrate the clear positive effect of infrastructure-based competition on investment.

This relationship is non-linear, as shown in an econometric study by Briglauer et al. (2013), which uses annual panel data from 27 EU Member States to identify the determinants of NGA network deployment, and the effect of infrastructure- and service-based competition in particular. The study finds that infrastructure competition incentivises operators to invest in innovative technology in view of the temporary market power rents that a company can gain as a result of introducing new technologies—the 'escape competition effect'. This effect can be offset as infrastructure competition increases and more competition reduces the potential rents from NGA investments, and hence limits incentives to invest—the 'Schumpetarian effect'. A follow-on study by Briglauer (2014) also finds evidence that a higher take-up and penetration of first-generation broadband connections is associated with a lower adoption rate of second-generation NGA services—the 'replacement effect'.

Briglauer et al. (2013) and Briglauer (2014) find that these Schumpeterian and replacement effects are outweighed by the gains that operators facing infrastructure competition can make from offering better broadband services—a finding supported by the competitive technology leapfrog effect we observe (as discussed in section 2.1.3).

2.3.4 Wholesale access regulation results in less investment

As described in section 2.1.1, wholesale access regulation aimed at promoting the ladder of investment is prevalent in Europe. Yet the evidence shows that, on balance, access regulation leads to less investment than infrastructure competition. For example, the Briglauer et al. (2013) and Briglauer (2014) studies find that an increase in service-based competition has a negative impact on NGA deployment. Grajek and Röller (2012) also show the depression of total investment in telecoms in EU member states under stricter access regulation, a major reason being that regulated wholesale access regulation depresses retail broadband prices. For example, Vogelsang (2013) finds that low LLU prices have discouraged investment in NGA networks. It also leads to lower investments by the incumbents. Moreover, most studies show that investments by wholesale access seekers do not offset the unrealised investment of incumbents.[41]

Regulated access may also lead to lower investments by incumbents because there is uncertainty over how investments will be reflected in cost-based access charges, and whether incumbents will be adequately rewarded for assuming the risks of rolling out new infrastructure compared to access seekers. Grajek and Röller (2012) find that access regulation discourages investment by

[41] See Bouckaert et al. (2010); Bourreau et al. (2010); Briglauer et al. (2015).

incumbents.[42] Typically, when demand is weak, access seekers have the option of using (bitstream or) local loops, and may consider investing and rolling out their own network only when demand is strong. Hence, the mandated provision of regulated wholesale access provides an option value to access seekers that is not available to investors.

2.3.5 Oligopolistic infrastructure competition delivers good outcomes for European consumers

Infrastructure competition increases investment through the mechanism described in the previous section (competing infrastructures increase the incentive for infrastructure providers to invest in their networks), and this investment in turn drives consumer benefits in terms of coverage, speed, penetration, price and choice.

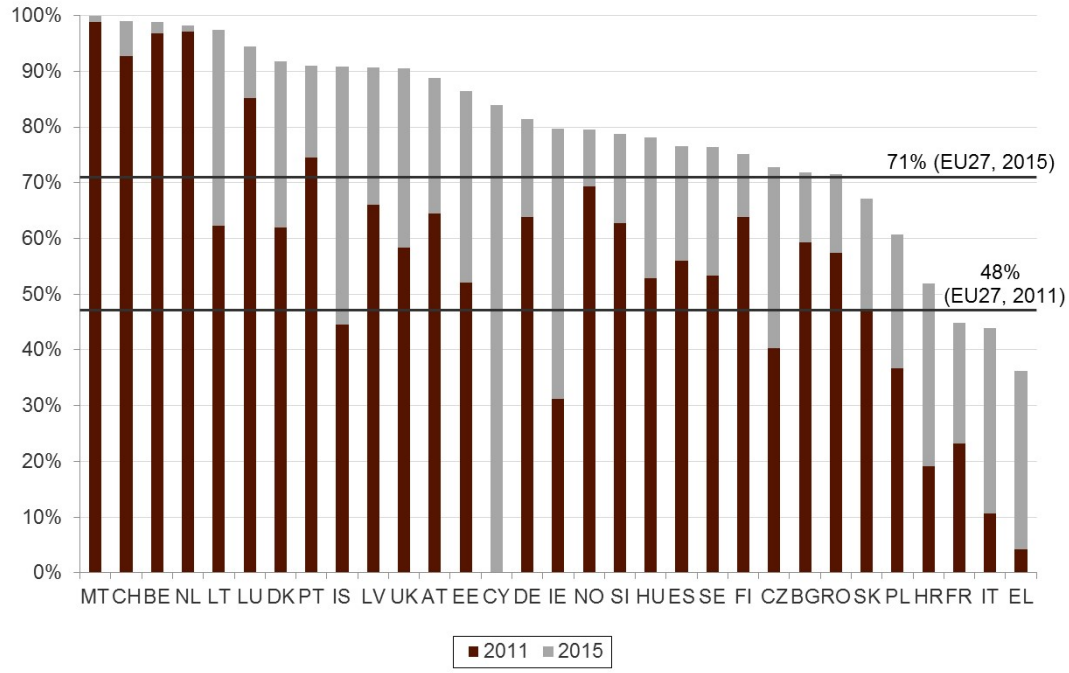
Greater coverage

Infrastructure competition increases both urban and rural NGA coverage as network operators compete for customers. For example, Yoo (2014) shows that infrastructure-based competition from cable has a positive impact on VDSL/FTTP NGA coverage from other network operators. This finding is replicated in rural areas.[43]

Indeed, Europe is making good progress towards the Digital Agenda coverage targets.[44] Figure 2.8 shows how NGA broadband coverage grew across Europe over the period 2011–15. NGA broadband is provided by competing infrastructure operators, which include cable and copper-fibre networks.

[42] The Grajek and Röller (2012) study is based on annual panel data covering 70 fixed-line operators in 20 European countries over the period 1997–2006.
[43] Yoo (2014) also finds that countries that focus on FTTP networks have lower NGA coverage, and therefore concludes that broadband policy should not focus on any particular technology but be flexible to account for differences between urban and rural areas and existing deployments.
[44] The Digital Agenda Europe targets include download speeds of at least 30Mbps for all citizens and 100Mbps for half of citizens by 2020. See European Commission, 'Pillar IV: Fast and ultra-fast Internet access', https://ec.europa.eu/digital-single-market/our-goals/pillar-iv-fast-and-ultra-fast-Internet-access, accessed 19 July 2017.

Figure 2.8 Coverage of ≥30Mbps broadband (% households)



Note: Based on advertised speeds. 2012 earliest available data for Croatia (not 2011).

Source: European Commission (2017), 'Digital Agenda Scorecard key indicators', http://digital-agenda-data.eu/, accessed 19 July 2017.

Higher speeds and lower retail prices

Alternative infrastructure operators have greater flexibility to differentiate their products and are therefore better able to compete on quality. This is demonstrated by Smith et al. (2013). As presented in section 2.1.2, an increase in infrastructure competition (as measured by market shares) results in a decrease in retail prices similar to LLU (a larger decrease than bitstream access) and a much larger effect on broadband speeds—infrastructure competition leads to a 20% increase in average broadband speeds. This is confirmed for the UK level by Nardotto et al. (2015), who find that, while broadband speeds are increased by both LLU access and infrastructure competition from cable, the latter has the stronger effect.

Greater penetration and take-up of services

Infrastructure competition is the main driver of broadband penetration, while service-based competition has a limited effect. Infrastructure competition increases broadband penetration because: first, there is greater coverage of broadband (see above); and, second, there is greater competition for subscribers between networks (which drives take-up).

The positive effect of infrastructure competition on penetration is demonstrated by various studies based on European data.[45] In the USA, Denni and Gruber (2007) find that both infrastructure- and service-based competition have a positive impact on broadband diffusion, but that the impact of the latter quickly dissipates as more access seekers enter the market. There is also a diminishing effect of access seekers—the second and third access seekers

[45] Bouckaert et al. (2008); Höffler (2007), Distaso et al. (2006); Cava-Ferreruela and Albau-Munoz (2006); Nardotto et al. (2015); Lee et al. (2011). We note that Gruber and Koutroumpis (2013) fail to find supportive evidence with the inclusion of non-European data.

have a less positive effect than the entry of the first access seeker (Nardotto et al, 2015).

Greater consumer choice

Competing networks bring greater consumer choice, especially when the networks are using different technologies (i.e. copper, cable and mobile). This is due to the leapfrog effect, and the fact that infrastructure competitors have a greater ability to differentiate their services compared with wholesale access seekers.

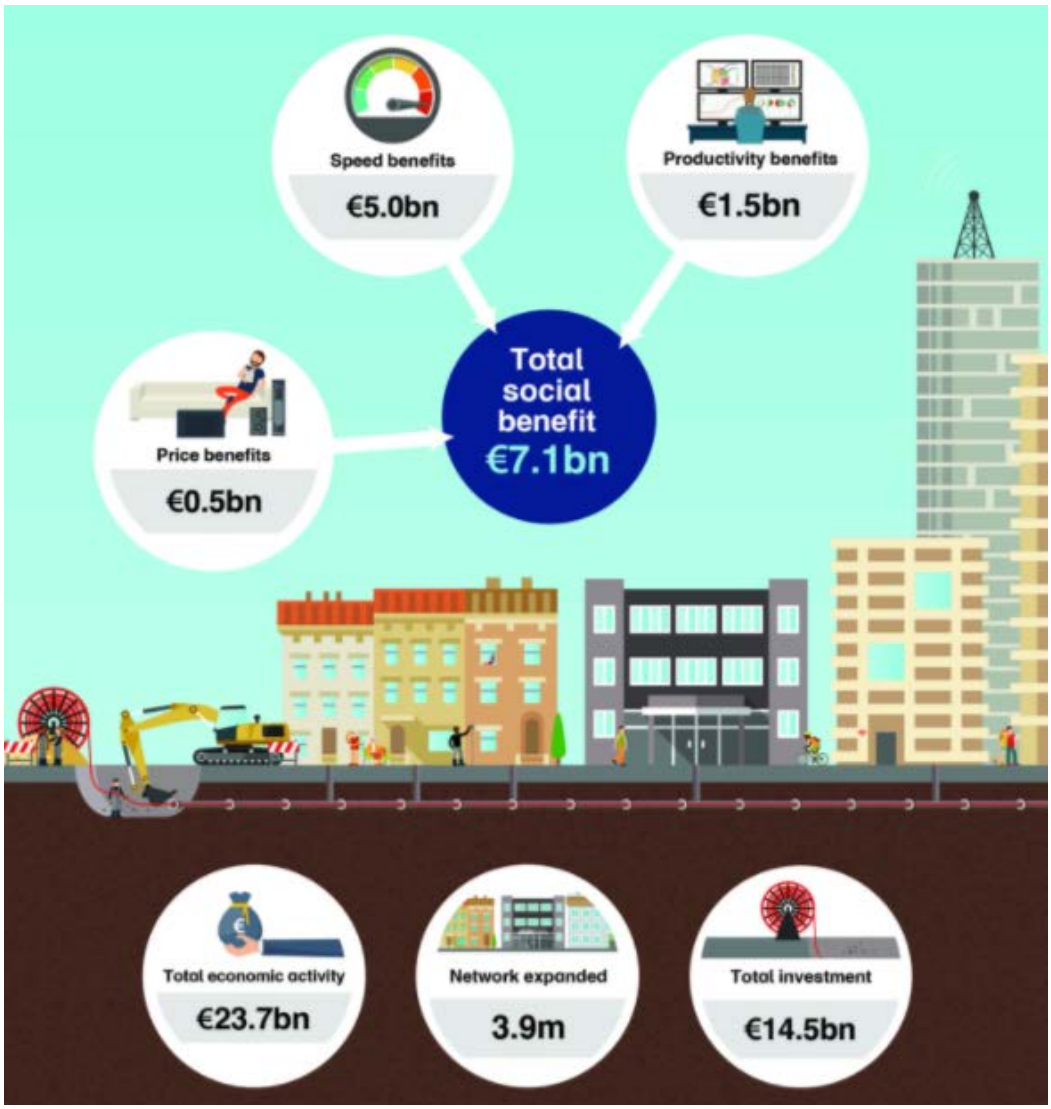
We present data illustrating the wide variety in retail choices with infrastructure competition in section 4.3.2, and in Figure 4.7 and Figure 4.8, which present the rapid product innovation by competing infrastructure providers (cable and the PSTN operator) in the Netherlands and Belgium respectively.

Wider economic benefits

There are also wider economic benefits from cable and other alternative network investments. We illustrate these by presenting the wider economic benefits from Liberty Global's investments in Europe.

Liberty Global has made significant investment in the reach and capability of its broadband cable network in the four years since the start of 2013, with further investment expected throughout 2017. Oxera has conducted an economic impact assessment of these investments to better understand and quantify the economic effects on consumers, employees and businesses in Europe. This investment has led directly to net consumer benefits in terms of speed, productivity and price—see Figure 2.9.

Figure 2.9 Building a GIGAWorld: economic effects of investment in Europe, 2013–17



Note:

Speed benefits: benefits to customers of accessing a greater range and quality of Internet services thanks to faster speeds.

Productivity benefits: the increased output that small businesses and home workers see thanks to access to better connectivity.

Competition benefits: Liberty Global investments can bring infrastructure-based competition to an area for the very first time. This brings downward pressure on prices, benefiting millions of European consumers.

Source: Oxera (2017), 'Liberty Global's Investment in Europe: An economic impact assessment', 30 May, http://www.oxera.com/Latest-Thinking/Publications/Reports/2017/Liberty-Global-s-investment-in-Europe-Oxera-s-find.aspx, accessed 19 July 2017.

2.4 Conclusion on the role of infrastructure competition

There is now significant infrastructure competition in many national markets in the EU. This infrastructure competition drives greater investment, which has led to greater broadband coverage and penetration, higher speeds and lower retail prices, increased consumer choice, and wider economic benefits.

Regulatory policy increasingly reflects the importance of infrastructure competition in achieving the public policy of ubiquitous availability of high-quality connectivity across Europe.

The success of infrastructure competition is to be celebrated, and regulators across Europe would be advised to ensure that investment continues to be incentivised, in order to maximise the benefits of electronic communications to European consumers and citizens.

In this context, the current debate on regulating oligopolies seems to run counter to the promotion of infrastructure competition, as it focuses on wholesale access to promote serviced-based competition, which in the past has been shown to be less effective at enhancing investment and innovation than facilities-based competition. This debate is of critical importance for the European telecommunications industry. As the Commission has observed, reaching Europe's connectivity objectives is likely to require €500bn of investment, most of it from the private sector, and under current investment trends there is an estimated €155bn shortfall.[46]

[46] European Commission (2016), 'State of the Union 2016: Commission paves the way for more and better internet connectivity for all citizens and businesses', press release, 14 September, http://europa.eu/rapid/press-release_IP-16-3008_en.htm, accessed 19 July 2017.

3 Oligopolistic competition: when is it of concern?

In this section, we explore whether the concept of a non-collusive 'tight oligopoly' can be objectively defined in a way that allows it to be codified in the European regulatory framework. In doing so, we critically review BEREC's and the Parliament's proposal to extend regulation in order to cover situations where two or more firms have 'unilateral market power' (UMP), as well as the European Council's proposal to expand the scope of symmetric access obligations beyond the first concentration point, irrespective of a finding of SMP.

We start in section 3.1 by discussing what economics has to say about competition in oligopolistic markets. In section 3.2, we review the economic underpinning of the proposed regulatory approaches to oligopolies based on the notions of tight oligopoly and UMP. Section 3.3 discusses BEREC's claimed parallels between UMP and unilateral effects analysis in the context of the SIEC (significant impediment of effective competition) test used in merger control Section 3.4 addresses the idea that the absence of regulated wholesale access justifies the introduction of the UMP concept. Finally, in section 3.5 we consider the recent proposals by the European Parliament on expanding the scope of symmetric access beyond the first point of concentration.

3.1 Oligopolistic competition: lessons from economic theory

Economic theory and empirical evidence show that oligopolies come in many different flavours. Structural market features on their own cannot provide strong evidence on whether competition between oligopolists will be effective or not. For example, markets with just two operators competing with differentiated but substitutable products, different cost structures, and facing significant competitive constraints from external forces (such as online platforms and OTT services) can produce significantly more competitive outcomes than those with many operators but where products, cost structures and technologies are more homogeneous.

In the economic literature, differences in market characteristics and competitive dynamics are modelled by considering, first, whether firms offer differentiated or homogeneous products; and second, whether the strategic variable of competition is price or quantity.

Cournot models of oligopolistic competition—named after French economist, Antoine Augustine Cournot—assume that firms compete on the quantity supplied to the market, and that they are offering a largely homogeneous product. The models make the very basic prediction that the fewer the number of firms in an oligopoly, the higher the price that will be charged in the market.

On the other hand, Bertrand models of competition—named after another French economist, Joseph Louis Francois Bertrand—assume that firms compete by setting prices. In its most basic form, when the product offered by firms is homogeneous, this model predicts that prices will be competed down to marginal costs, with no economic profits to be made, regardless of the number of firms that are competing with each other.

In Bertrand models, if firms are assumed to offer differentiated but substitutable products, the level of prices and profits in the market will depend on the degree of differentiation—the more differentiated the products, the greater the degree of pricing power that a firm can enjoy, and the higher the prices that can be charged. The number of firms in a market still plays a role, as in Cournot

models, but is not a definitive factor. For example, two-player markets with highly substitutable products competing on price (Bertrand) may result in lower consumer prices than a market with many more firms competing on quantities offering a homogeneous product.

Hence, economic models of competition in oligopolistic markets provide a full range of predictions based on different features in the market, from monopoly to perfect competition. Market structure on its own (e.g. the number of firms in the market) therefore cannot provide a definitive answer on the intensity of competition in a market.

It is clear that no regulatory intervention is required when the outcome of an oligopoly is the same as a competitive market. It is also well understood that a collusive oligopoly will lead to market outcomes that are likely to reduce consumer and social welfare, and that some form of intervention (ex ante or ex post) may be required. We discuss the application of the existing SMP standard to address a collusive oligopoly (joint SMP) in section 4.

In this section we explore the case for regulatory intervention in the case of an oligopoly with low likelihood of tacit collusion and an outcome somewhere between a competitive and monopoly outcome.

3.1.1 Dynamic non-collusive oligopolistic markets with entry and investment

The electronic communications industry (including both fixed and mobile networks) is characterised by high sunk investment costs, a degree of excess capacity,[47] and low marginal costs of production. In particular, the presence of substantial fixed costs leads to economies of scale—i.e. increasing traffic volumes tend to lower the average cost per unit of traffic carried over the network. This means that only a small number of networks may be able to operate at a profitable or cost-minimising level of production in the market. In addition, there may be technical or resource limits on the number of competitors in a market, such as the limited availability of suitable radio spectrum for mobile networks.

Given these characteristics, oligopolistic competition in the electronic communications sector may be closer to differentiated Bertrand competition—i.e. price competition on differentiated products and services.

We now take a closer look at key features of Bertrand models of oligopolistic competition in the electronic communications sector—in particular, dynamic considerations of market entry and investment incentives.

A common prediction of models of Bertrand competition is that where substitutability between products is relatively low, firms in the market can charge relatively high prices. For a given level of entry costs, the higher the price level in the market, the more likely it will be for a potential entrant to cover its entry costs, thus inducing market entry. When entry occurs, product substitutability is likely to rise (as a result of overlaps between the new and existing products) and prices are likely to fall.

[47] Mobile networks may face temporary capacity constraints in the radio access network, but these can usually be overcome by deploying more radio access network equipment, using more spectrum and/or technology improvements such as the expected rollout of 5G networks. Fixed networks tend not to face capacity constraints in the access network as each household is usually supplied through a dedicated access line.

On the other hand, if competition is already strong (for example, where products sold are relatively homogeneous and substitutability is high), price levels may be insufficient to induce further entry. Alternatively, where entry barriers are low or a potential entrant is on the verge of entry, the threat of entry can lead firms in the market to set low prices in order to forestall further entry into the market.

We note that entry barriers in electronic communications markets are falling (and are low for services provided over these networks). There is likely to be more infrastructure competition given industry dynamics, as discussed in section 2.1.3. This is reflected in the rollout of alternative FTTx networks, the expansion of cable networks into the broadband market, and potential competition from hybrid fixed-mobile 5G networks.

Another factor that substantially alters the competitive conditions is where firms choose to incur investment costs in return for increased profits in the future (e.g. as a result of cost or quality improvements). The idea is similar to the case of entry: higher margins justify higher investments, and firms may choose to incur higher investments in search of higher margins.

Thus, even without new entry, competition may induce firms to continue incurring the costs associated with performance improvements, including network rollouts and the adoption of new technologies. This dynamic investment process can induce a leapfrogging phenomenon (as seen in section 2.3), where firms alternately invest in an attempt to leave behind their rivals by developing better networks and services (product innovations). Indeed, this leapfrogging dynamic is common in markets with infrastructure competition.

3.1.2 Conclusion on non-collusive oligopolistic markets

The above discussion shows that a full assessment of a dynamic market needs to look beyond short-run price levels and measures of market structure.

The oligopolistic market structure (in particular, the number of infrastructure networks competing against each other) is by no means not the only determinant of these outcomes. For example, prices that may appear to be high in a static analysis can induce entry that would have a long-run effect on both prices and market structure. Focussing solely on market outcomes from oligopoly in terms of higher prices ignores:

- potential changes/innovations in services offered as a result of investment in new technologies and demand trends. Price indices may fail to reflect the take-up of data-driven plans compared with minute-driven plans;
- quality of service and benefits from competition on non-price attributes, which include broadband speed, reliability, security and privacy; customer service differentiators, such as access to technical support and installation professionals; innovative media services, such as on-demand catalogues or highest-quality broadcasts; as well as other initiatives such as WiFi hotspots and international roaming agreements.

Furthermore, R&D and technological progress provides firms with an opportunity to invest in network quality upgrades that customers will value (e.g. 4G/5G; FTTx; DOCSIS 3.x).

Hence, from the consumer perspective, there may be a trade-off between the short-run static benefits of low prices and the long-run dynamic benefits of dynamic investment, including improved service quality.

Ultimately, what is important is whether, given the underlying cost of the infrastructure, consumers are receiving the benefits of competition, through high-quality networks, innovative products and services, and competitive prices.

3.2 Critical review of the alleged problem: 'tight oligopolies'

As explained above, BEREC is seeking to extend regulation to cover situations where two or more firms have what it calls 'unilateral market power' (UMP). This novel concept is defined by BEREC as a situation where firms are not coordinating their behaviour—and therefore do not have joint SMP—but have the unilateral incentives and ability to behave in ways that lead to ineffective competition and poor consumer outcomes. This is considered to be closely related to the concept of tight oligopolies.

BEREC describes tight oligopolies as 'ineffective' competition *without tacit collusion'*.[48] In particular, it describes them as leading to an outcome that is inefficient from both a static and dynamic point of view. BEREC considers that tight oligopolies can be associated with any of the following market characteristics:

- high market concentration;
- high entry barriers and a lack of entry;
- a lack of countervailing buyer power;
- a lack of innovation ('mature technologies');
- capacity constraints;
- low price sensitivity;
- low market growth ('mature markets').

As noted above, market outcomes in oligopolies can range from competitive to less competitive. By defining tight oligopolies, BEREC seeks an arbitrary demarcation that is not practicable, and an assessment of whether a given oligopoly is 'effective' will not be a simple exercise involving checking off a list of criteria. Rather, the above factors need to be weighed against each other. This gives rise to at least two potential issues.

- First, there is no clear definition of when an oligopoly is sufficiently tight to be problematic, requiring ex ante regulation.
- Second, it is not clear to what extent the notion of a tight oligopoly differs from that of market power, as the market characteristics of a tight oligopoly are all relevant for assessments of market power (and SMP) as well. For example, if product substitutability is low, this might lead to a narrow market definition and a finding of market power. Thus, although BEREC considers that tight oligopolies may be associated with low substitutability, if substitutability is too low, a given firm may simply have SMP. This raises the question of whether

[48] BEREC (2015), 'Report on oligopoly analysis and regulation', BoR (15) 195, 27 November.

> the notion of a tight oligopoly adds anything to existing concepts such as market power.

The associated concept of UMP that BEREC proposes for dealing with tight oligopolies has many of the same shortcomings, as we discuss below in sections 3.3 and 3.4.

3.3 Critical review of the proposed introduction of the unilateral market power test, and the claimed parallels with merger control

BEREC highlights its concern over 'unilateral effects arising in the absence of explicit collaboration or tacit collusion' in what it calls 'non-competitive oligopolies… in situations where … the market structure might not result in effective competition'.[49] To address this concern, BEREC proposes that the concept of UMP be adopted in the amended Electronic Communications Code, and provides the following definition:

> An undertaking shall be deemed to have unilateral market power where, in the absence of significant market power, it enjoys a position of economic strength by virtue of the weakness of competitive constraints in an oligopolistic market, enabling it to act in a manner which is detrimental to consumer welfare.

As such, UMP appears to be an extension of SMP to more than one firm in a market where there is no collusion. As with the concept of tight oligopolies, the concept of UMP is not clearly defined. We note that a 'relevant market' is defined so as to include the set of close competitive constraints faced by the supplier of some focal product of interest. Thus, if several firms have a high degree of (unilateral) market power, this must be because these firms are not in the same relevant market. In such cases, they may simply have SMP in separate relevant markets.

This suggests that UMP would occur when firms provide sufficiently close competitive constraints to each other to be included in the same relevant market, but not that close to prevent each other from exercising market power. This interpretation means that, in many cases, UMP may simply be a milder version of SMP, providing regulators with considerable freedom for intervention.[50]

We consider that BEREC has not articulated sufficiently clearly this additional scope for regulatory intervention. There is a considerable risk that its adoption will lead to over-regulation of electronic communications markets, resulting in significant costs for the industry as a whole.

The risk of over-regulation is also illustrated by BEREC's reference to the 'significant impediment to effective competition' (SIEC) test as a justification for the UMP concept. BEREC makes the analogy that the SIEC test closed a perceived enforcement gap in merger control (the so-called unilateral effects gap), thereby allowing regulators to block or address harm caused by transactions involving non-dominant companies.

To assess the validity of this claimed analogy, it is worth briefly recalling the evolution of merger control tests.

[49] See BEREC (2017), 'BEREC views on non-competitive oligopolies in the Electronic Communications Code', BoR (17) 84.
[50] One potential exception is where there are capacity constraints, such that firms may be unable to place competitive pressure on each other despite supplying close substitutes. We are not aware that BEREC has this particular situation in mind in its proposals.

The original test in merger control was whether a merger created or strengthened a dominant position. There was a long debate in the 1990s about whether this included joint dominance—the Gencor case of 1996 eventually confirmed that it did.[51] The debate then moved on to how to define joint dominance. In the Airtours case, the European Commission defined joint dominance as any oligopolistic interdependence (and, as such, this definition captured static outcomes where prices are somewhat higher than in competitive markets). However, the Court disagreed with the Commission in the well-known Airtours judgment, equating joint dominance with tacit collusion. Joint dominance therefore does not include any oligopolistic interdependence, but only ones involving tacit collusion (the 'Airtours criteria' set out the conditions under which tacit collusion is likely to occur).

After this, a debate arose on the perceived unilateral effects gap. Dominance (single and joint) did not cover situations where close competitors in differentiated markets merged and raised prices in the absence of tacit collusion. It is in this context that the SIEC test was introduced in order to capture such unilateral effects in merger control.

However, whereas the SIEC test is used to assess changes in the degree of competition resulting from specific changes in market structure (i.e. mergers), and hence deals with *relative* levels of competition, the UMP test would be used to assess the *absolute* level of competition for a given market structure (i.e. with no specific change in the market structure). Therefore, while superficially similar, the genesis of the SIEC and unilateral effects test in mergers does not provide a guide or blueprint for the UMP test as proposed by BEREC.

3.4 Critical review of the absence of regulated access as justification for unilateral market power

A different form of UMP test that would make it closer to the SIEC test in mergers could be limited to assessing how specific changes in market structure affect competition. In the case of mergers, we typically 'lose' the competitive pressure exerted by the acquired firm, which could then result in a unilateral price rise by the merged firm. If such a price rise is material, it could be seen as an SIEC.

A comparable scenario in the context of electronic communications markets might be the removal of regulated wholesale access currently provided by a fixed operator. For example, a traditional fixed incumbent might choose not to renew existing regulated terms of access if it were no longer obliged to do so by regulation.[52] If such access is being used by operators exerting significant competitive pressure in the market, this could give rise to competition concerns similar to an SIEC from the unilateral effects of the incumbent's action.

A potential advantage of a test focusing on the hypothetical removal of regulated access is that it is more clearly defined (dealing with changes in market structure). Nevertheless, the application of such a test in an ex ante context would still be complex, and the benefits of such regulation, if any, would be ambiguous. In particular:

[51] European Commission (1996), Gencor/Lonrho, Case No IV/M.619, Council Regulation (EEC) No 4064/89, 24 April.
[52] This is a hypothetical scenario. The incumbent may in fact continue to have strong incentives to provide access on a commercial basis, as we explain in further detail below.

- the removal of regulated access obligations does not imply that wholesale access will not be provided on a commercial basis, and the provision of such commercial access would need to be taken into account when assessing hypothetical competitive effects, as we discuss in section 3.4.1;

- the case for showing a material negative effect from the absence of regulated wholesale access is not always clear-cut, particularly when set against the evidence presented in section 2 showing the benefits of infrastructure competition for consumers.

Moreover, the absence of commercial access offers by a non-incumbent operator, when the operator is currently not providing any form of access, would not by itself be considered a trigger for intervention. This is because there has been no change in market conditions, and, in the absence of dominance, refusals to provide access do not give rise to competitive harm as such.

3.4.1 Incentives to provide wholesale access on a commercial basis are likely to exist in many markets

Static analysis—incremental profit from the sale of wholesale access

Incumbent operators currently providing regulated access have built up a profitable wholesale business over the years, and already incurred fixed costs in setting up various wholesale access products and supporting services such as wholesale billing and support functions. There are many circumstances in which these operators will have strong incentives to continue providing wholesale access on a commercial basis in order to protect their existing wholesale access revenue stream and investments. Stopping provision of these wholesale access services runs the risk of losing a source of profit to a rival infrastructure operator.

Hypothetically, if we start from a market situation where the infrastructure operator is not offering wholesale access, its incentives to do so would be determined by whether the incremental profit obtained from the sale of wholesale access services outweighs the reduction in retail profits from customers who migrate to access-based operators (i.e. 'cannibalised' customers).

Therefore, provided that the provision of access results in a sufficiently small number of cannibalised retail customers,[53] it would be in the network operator's commercial interest to voluntarily offer wholesale access.

In many cases, the positive effect on wholesale profits outweighs the negative effect on retail profits, as a result of what Ordover and Shaffer (2007) call 'a favourable ratio of input sales to output sales'. That is, the positive effect on wholesale profits comes from all sales of the access seeker, whereas the negative effect on retail profits comes only from the sales that the access seeker diverted from the access provider. Indeed, Ordover and Shaffer find that when access seekers steal business from the access provider and its rivals in proportion to market shares then vertically integrated firms have an incentive to provide wholesale access.[54]

[53] This would be the case if a sufficiently large proportion of customers acquired by access-based operators were not previously customers of the network operator.
[54] Similarly, in the set-up considered by Atiyas et al. (2012), the provision of wholesale access in equilibrium is a general outcome, whereas the refusal to provide wholesale access arises only in certain circumstances as a second equilibrium.

We note that this finding is supported by market developments, and there are many instances where infrastructure operators offer commercial access to their networks—for example, in the Netherlands, Belgium and Hungary, which are the three case studies presented in this paper.

In the Netherlands, KPN's access agreements for WBA fall under Market 3b, wholesale central access provided at a fixed location for mass-market products, a market that is not regulated. In addition, access contracts agreed with KPN are often negotiated with a bespoke pricing structure—for instance, agreeing on higher fixed costs of access in return for lower variable costs of access. Hence, it appears likely that KPN would continue to offer commercial wholesale access in the absence of regulations—indeed, KPN made this offer explicitly in 2014.[55]

In Belgium, Proximus provides commercial access to VDSL bitstream and FTTH. In addition, Telenet provides commercial access to its mobile network in various forms: resale, light and full mobile virtual network operator (MVNO) access. In Hungary, Magyar Telekom and Invitel provide commercial infrastructure access to ducts, poles and backbone, and Vodafone provides light and full MVNO access on a commercial basis.[56]

Given incentives to provide commercial access, any analysis of the market would need to take this into account. Moreover, any regulation, if appropriate, should provide the freedom to strike different types of commercial agreement (with short or long contract durations and different pricing structures), tailored to the commercial requirements and business plans of a wholesale access seeker. There is a risk that commercial agreements are crowded out by mandated wholesale access regulations that generally impose uniform wholesale access conditions for all access seekers.[57]

Dynamic considerations regarding commercial wholesale access

A number of dynamic considerations also suggest that network operators may have strong incentives to offer wholesale access. This includes markets where access seekers have countervailing buyer power, face strong competition from alternative infrastructure providers, and have the incentives to fill spare network capacity and de-risk investment, and prevent access-based rivals from finding alternative routes to market.

Markets where access seekers have countervailing buyer power

There are markets and scenarios where access competitors can create significant value, partly as a result of controlling other inputs valued by consumers (e.g. premium content or mobile services) that are often sold in bundles with broadband access. This means that any one operator may not control all the key inputs required in order to supply bundles. Thus, the access seeker and access provider are mutually dependent, and bargain on various terms and conditions of providing access to each other's inputs and platforms.

In such cases, network operators may have strong commercial incentives to provide access because networks would also benefit from being able to access

[55] KPN (2014), 'Position paper on Open Wholesale Model KPN', May.
[56] Source: Liberty Global.
[57] Regulation can crowd out other wholesale access offers. In particular, given that downstream firms face high switching costs, they would switch only in response to an offer that is sufficiently more attractive than the regulated offer. If the latter is already set at a cost-reflective level, the provision of wholesale access would not be profitable to alternative access providers, as they would be forced to price below cost to overcome the switching costs. Indeed, as access regulation weakens the bargaining position of the regulated network, this is likely to divert access seekers away from the unregulated networks.

the platforms of the wholesale access seeker (e.g. if they are TV operators) and/or distribute the premium content controlled by the wholesale access seeker.

Fill capacity and de-risk investments

Irrespective of the presence of wholesale access seekers, cable operators such as Ziggo in the Netherlands and incumbent operators such as KPN have strong incentives to continue to compete with each other and take full advantage of any technological superiority while it is available. Significant investments are required to roll out a FTTC/FTTH network. This carries considerable risk, which can be minimised and managed through commercial partnerships with wholesale operators. Such partnerships may result in a higher take-up of the fibre network than would otherwise be the case. For example, established access seekers can more easily migrate their existing copper customers to fibre as the end-user does not have to switch provider.

Alternative operator fibre roll-outs are generally on an open wholesale access or co-investment basis, and include Open Fibre in Italy and SIRO in Ireland.

Prevent access-based rivals from finding alternative routes to market

In the absence of a wholesale access regulation, it cannot be ruled out that one or more former access-based operators would seek to find an alternative option to reach fixed broadband customers. For example, major mobile operators such as Vodafone have already shown an appetite for investing in their own fixed network in Ireland and Spain via co-investment arrangements. The evolution towards 5G mobile networks is likely to provide a further impetus for MNOs to invest in their own fixed networks, as 5G networks will be hybrid fixed-mobile networks.

Overall, Oxera's analysis indicates several reasons why operators may have incentives to offer wholesale access on a commercial basis in the absence of regulation. Importantly, once they do, this might also induce their competitors to grant access. That is, firms are likely to have an incentive to provide wholesale access particularly when their competitors are also providing access.

3.5 Critical review of proposals on extensions to symmetrical access remedies

Oxera understands that the European Parliament proposes to extend the scope of symmetrical access obligations under Article 59 of the Electronic Communications Code on networks elements that are beyond the first concentration point, irrespective of a finding of SMP.

We do not consider there to be a strong economic rationale for this proposal. Article 59 is intended to complement other remedies in the regulatory framework based on a clear SMP rationale, by reducing the unnecessary cost of duplicating certain network elements, such as in-building wiring. If this logic is extended to cover all other network elements in the value chain, the entire regulatory framework is called into question. The proposal is therefore problematic from an economic perspective.

First, the proposal would bypass the SMP market review process, allowing regulators to impose access obligations on any network owner regardless of their position in the market.

Second, the oligopolistic market structure in telecoms networks (with competing copper, fibre and cable networks) indicates that network assets are,

by definition, replicable. All across Europe, new networks with very high capacity are being rolled out. These include, for example, co-investments using the networks of other utilities, such as energy distribution. Furthermore, the Commission's 2014 Cost Reduction Directive, which targets better access to the civil infrastructure of all utility providers, is likely to be an important enabling factor in these deployments.

Moreover, by the time the European Electronic Communications Code has entered into force and is transposed into national laws over the next two regulatory review periods (approximately 6 years), the deployment of 5G mobile networks will deliver speeds comparable to fixed broadband networks, and competition between networks and technologies is set to intensify even further.

Hence, the symmetric access proposals are predicated on the premise that passive and active network elements are essential facilities that cannot easily duplicated, a premise that is not supported by the facts.

3.6 Conclusion on whether new regulatory tools are required to deal with oligopolistic markets

The proposed UMP test and expansion of symmetrical access do not have a solid grounding in economic theory. The UMP test is not equivalent to the unilateral effects test in merger analysis, contrary to BEREC's claim. Moreover, finding objective criteria and an unambiguous threshold below which markets can be characterised as ineffectively competitive in the absence of SMP is fraught with theoretical and practical problems.

Therefore, expanding the regulatory toolkit to include UMP and symmetrical access will increase the risk of over-regulation, introduce regulatory uncertainty, and diminish investment incentives. This seems the opposite of what is required to meet Europe's connectivity objectives in the next years.

4 Collusive oligopolies and the joint SMP standard

In section 3 we discussed that oligopolies come in many different flavours and that structural market features on their own cannot determine whether competition will be effective. The key in electronic communications markets is whether consumers are receiving the benefits of competition, through high-quality networks, innovative products and services, and competitive prices, given the underlying cost of the infrastructure.

Where this is not the case, this can be indicative of ineffective competition—markets with limited churn, stable demand, few product and service innovations, limited investment in new technologies, and prices considerably in excess of the cost of production. In these circumstances, regulators may find tacit collusion/joint SMP under the Airtours criteria (transparency around a focal point of coordination; effective punishment mechanisms; and no external destabilising forces), as in any other sector.

In this section, we review the criteria for joint dominance and how it can be applied in electronic communications markets. We start with the methodology for the identification of tacit collusion in section 4.1, and then assess the characteristics of electronic communications markets against these criteria in sections 4.2 to 4.5. In section 4.6 we analyse more closely the potential for tacit collusion by joint refusal to supply wholesale access. Section 4.7concludes.

4.1 Definition and application of joint dominance in electronic communications markets: the Airtours criteria

According to the EU courts, in general terms, in order to show that two or more undertakings hold a joint dominant position, it is necessary to consider whether the undertakings concerned together constitute a collective entity relative to their competitors, their trading partners and their consumers in a particular market. This will be the case when:

- there is no effective competition among the undertakings in question; and
- the said undertakings adopt a uniform conduct or common policy in the relevant market.

In terms of the ability of the undertakings to adopt a uniform conduct or common policy, the appropriate starting point are the criteria that the General Court set out in *Airtours/First Choice* (and subsequent cases such as *Impala*).[58]

These *cumulative* criteria determine whether the market conditions give rise to all of the requirements for effective tacit collusion, comprising:

- the ability to reach terms of coordination around a focal product;
- the ability to monitor partners for deviation from the coordinated outcome;
- the stability of the coordination in the face external factors; and
- a credible punishment mechanism to apply if a deviation is detected.

This test is in line with the economics of tacit collusion. It has since been employed in merger cases across a range of sectors. The elaboration of these

[58] Case T-342/99 *Airtours v Commission*, para. 62; and Case T-464/04 *Impala v Commission*.

criteria over time by the EU courts provides a degree of legal certainty and predictability to the market participants.

In applying these conditions, the Court of Justice has emphasised that it is necessary to avoid a mechanical approach involving the separate verification of each condition taken in isolation, while taking no account of the overall economic mechanism of a hypothetical behaviour.[59]

We note that BEREC has reviewed previous cases relating to the finding of joint dominance in various markets. There are relatively few findings of joint dominance by national regulators to date in the electronic communications sector. This is not surprising and should not be a cause for concern. It is likely to be a reflection of the fact that electronic communication infrastructure operators have strong incentives to compete, and consumers are receiving the benefits of competition, through high-quality networks, innovative products and services, and competitive prices, given the underlying cost of the infrastructure.

4.2 Airtours criterion 1: identifying focal points for coordination in electronic communications markets

4.2.1 Price or quality as a focal point

Tacit coordination requires a clear focal point on which to collude. A focal product may be easy to identify for operators providing services using a similar network technology, with little scope to differentiate products, or for operators offering limited service options targeting the same customer segments.

However, identifying a focal product may not be easy for infrastructure operators competing using different technologies; for example, cable and copper-fibre network operators that come from different core-product backgrounds and enjoy different comparative advantages. The bundling of a range of services offered by these types of operator may further lead to a wide range of differentiated retail offers, and hence make having a focal point more difficult.

In some cases shown in Table 4.1 for Belgium, the Netherlands, Hungary, Germany and the UK, we observe a significant number of product bundles available across two-play (2P), three-play (3P) and four-play (4P) bundles, with each provider offering multiple bundles. In such cases, it may be difficult for competitors to identify a focal product.

Table 4.1 Number of providers and available product bundles in sample of EU countries

		Belgium	The Netherlands	Hungary	Germany	UK
2P	Providers	4	26	1	4	4
	Offers	10	213	11	9	22
3P	Providers	4	18	5	4	4
	Offers	8	152	33	9	24
4P	Providers	4		1	4	3
	Offers	9		3	9	12

Note: Belgium, Germany and the UK: Proximus data for 2016; the Netherlands: Ziggo data ('Concurrenten overzicht 20170504'); Hungary, information provided to Oxera by UPC Hungary.

[59] Case T-464/04 *Impala v Commission*, para. 125.

There could also be variation in the design of bundles (e.g. due to different TV channel packs, set-top boxes, and other inclusive services, such as hotspot access and unlimited calls packs), with differences across both pricing dimensions and multiple quality dimensions. The existence of many permutations would make arriving at a suitable focal product on which to base tacit coordination on price or quality difficult. Table 4.2 gives an overview of available 3P bundles in the Netherlands, Belgium and Hungary.

Figure 4.1, 4.2 and 4.3 compare 3P products available in the Netherlands, Belgium and Hungary, respectively, across two dimensions: price and download speed. They illustrate that making comparisons (and hence tacit collusion) will be more difficult in countries with a wider spread of price and download speed combinations. We also note that, for these countries, not all price and download speed combinations are offered by all operators. This shows that there is product differentiation in the market based on the underlying differences in the technology used to provide these services.

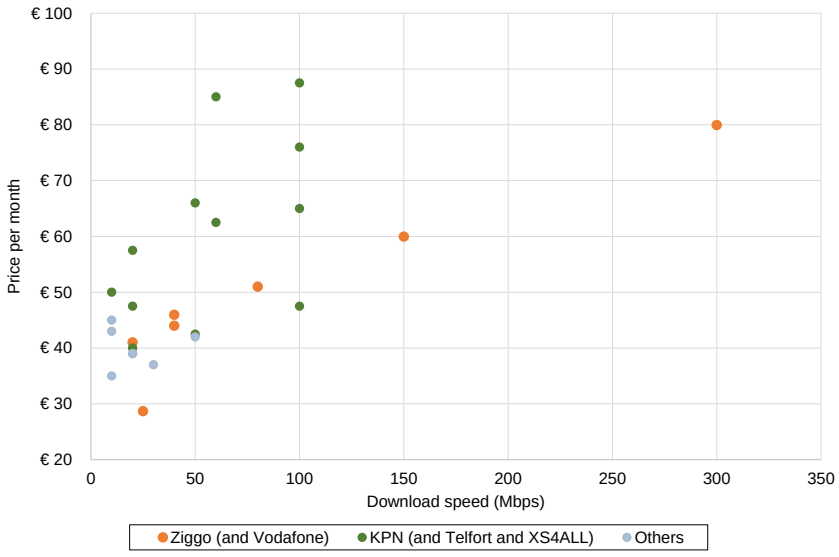
Table 4.2 Overview of product dimensions per country for 3P bundles

	The Netherlands		Belgium		Hungary	
	Ziggo	KPN	Telenet	Proximus	UPC	Telekom
Monthly price (min.)[1]	€45.95	€40	€68.82	€74.95	€21.74	€17.80
Monthly price (max.)[1]	€90.90	€97.5	€79.48		€40.24	€55.10
Speed Mbps (min)	40	20	100	100	30	20
Speed Mbps (max)	300	500	200	100	500	1000
TV options	3	2	1	1	3	2
Telephony options	2	1	2	1	1	2
Add-on TV options	3	2	4	7	11	5

Note: [1] General prices for the cheapest and most expensive bundle, without any temporary discount. To compare, we have converted the price of the Hungarian bundles from Hungarian Florint to euros using the current exchange rate (1 HUF = €0.0032).

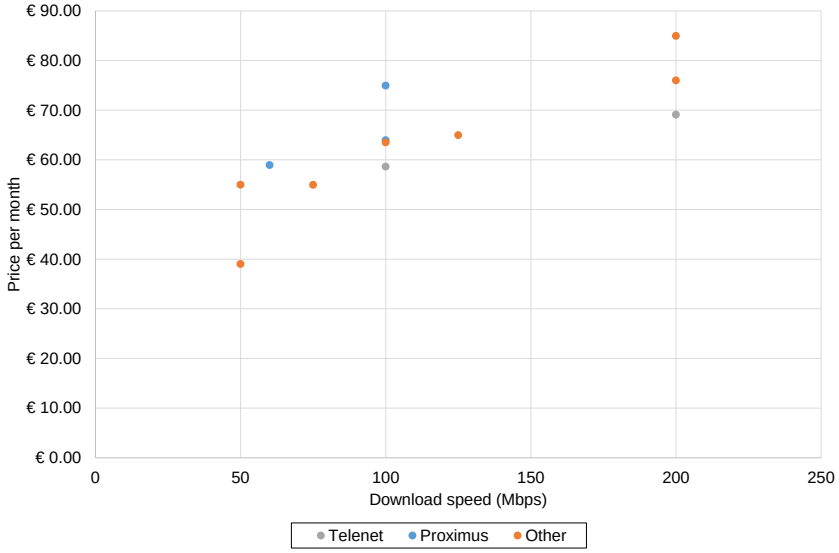
Source: Data taken from company websites, accessed 15 June 2017. Hungarian numbers are based on the UPC Hungary website and information provided to Oxera by UPC Hungary.

Figure 4.1 Prices and download speeds in 3P products in the Netherlands



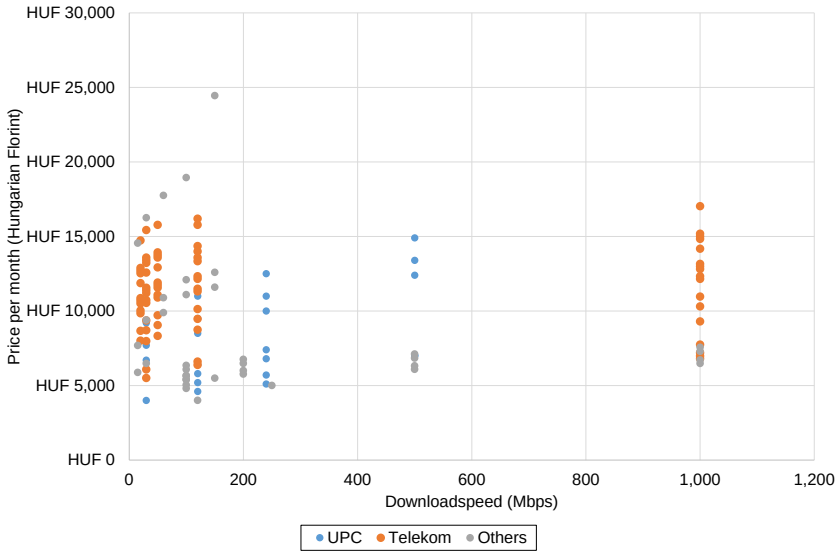
Source: Ziggo data (February 2017) and Oxera analysis.

Figure 4.2 Prices and download speeds in 3P products in Belgium



Source: Liberty Global data (2016) and Oxera analysis.

Figure 4.3 Prices and download speeds in 3P products in Hungary



Source: Liberty Global data (2016) and Oxera analysis.

4.2.2 The introduction of new technologies as a focal point

We note that headline information on infrastructure deployed tends to be readily available to undertakings. However, for infrastructure operators using technologies with different technology cycles, a coordination strategy that reduces technology innovation is not credible. This may not be the case for infrastructure operators using the same technology—for example, mobile operators or operators using a similar FTTx deployment.

For technologies with different technology cycles, technological innovations are generally not driven directly by infrastructure operators. Standard-setting bodies (e.g. the International Telecommunication Union, for mobile technologies, and different industry associations for fibre and coax technologies) and network equipment manufacturers usually drive this process

of technological innovation. Individual infrastructure operators decide when to introduce these technologies as part of their competitive strategy.

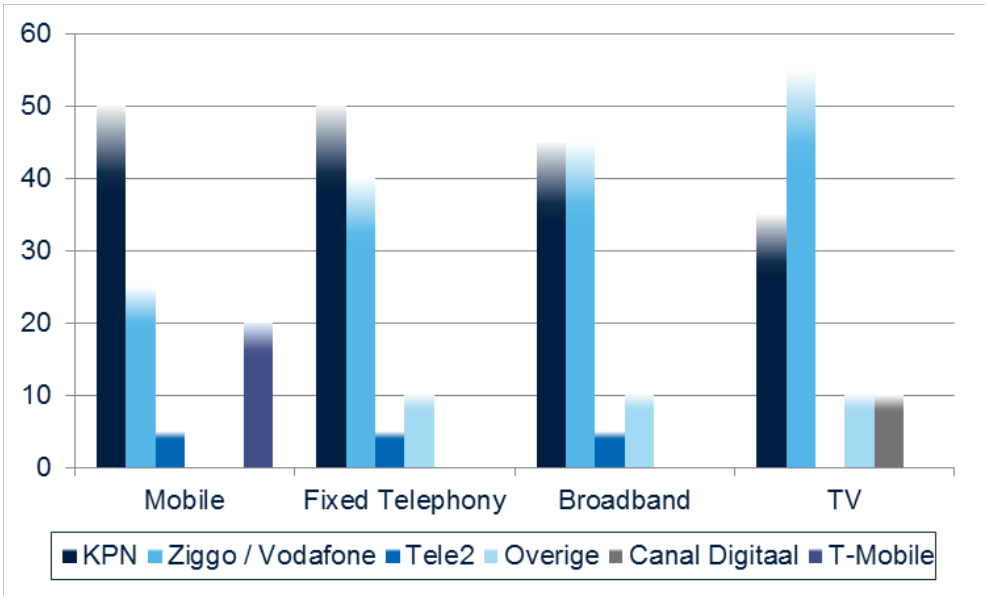
4.2.3 Market shares as a focal point

Headline information on market shares tends to be readily available to undertakings. However, the introduction of new technologies and innovations is likely to affect the market shares held by each player. During periods of innovation and technological disruption, it would be difficult for operators to distinguish deviations from a common policy from general market share movements due to technology cycles. This will make it difficult to use market shares as a focal point.

If there are periods of technological stagnation (i.e. no new technologies are introduced for an extended period of time), market shares might be more stable. For example, there is currently significant variation in the market shares of subscribers by product, reflecting the different historical background of cable and copper-based networks. Cable technology, which consists of coax cable, was historically installed and owned by suppliers of cable television services, whereas copper-based networks were installed to provide voice services followed by Internet access services.

Figure 4.4 to 4.6 show this variation in product market shares for the operators in the Netherlands, Hungary and Belgium, respectively. We note that there is variation in the market shares among the product segments (mobile, fixed, broadband and TV), reflecting differences in the competitive positions of the infrastructure operators in these market segments.

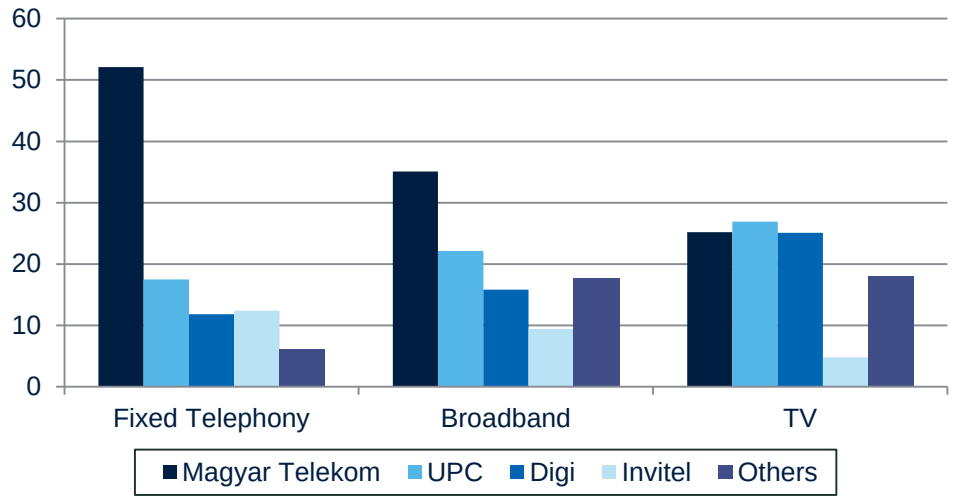
Figure 4.4 Product market shares (estimated %) for operators in the Netherlands, Q3 2016



Note: the Dutch Authority publishes market shares data as ranges of value. For example, KPN's market share in the mobile market ranged between 45% and 50% in Q3 2016.

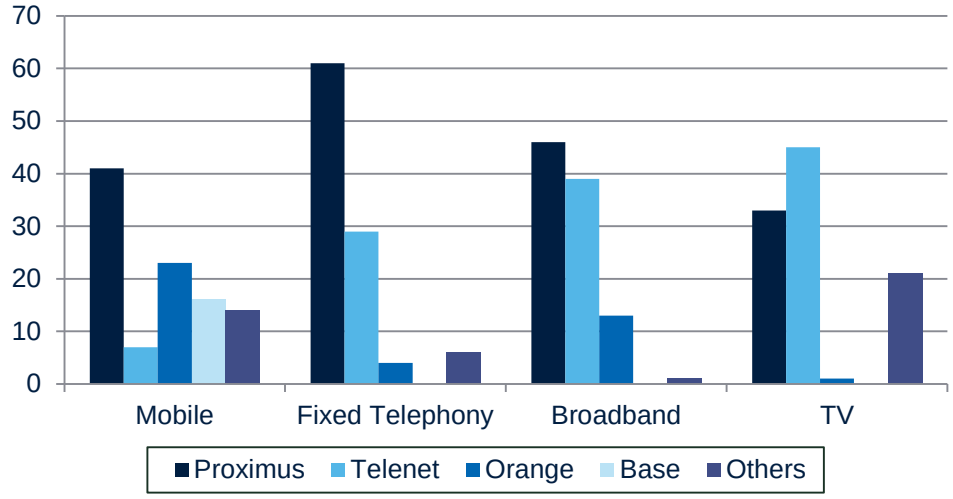
Source: Dutch Consumers and Market Authority (2016), 'Telecommonitor Q3 2016' and Oxera analysis.

Figure 4.5 Products market shares for different operators in Hungary, Q4 2016



Source: Liberty Global data and Oxera analysis.

Figure 4.6 Products market shares for different operators in Belgium, Q4 2016



Source: Liberty Global data and Oxera analysis.

4.3 Airtours criterion 2: ability to monitor potential deviations by partners in the common policy

4.3.1 Headline price and quality

It is recognised in the economics literature that price transparency is a crucial aspect of coordination. Headline price and quality information on current product offerings tends to be readily available to undertakings since these are advertised on provider websites.[60] In principle, operators could monitor this information. However, if technical and external market forces drive rapid evolution, with products and services frequently added (including quality innovations), reconfigured and taken away, this will make it difficult to monitor products. We observe such rapid product innovation in the cases of the

[60] In addition, a number of third parties collect this data for sale to operators. This includes Telecompaper in the Netherlands, which collects monthly product information.

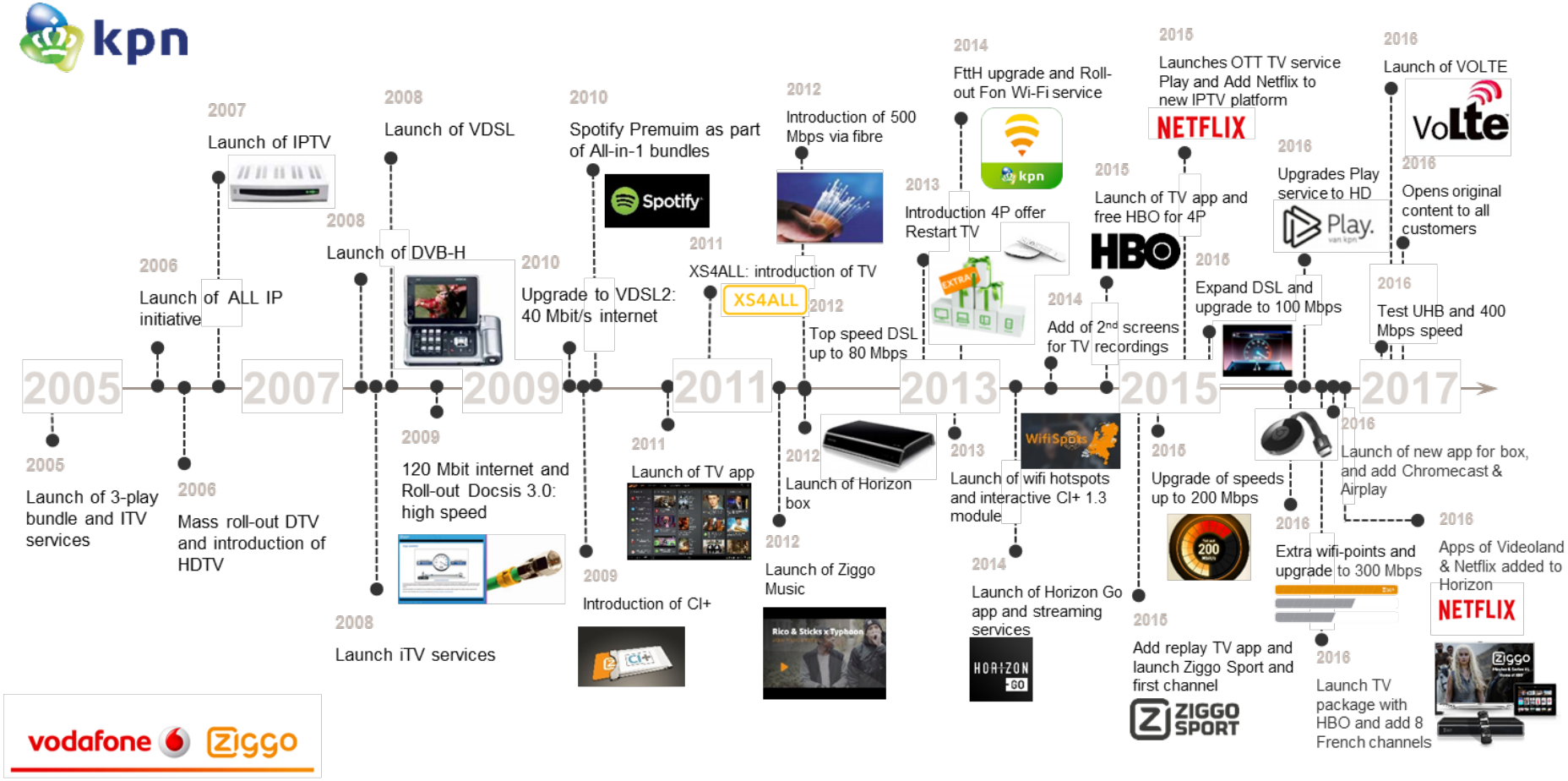
Netherlands and Belgium, as illustrated in Figure 4.7 and Figure 4.8 respectively.

Operators will not have information on the number of customers that use each package offered by their competitors, even if the terms of such packages are transparent. In addition, discounts on the headline price or quality enhancements if offered to certain groups of customers (e.g. focused on a local geography or particular demographic), or even individual customers, will make price or quality monitoring yet more difficult.

4.3.2 Market shares and churn rates

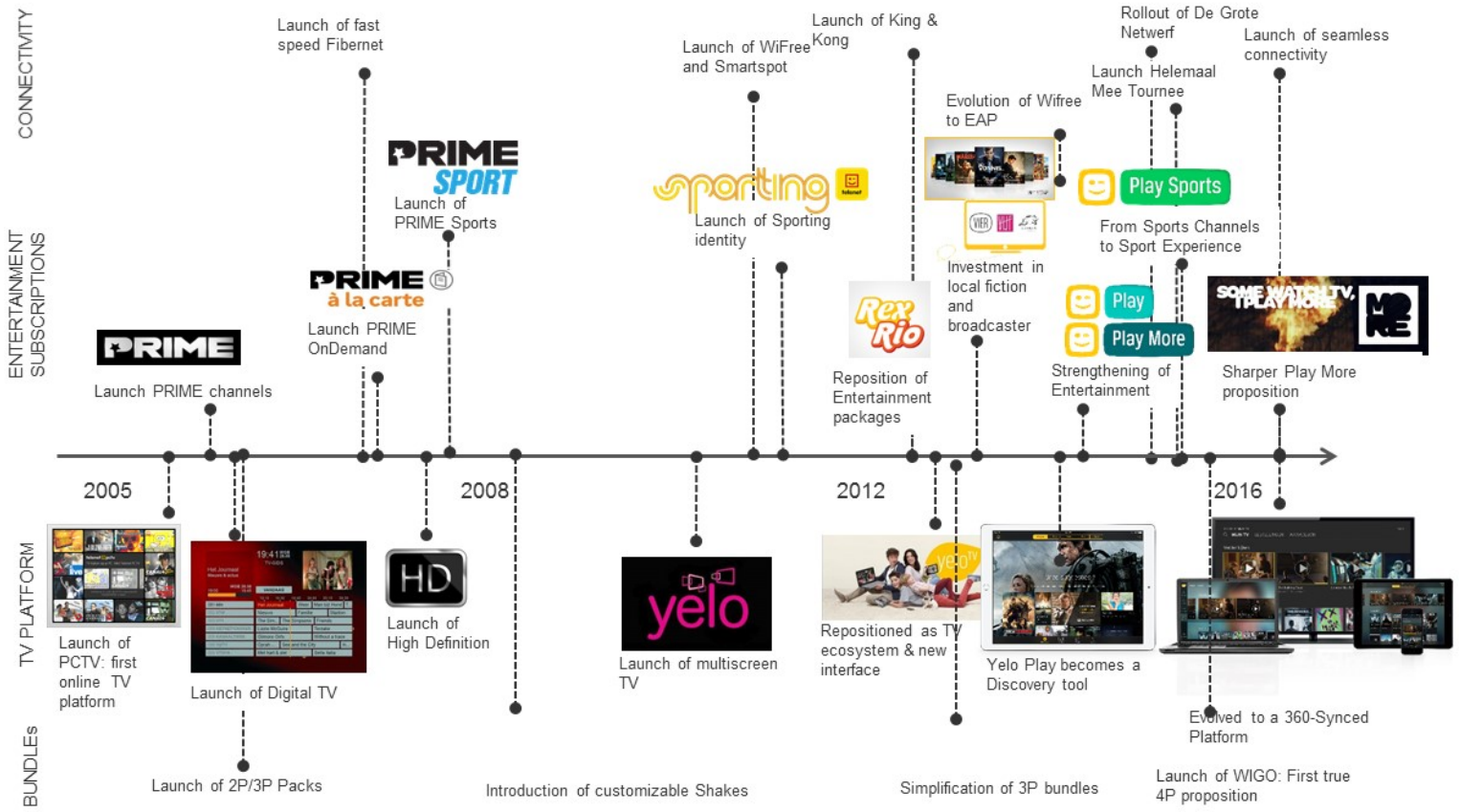
Information to evaluate market shares is less readily available, making monitoring along these lines more difficult, and likely to be subject to delays, making deviations more profitable. The most up-to-date information available to undertakings relating to market shares is likely to be on customer churn. However, this would provide an imperfect measure of evolving shares, and, by itself, is an imperfect tool for monitoring. This is because a firm losing sales and observing churn rates cannot determine *why* this is happening—for example, whether it is an unexpected change in demand, or a deviation from the coordinated outcome by the other parties.

Figure 4.7 Overview of product innovation in the Netherlands



Source: Liberty Global data and Oxera analysis.

Figure 4.8 Overview of Telenet's product innovation in Belgium



Source: Liberty Global.

4.4 Airtours criterion 3: external destabilising factors

Fixed broadband services are often sold in bundles with other services. This means that developments in other services bundled with fixed broadband can act as an external destabilising factor since these services may be supplied by other service providers (i.e. not the infrastructure operators themselves). Examples include mobile services and OTT media services such as Netflix. Existing wholesale access seekers may also act as a destabilising force in the market. The presence of these external parties means that any collusive agreement may be destabilised by the introduction of new services and/or quality/price changes by these service providers.

Mobile networks and external stability

For fixed markets, one external destabilising effect includes technical improvements in mobile data provision. As discussed in section 2.1.3, the market expects increasing infrastructure competition via the convergence between fixed and mobile networks and the rollout of 5G networks.

One would expect that markets in Member States with independent mobile network infrastructure operators (i.e. not controlled by existing fixed network operators) rolling out 5G networks will be even less prone to collusion than in those member states where this is not the case.

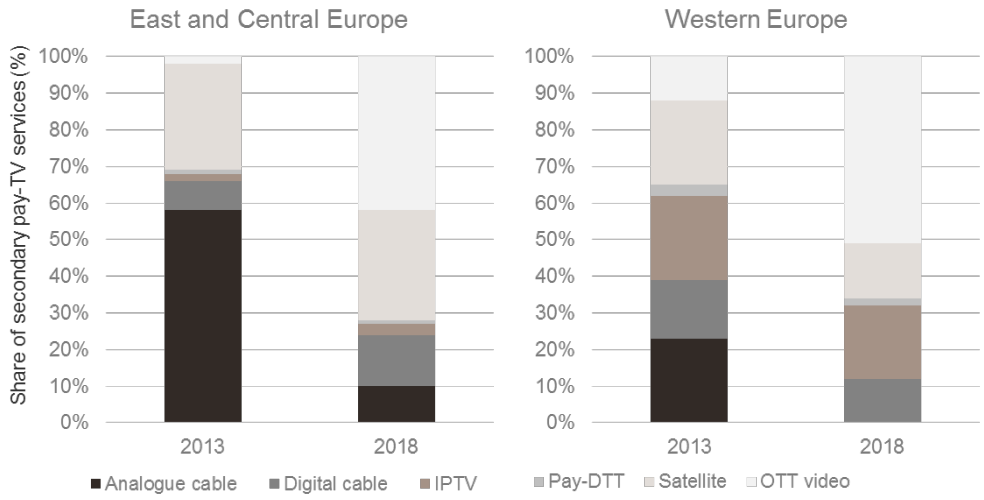
OTT providers and external stability

The growth in OTT services and the emergence of new content application providers (CAPs) that consumers wish to access via their Internet connections also place external pressure on any coordinated outcome. Evolving demand requirements (for example for higher speeds—both upload and download—and more capacity) provide an opportunity for operators to exploit any comparative advantage gained by introducing new technologies. A study by Analysys Mason estimates that nearly half of households in Europe (42% in Eastern and Central Europe, and 51% in Western Europe) subscribe to OTT video services (see Figure 4.9).

Even if OTT video services are in some cases a complement rather than a substitute for traditional linear TV services, the popularity and take-up of these services means that network operators have to respond competitively. This may, for example, involve introducing innovative set-top boxes with increased interactive functionality, or including services such as Netflix at a discount in broadband bundles.

The requirement to react to these external market developments (not controlled directly by any of the competing infrastructure operators) would also make coordination more difficult to sustain.

Figure 4.9 Estimated distribution of subscribers of secondary pay-TV services by technology, 2013 and 2018 (%)



Source: Analysis Mason (2013), available in Nemzeti Média- és Hírközlési Hatóság (2014), 'Az over-the-top Tartalomszolgáltatások hatása a médiarendszerre', http://nmhh.hu/dokumentum/165093/nmhh_ott_hatasa_a_mediarendszerre_nyilvanos_konzultacio_2014.pdf, accessed 19 July 2017.

Wholesale access seekers and external stability

Finally, another external destabilising force may be the presence of wholesale access seekers. Any market analysis would thus need to consider whether tacit collusion could arise in a hypothetical scenario where there is no access regulation.

Two key questions to consider in this context would be: is the presence of access competitors the key destabilising force that would prevent firms from agreeing a common policy? And would commercial access emerge in the absence of an obligation to supply?

Importantly, such an analysis would need to distinguish between a scenario where the loss of an access provider would result in a marginal loss of (mainly price) competition but would not result in tacit collusion; and another scenario where the exit of the access operator not only reduces price competition, but facilities tacit coordination between the remaining network operators. It is only the latter scenario which would be consistent with a joint SMP finding, provided that the other criteria are also met.

4.5 Airtours criterion 4: effective punishment mechanisms

To maintain effective coordination, it is necessary for coordinating parties to be able to enforce the agreement in the case of deviations. This implies the need for a credible punishment strategy that will negate any gains that the other party enjoys from reneging on the tacit agreement.

A key feature of the industry is that consumers care about quality as well as price, where quality is directly related to investments. For coordination to make sense, it thus has to cover both price and investment.[61] Firms can then cheat on the coordinated outcome simply by reducing their prices or by increasing

[61] For example, if there is an agreement to set high prices, this would not prevent firms from competing by investing more—indeed, the high prices would give them incentives to do so.

their investments. Their rivals can then punish them by likewise reducing their prices or increasing their investments. However, in dynamic markets where investments play a key role, it is unclear whether either of these is likely to be an effective punishment mechanism.

Investment cycles have long lead times and are thus difficult to align. There will therefore be times where one firm is naturally more up to speed with investments than its rivals. The firm that is in the lead will then have a quality advantage over its rivals that will make it less vulnerable to price retaliations. Thus, if a firm expects to become the leader, it will have an incentive to deviate. This is because even if its rivals retaliate by lowering their prices, the fact that the deviating competitor can offer a higher quality reduces the extent to which it is affected by the retaliation.

The fact that investment cycles have long lead times also means that retaliations in the form of increased investments are unlikely to be effective. It simply takes too long to retaliate in this fashion, so there are likely to be high gains from deviation and a reduced threat of punishment.

Overall, the ability for firms to coordinate thus depends crucially on how dynamic the market is. Although there may be scope for coordination in static markets with stable demand, few product and service innovations, and limited investment in new technologies, the scope of coordination is likely to be more limited in dynamic markets characterised by significant investments.

4.6 The potential for tacit collusion in the provision of wholesale access

We now consider the potential for tacit collusion in the form of a collective refusal to provide network access. We refer to the cases mentioned in BEREC's review related to the market for access and call origination on public mobile telephone networks and the market for wholesale broadband access where applicable.[62]

Considering the four Airtours criteria, it would appear that wholesale market access is likely to be a more plausible focal point than the other coordination metrics evaluated. In addition, monitoring the supply of wholesale access is also likely to be relatively easy (i.e. it is clear when access is provided). Although the following list of relevant factors may not be exhaustive, we consider that it covers the relevant conditions for an assessment of tacit collusion in the provision of network access.

4.6.1 There needs to be market stability and profits to protect at the retail level

The profitability at the retail level needs to be 'high enough to motivate the collective refusal of network access'.[63] If this is not the case, the gains from providing wholesale access would outweigh the losses at the retail level. This would imply that coordination based on refraining from providing wholesale access would not be internally stable since both parties would be better off by offering access.

Moreover, as shown above, even high retail prices may be justified in a context of large dynamic investments. The question of joint dominance in the provision of wholesale access is thus relevant only when retail prices materially exceed

[62] See BEREC (2015), 'Report on Oligopoly analysis and regulation', BoR (15) 195, December, Annex A.
[63] See BEREC's summary of the European Commission's comments in the Spanish case ES/2005/0330, involving the question of joint dominance of MNOs in the market for mobile wholesale access.

the dynamically efficient level—i.e. when there is an overall inefficient market outcome.

4.6.2 There needs to be a punishment mechanism

To sustain coordination, there needs to be a punishment mechanism to prevent firms from deviating from the collusive outcome. In the case of the refusal to provide wholesale access, such mechanisms can exist—at least in principle—at both the wholesale and retail level.[64]

At the wholesale level, retaliation can involve the provision of wholesale access by non-deviating firms. This can involve access to the access seeker supplied by the deviating network as well as to other access seekers. The feasibility of a retaliation mechanism at the wholesale level will depend on the potential to gain a first-mover advantage to the deviating network. For example, long negotiation periods may delay the ability of the non-deviating network to respond, and if there are only very few access seekers that account for the bulk of wholesale volumes then using wholesale access as a punishment mechanism will be more difficult.

This reflects the fact that coordination tends to be difficult because the gains from deviating are high in the case of giving access to a large access seeker, and retaliation is delayed due to the infrequency of transactions (i.e. access is sought and then agreed only periodically). Thus, punishment mechanisms at the wholesale level are most likely to be credible if there is a large number of roughly equally-sized access seekers (as opposed to some large and some small access seekers).

The European Commission has previously therefore focused on retaliatory mechanisms at the retail level when considering wholesale access as a punishment mechanism.

Retaliation at the retail level can involve the setting of lower retail prices, although this assumes that prices are above the competitive level at the time of retaliation. Thus, for price reductions to be a credible threat, retail prices must be above the Nash equilibrium (with 'reversion to Nash' constituting a sub-game perfect equilibrium).

On this basis we consider that collusion at the wholesale level is unlikely to occur unless there is collusion at the retail level as well. As such, we would expect wholesale access collusion to be merely a potential add-on to collusion at the retail level rather than a stand-alone issue.

Sustaining collusion at the wholesale level via retaliation at the retail level would require coordination at both the wholesale and the retail level. In particular, not only does wholesale coordination depend on retail coordination for a punishment mechanism, but retail coordination depends on wholesale coordination to prevent disruptions from access seekers. This 'coordination of coordination' at both levels of the supply chain would seem difficult to achieve in practice.

4.6.3 Potential cases of no provision or no take-up of commercial access

Importantly, in finding collective dominance in the provision of wholesale access based on a refusal to supply wholesale access, it is not sufficient to

[64] See, for example, BEREC's summary of the European Commission's comments in the Maltese case MT/2006/0443 involving the question of joint dominance of MNOs in the market for mobile wholesale access.

show that the conditions of the market are consistent with tacit collusion. This is because it may equally be the result of firms having individual incentives to refuse access, especially when one operator is regulated to provide access and other operators refuse access.[65]

In a particular case that was appealed, BEREC notes that this 'had to do with the fact that, while the outcome observed in the market was consistent with tacit collusion, it could have been equally consistent with non-cooperative/competitive behaviour by the two operators which were deemed to be jointly dominant', and that, in this regard, the NRA (ComReg) should have carried out 'detailed quantitative analysis based on which to conclude on the competitiveness of the market'.[66]

There also needs to be a demand for wholesale access: 'where there is no demand for access, there cannot be any collective denial of access'.[67] In particular, we consider that for there to be pent-up demand, there needs to be demand for wholesale access from access seekers at prices that are at least sufficient to cover the costs of providing wholesale access. It is thus not sufficient to show that there is demand at unreasonably low wholesale access prices.

Given that, as explained above, collusion over wholesale access is difficult to achieve and that there are circumstances where firms may have a unilateral incentive not to provide wholesale access, it follows that vertically integrated firms refusing to provide wholesale access should not be presumed to be colluding.

4.7 Conclusion on how the joint SMP test can be applied in electronic communications markets

The criteria for establishing joint SMP are sufficiently understood in case law and economic theory. The apparent paucity of cases involving joint SMP is not due to a lack of understanding of how to implement the test. Rather, it reflects the fact that in many telecoms markets where there is no longer a single incumbent with SMP, competition is effective and produces good consumer outcomes.

Furthermore, there is no empirical evidence that oligopolistic market structures have been detrimental to consumer welfare, absent tacit coordination. Hence, we conclude that the SMP test in its current form continues to be fit for purpose, covering both single-firm SMP and joint SMP/tacit collusion.

[65] See BEREC's summary of the European Commission's comments in the Slovenian case SI/2008/0806 involving the question of joint dominance of MNOs in the market for access and call origination.
[66] See BEREC's summary of the European Commission's comments in the Irish case IE/2004/0121 involving the question of joint dominance of MNOs in the market for wholesale access and call origination.
[67] See BEREC's summary of the European Commission's comments in the Slovenian case SI/2008/0806 involving the question of joint dominance of MNOs in the market for mobile wholesale access.

5 Overall conclusions

In this paper we have analysed whether there is a need to introduce new regulatory tools to deal with oligopolistic markets in the electronic communications sector. Based on the evidence and analysis presented in the paper, we reach the following conclusions.

- Regulators should not be concerned by the rise of oligopolistic market structures since this rise is being driven by desirable infrastructure-based competition.
- Expanding the regulatory toolkit to include UMP or expanding symmetric access obligations will increase the risk of over-regulation, introduce uncertainty, and diminish investment incentives.
- The criteria for establishing joint SMP are sufficiently understood in case law and economic theory. Regulators should be able to regulate poorly performing oligopolistic markets with the existing toolkit, where the conditions exist and merit this.

Any enforcement gap, to the extent that it exists, is small and does not need to be addressed by additional ex ante regulation such as UMP or extended symmetrical access.

In this context it is important to consider that a large range of potential competition problems are already dealt with by existing regulation and antitrust enforcement. For example:

- the existing SMP standard covers both single and joint dominance based on collusion. Furthermore, the Airtours criteria are accepted and have a well-established case law and guidance in applying the criteria to determine whether market conditions give rise to all of the requirements for effective tacit collusion and hence collective dominance;
- Articles 101 and 102 TFEU cover a variety of anticompetitive behaviours, including various forms of exclusion and discrimination. In particular, most of the characteristics BEREC put forward as being relevant to tight oligopolies are explicitly considered in the EU abuse of dominance guidelines;[68]
- merger control, which deals explicitly with potential increases in concentration and the risk of coordination and unilateral effects as a result of mergers.

In addition, regulators can influence competitive dynamics by using consumer protection powers, as well as exercising regulatory discretion—for example, in relation to spectrum auction rules with a view to increasing competition in the market.

We note that even if one could conceive of a potential regulatory gap, not every gap necessarily requires filling. The idea that regulatory intervention to fill a gap unambiguously makes things better is misconceived. Indeed, the costs and risks associated with regulation are only justified by a sufficiently significant market failure. Jullien and Sand-Zantman (2010) note that:

[68] European Commission (2009), 'Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings', Official Journal of the European Union, C 45/02, 24 February.

> When the market is in a stage of rapid technological development, it is often preferable to adopt a light regulation, of the antitrust type, and to leave the competitive processes to develop.

Any serious proposal to tighten regulation would need to consider what the optimal level of regulation is. This is because regulation itself is costly and can dissuade entry and innovation. As Jullien and Sand-Zantman (2010) note:

> If the fear of excessive interventionism interrupts the innovation process, or limits the entry of potential competitors, it can result in private decisions which do not reflect the long term interest of society… [I]n the case of innovative industries, competition policy must come as a compromise between the protection of the innovator's profits, which compensate their innovation, and the limitation of anticompetitive behavior.

In general, an appropriate balance needs to be struck between the perceived problem to be addressed, on the one hand, and the costs and risks of market distortions associated with regulation, on the other.

Ex ante regulation is the most intrusive form of regulation and, following the principle of proportionality, it should therefore first be shown that other, less intrusive forms (notably competition law and consumer protection law) are inadequate to deal with potential issues. The principle—that ex ante regulation should be considered only if competition law enforcement is insufficient (on a prospective basis) to deal with the identified market failures—is well established in the three-criteria test that underpins the SMP framework. Since the introduction of UMP regulation would constitute a significant extension of the regulatory framework, beyond what is foreseen even by ex post competition law, the burden of proof should be high, and certainly higher than that for the imposition or withdrawal of regulation based on a finding of (absence of) single or joint SMP.

The Commission's connectivity targets are ambitious. By 2025, it envisages reaching 100% coverage of networks delivering over 100Mbps, with the capability of being upgraded to 1Gbps. Achieving these goals will require a stable and predictable regulatory environment.

The analysis we have presented in this paper leads us to conclude that the calls for greater regulatory tools—UMP, enhanced symmetric access and a lowering of the standard of proof for joint dominance—will achieve the precise opposite. They risk introducing a degree of legal and economic uncertainty that will reduce investor confidence at a time when it is needed the most in order to boost investment in fibre broadband and deliver on Europe's ambitions for a truly gigabit society.

A1 Country case studies: the Netherlands, Belgium and Hungary

Market evidence from the Netherlands, Belgium and Hungary (discussed in sections A1.1 to A1.33 below) illustrates that competition between infrastructure operators is intense and delivers good outcomes for consumers.

For each of these countries, we present evidence on how infrastructure competition has resulted in competitive network upgrades (for both fixed and mobile operators), the provision of higher broadband speeds, and product innovation, resulting in more choice for consumers. These innovations and service improvements have generally been delivered without price increases—or even falling prices (e.g. the prices of triple play bundles including fast broadband access, fixed telephony and television went down by 27% since 2013).[69]

In each of these countries, as in the rest of Europe, we foresee a dynamic evolution of the market in terms of changing consumer demand, greater competition from OTT service providers such as Netflix and Skype, and increasing infrastructure competition. This dynamism provides opportunities and challenges for existing network operators and new entrants, and means that infrastructure competition in the electronic communications market should continue to deliver good outcomes for consumers.

[69] European Commission (2017), 'Connectivity Broadband market developments in the EU, Europe's Digital Progress Report 2017', Slide 30.

A1.1 The Netherlands

We first explain the existing electronic communications market structure in the Netherlands and how competition in this market is delivering good consumer outcomes. We then discuss the future dynamic evolution of the market.

A1.1.1 Market structure

The Dutch market is characterised by strong competition between different network operators. These network operators include KPN and VodafoneZiggo (which operate fixed and mobile networks) as well as T-Mobile and Tele2 (which operate their own mobile networks).[70]

This competition between KPN and VodafoneZiggo in fixed networks originally developed from a market situation where the fixed-line incumbent, KPN, offering a full range of fixed services over national fibre-optic and copper (DSL) networks, was competing with several regional cable networks. These regional cable networks gradually merged to form one cable network, Ziggo, in 2015.[71] There are a few other smaller operators (such as Caiway, CIF and Delta) that offer fixed broadband, voice and TV services through their respective footprints, which tend to be local.

KPN was the first mobile operator in the Netherlands, with subsequent entry by Vodafone, T-Mobile and Tele2. The 2016 creation of a joint venture between Vodafone and Ziggo, merging Vodafone's MNO with Ziggo's national cable network, means that the Dutch market has two firms (KPN and VodafoneZiggo) operating fixed-line and mobile networks, with T-Mobile and Tele2 also operating smaller fixed-line networks along with mobile networks. This means that there are four converged fixed and mobile competitors in the Dutch market.

Tele2 and T-Mobile compete on the basis of their own mobile infrastructure with KPN and VodafoneZiggo, and often play a disruptive role in the retail market. For example, Tele2 has adopted an aggressive pricing strategy since acquiring spectrum in 2012,[72] and both T-Mobile and Tele2 offer contracts with unlimited mobile data. Such contracts have generally been withdrawn from the market in other European countries.[73] This competition from mobile operators is reflected in the increase in mobile data consumption in the Netherlands in recent years. For example, ACM reported a 63% increase in mobile data consumption in 2016 compared to 2015.[74]

KPN retains its position as the largest provider of fixed telephony and mobile services in the Netherlands. VodafoneZiggo continues to hold the highest market share in fixed TV, its traditional stronghold. KPN and VodafoneZiggo, compete to defend their traditional areas of focus, as well as to gain market share in each other's historical areas of focus. Figure 4.4 in section 4.2.3 shows this variation

[70] Tele2 and T-Mobile also offer fixed services. T-Mobile recently also bought Vodafone Thuis to increase its focus on fixed products.
[71] For example, the 2008 merger of Multikabel, @Home Network and Casema to form Ziggo, combining three regional cable networks; the 2015 merger of UPC and Ziggo, combining the two main regional networks to create one national cable network; and the 2016 creation of a joint venture between Vodafone and Ziggo, merging a MNO and the national cable network.
[72] For a two-year contract with 10GB of data and unlimited texts and calls, Tele2 is currently offering a price of €21/month. KPN's price for the same bundle is €31/month and T-Mobile's €22.50/month. VodafoneZiggo's price for 12GB of data and unlimited texts and calls is €34/month. Source: Provider websites checked on 27 June 2017.
[73] T-Mobile is currently offering a two-year contract with unlimited data in the Netherlands for €35/month, or €30/month if bought by two or more persons, and Tele2 for €25/month. Source: Provider websites checked on 27 June 2017. Tele2 has also recently introduced an unlimited data offer in its home market of Sweden.
[74] https://www.acm.nl/en/publications/publication/17546/Massive-increase-in-mobile-data-consumption/ , accessed 11 August 2017.

in product market shares for the operators in the Netherlands. The largest shift in market shares compared with those at the start of 2013 has been in TV, with KPN increasing its share of the market by 8 percentage points over the period (VodafoneZiggo lost 4 percentage points market share).[75]

While operators using wholesale access do add to the competitive dynamics of the retail broadband market in the Netherlands, the main driver of competition in this market is infrastructure competition, as illustrated by the fact that the vast majority of consumer benefits have come in the form of upgrades to broadband speeds (both fixed and mobile), at competitive prices compared with EU averages, as we discuss next.

A1.1.2 Competition producing good consumer outcomes

In the Netherlands, effective infrastructure competition has led to a wave of infrastructure upgrades (of both fixed and mobile networks), higher broadband speeds, and prolific product innovation. Below we present evidence on these trends.

Infrastructure upgrades (direct competition between KPN and VodafoneZiggo)

Key outcomes: the Netherlands has significantly greater coverage of NGA broadband than the EU average (98% in 2016 compared with an EU average of 76%). Overall, the European Commission's Digital Economy and Society Index (DESI) in 2017 gave the Netherlands the highest connectivity score of all EU countries.[76]

All significant fixed and mobile market players in the telecommunications sector in the Netherlands have been investing in their networks in the last few years.

In the fixed and mobile markets, intense dynamic competition between KPN, VodafoneZiggo, Tele2 and T-Mobile has led the parties undertaking a series of infrastructure updates to remain competitive in the broadband market and meet the evolving consumer demand for faster speeds and more data. Figure 2.5 in section 2 shows this technology leapfrogging between KPN and VodafoneZiggo in fixed network technologies, as well as the parallel rollout of LTE (4G) mobile networks. For instance:

- VodafoneZiggo's upgrades to Docsis 3.0 were closely followed by KPN's upgrades to VDSL2;
- VodafoneZiggo upgrading of speeds to 120Mbps and 200Mbps in 2015 was closely followed by KPN increasing its DSL speed to 100Mbps and starting to test technologies enabling 400Mbps speeds. Subsequent to KPN's upgrade, VodafoneZiggo increased speeds, from 120Mbps to 150Mbps and 200Mbps to 300Mbps;
- with all cable networks in the Netherlands fully upgraded to DOCSIS 3.0, VodafoneZiggo is looking into the implementation of DOCSIS 3.1 standards, which will enable it to provide speeds of 1Gbps to consumers within the next few years;

[75] KPN's share of TV (DTV and ATV) increased from 23% in Q1 2013 to 31% in Q4 2016. VodafoneZiggo's share decreased from 57% in Q1 2013 to 54% in Q4 2016. Source: Telecompaper data.
[76] European Commission (2017), 'Europe's Digital Progress Report (EDPR) 2017, Country profile the Netherlands'. The connectivity score is based on eight metrics: fixed broadband coverage; fixed broadband take-up; mobile broadband take-up; 4G coverage; spectrum; NGA coverage; subscriptions to fast broadband; and fixed broadband price. NGA includes VDSL, Cable Docsis 3.0 and FTTP.

- KPN has been focusing on expanding its high-speed broadband networks through a continued VDSL rollout. KPN also became the sole owner of the wholesale fibre operator, Reggefiber, at the end of 2014, and has subsequently been extending Reggerfiber's FTTP network.

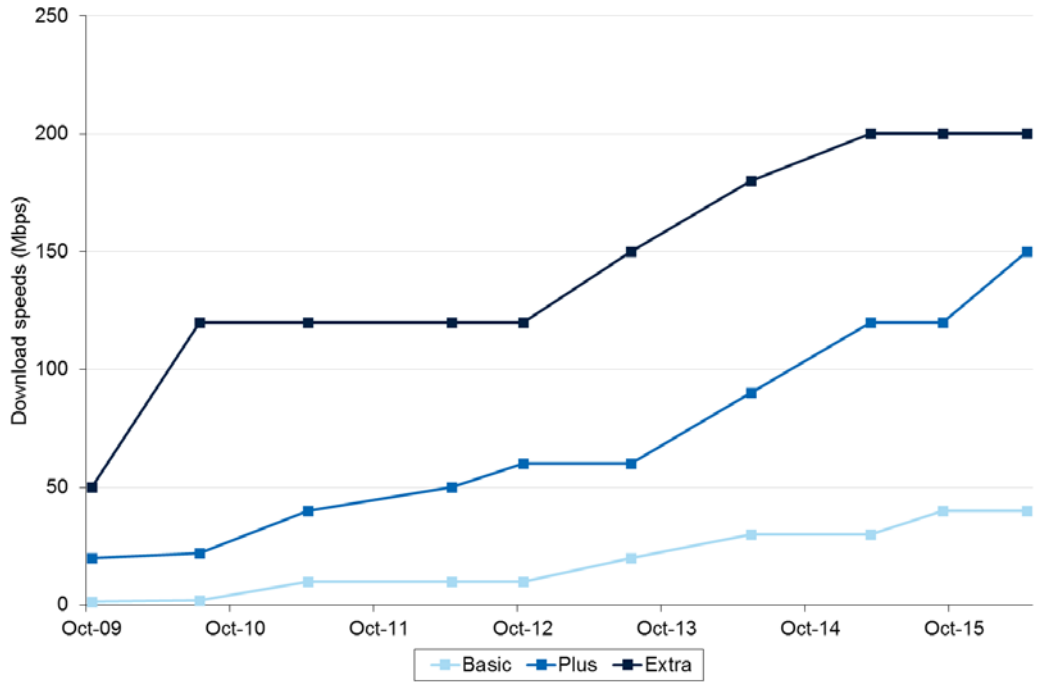
T-Mobile and Tele2, have also launched LTE networks, and by the end of 2014 the Netherlands reached nearly universal LTE coverage with 99.6% of homes being passed by the high-speed mobile network.[77] The focus subsequently shifted to LTE-Advanced networks, with KPN and VodafoneZiggo launching the first LTE-A networks in The Hague and Amsterdam in September 2014, followed by Tele 2 in 2015.

Increasing coverage and take-up of higher broadband speeds

Key outcomes: in Q4 2016, the Netherlands had the third-highest average download speed in the EU, at 17.6Mbps[78]and leads Europe in fast (over 30Mbps) broadband household penetration. It is also among the leaders in ultrafast (over 100Mbps) broadband household penetration.

Intense infrastructure competition between KPN and VodafoneZiggo has led to significant increases in the fixed broadband speeds available in the Netherlands. For example, Figure A1.1 shows the increase in VodafoneZiggo's available download speeds over time, and Figures A1.2 and A1.3 show that households in the Netherlands are also leading Europe in subscribing to higher-speed connections.

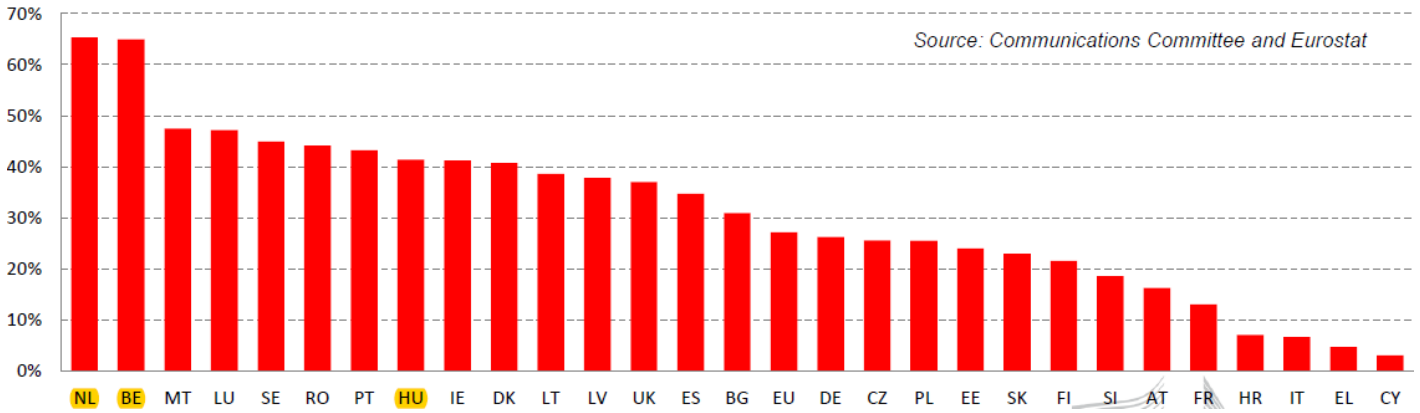
Figure A1.1 Evolution of VodafoneZiggo's download speeds (Mbps) for different broadband product tiers



Source: VodfoneZiggo.

[77] European Commission (2016), 'Broadband Internet Access Cost (BIAC 2015)', Autumn.
[78] Below first-placed Sweden, at 22.8Mbps, and second-placed Denmark, at 20.7Mbps. Source: Akamai (2016), 'akamai's (state of the internet) Q4 2016 report', **9**:4.

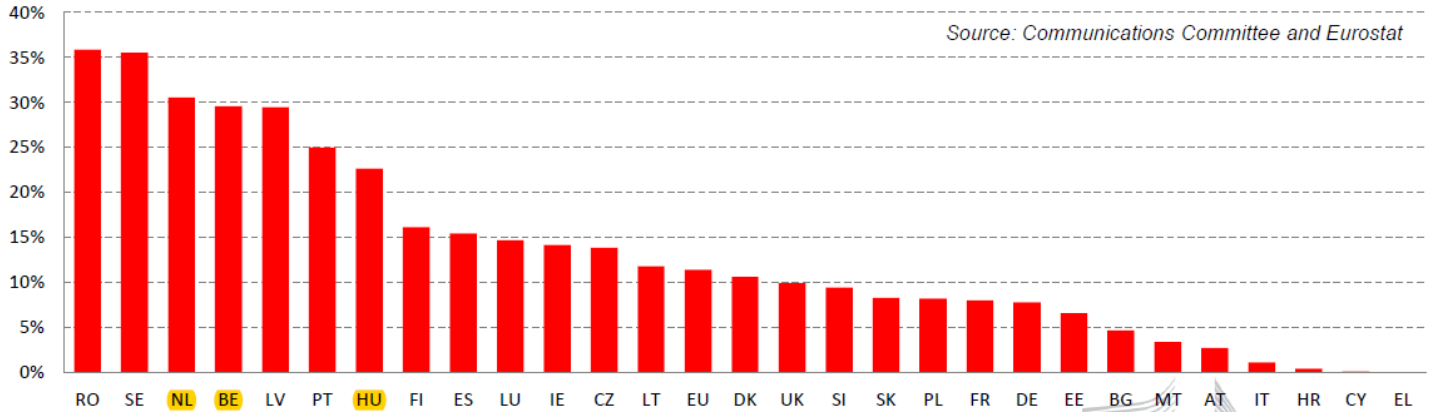
Figure A1.2 Fast (at least 30Mbps) broadband household penetration—Netherlands, Belgium and Hungary, 2016



Note: NL, Netherlands; BE, Belgium; and HU, Hungary.

Source: European Commission (2017), 'Connectivity Broadband market developments in the EU, Europe's Digital Progress Report 2017', Slide 14.

Figure A1.3 Ultrafast (at least 100Mbps) broadband household penetration—Netherlands, Belgium and Hungary, 2016



Source: European Commission (2017) 'Connectivity Broadband market developments in the EU, Europe's Digital Progress Report 2017, Slide 15.

Significant levels of product innovation and consumer choice

Key outcomes: customers in the Netherlands have benefited from significant levels of innovation in service offerings, in terms of new and improved (double-, triple- and quadruple-play) bundle combinations and in TV services.

As discussed in section 4.2 and shown in Table 4.1, we observe a large number of product bundles available across 2P, 3P and 4P bundles in the Netherlands. There is also rapid product innovation driven by technical and external market forces, with products and services added (including quality innovations) and reconfigured in different packages.

This is illustrated in Figure 4.7 in section 4.3, which shows the competitive launches of different services by KPN and VodafoneZiggo. For example, the mass rollout of DTV and the introduction of HDTV by Ziggo followed the launch of IPTV by KPN; and the launch of OTT TV services and the addition of Netflix to the IPTV platform by KPN followed by the addition of the Videoland and Netflix apps to the Horizon set-top-box by Ziggo as well as the addition of the 'Ziggo Go' app.[79]

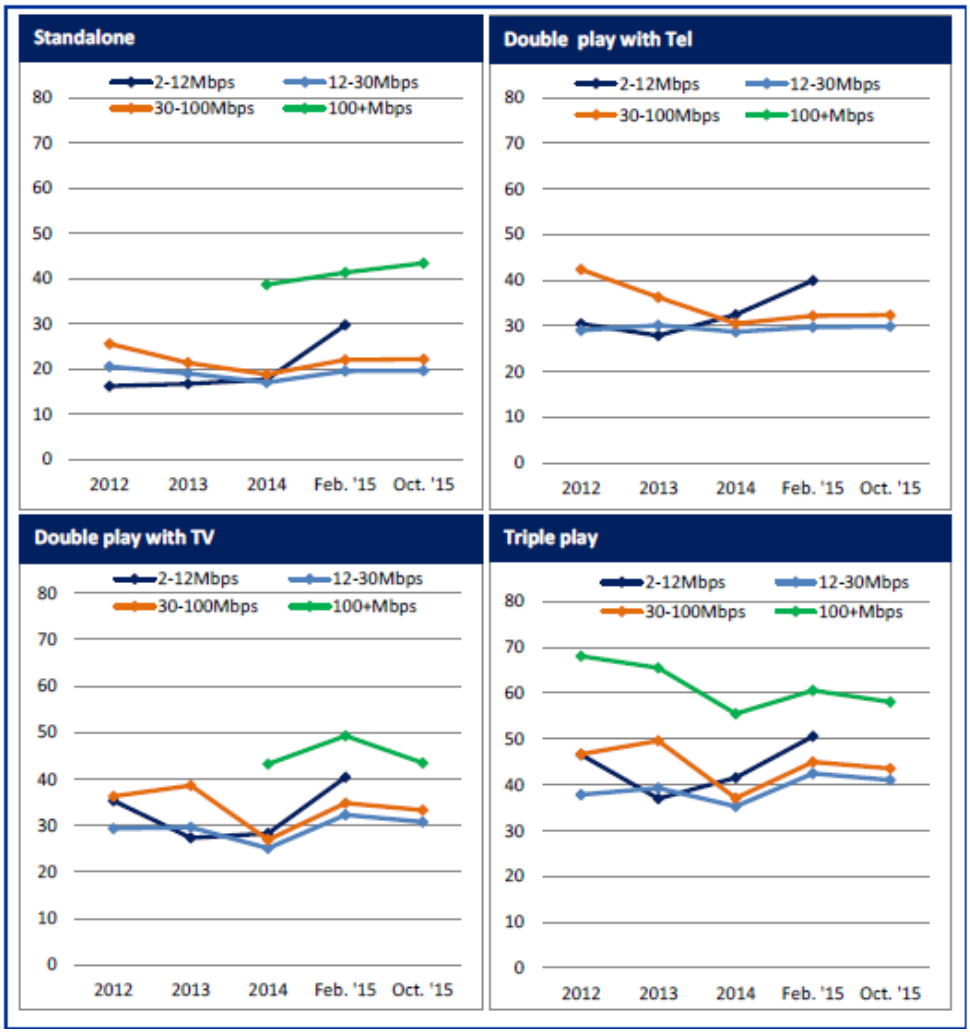
Higher broadband speeds and product innovations are available at prices similar to, or lower than, previous years

Key outcomes: fixed broadband prices in the Netherlands compare well to prices in other EU countries, representing an average of 1.0% of income in the Netherlands compared with an EU average of 1.2% of income.[80] Prices for many broadband speeds have decreased, as discussed below.

The intensity of competition in the market is reflected in price trends between 2012 and 2015. Prices have not increased over this time period (see Figure A1.4 below), while at the same time the quality of services has improved considerably, as measured, for example, by the download speeds in different product tiers offered by VodafoneZiggo (see Figure A1.1). The European Commission's Broadband Internet Access Cost report of Autumn 2015 also states that, when comparing prices in 2012 and autumn 2015, all 30–100Mbps offer prices have decreased, as have 3P prices above 100Mbps. Many of the other prices are now at a level fairly close to, or slightly above, the 2012 value.

[79] https://www.ziggo.nl/televisie/zenders/xite/, accessed 19 July 2017.
[80] European Commission (2017), 'Europe's Digital Progress Report (EDPR) 2017, Country profile the Netherlands'.

Figure A1.4 Recent evolutions in broadband prices (€/month) in the Netherlands, 2012–15



Note: The least expensive offer in € (with a purchasing power parity conversion used for countries with a different currency) as at February 2012, 2013, 2014, 2015 and October 2015. In the study, each offer is assigned to only one speed basket/usage profile, depending on its download speed. This implies that, when identifying the least expensive offers per basket and offer type, each offer is considered only for the usage profile corresponding to its speed. If a higher-speed offer is cheaper, a rational consumer may choose that offer. As stated in the study, the chosen approach has the advantage of highlighting market dynamics by identifying for which speed categories the competition between the operators is the highest, leading to lower costs.

Source: European Commission (2016), 'Broadband Internet Access Cost (BAIC) Autumn 2015', Figure 91.

A1.1.3 Future evolution

Consumer demand for telecoms services is continuing to change rapidly, with increasing demand for fast connectivity and flexibility (especially for accessing TV services). Revenues in TV and fixed telephony are declining, as are revenues for mobile calls and texts. Infrastructure providers will therefore have to continue to innovate and compete in order not to lag behind and miss out on new customers and markets. Operators are (therefore) investing in innovative content, entertainment offers and content services, spending more on their own content production, own TV channels and innovative apps.

Further fixed–mobile convergence is anticipated in the Netherlands, with commercial 5G services expected as early as 2019.[81] Unlimited data offers, such as those currently being sold by Tele2 and T-Mobile, are paving the way towards more direct competition likely to be seen between fixed and mobile networks in the future.

There is also intense competition in the content market between network operators and a number of OTT services.

Ziggo has introduced 'Movies & Series' and 'Movies & Series XL' (previously MyPrime), which are included in some higher-tier products, but can also be bought separately. (The service offers on-demand movies and series, including content from HBO in the 'XL' package.)

KPN and T-Mobile have introduced OTT TV applications Play Van KNP and Knippr respectively. These applications allow subscribers to watch linear TV on demand. NLziet is another important OTT platform started by three major Dutch broadcasters, the public broadcaster NPO and the commercial broadcasters RTL and SBS.

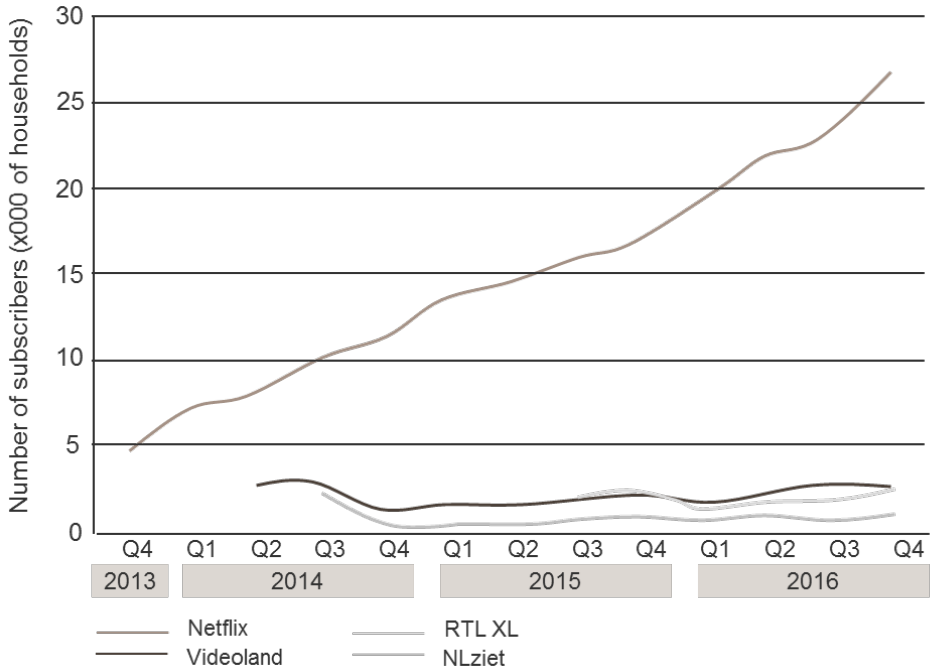
OTT players such as Netflix are also competing in content markets in the Netherlands. In January 2017 Netflix had about 2 million subscribers in the Netherlands,[82] implying that one in four households has a Netflix subscription.

There are also local OTT players in the market. For example, Videoland, owned by broadcaster RTL and only transmitting RTL series and shows, has around 200,000 subscribers. Cinetree, a similar OTT on-demand service for art house movies, entered the market at the end of 2014.

Figure A1.5 shows the increase in the number of households that subscribed to video-on-demand services in the Netherlands between 2013 and 2016.

[81] European Commission (2017), 'Europe's Digital Progress Report (EDPR) 2017, Country profile the Netherlands'.
[82] Source: Telecompaper.

Figure A1.5 OTT subscribed video-on-demand services in the Netherlands, Q4 2013–Q4 2016



Source: De Bruyckere, S. (2017), 'Video Behaviour of Dutch Consumers 2016 Q4', tp research, telecompaper, 10 March.

A1.2 Belgium

We first explain the existing electronic communication market structure in Belgium and how competition in this market is delivering good consumer outcomes. We then discuss the future dynamic evolution of the market.

A1.2.1 Market structure

The Belgian market is characterised by strong competition in the fixed broadband market between Proximus (formerly Belgacom) and two regional cable service providers, Telenet and VOO. These operators also use their networks to provide TV (cable TV or IPTV) and fixed telephony services.

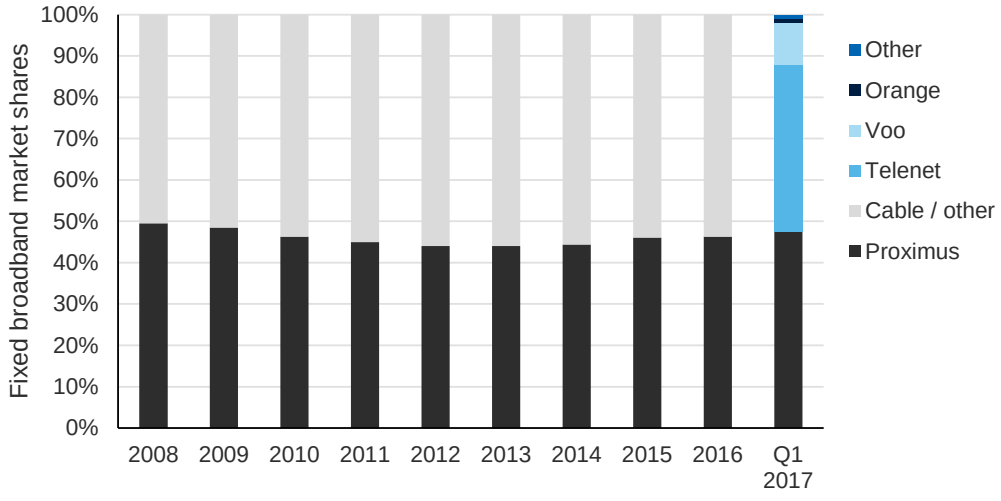
Proximus, VOO and Telenet also provide mobile services and bundles, competing against Orange. Proximus uses its own mobile network, while VOO offers mobile services as an MVNO. Telenet has access to Orange's mobile network as an MVNO (although the full MVNO agreement between Orange and Telenet will end in 2018 as Telenet will start using BASE's network, which it acquired in 2015).[83]

The fixed access market includes other smaller DSL operators, such as Orange, billi, edpnet, dommel, Digiweb (United Telecom as of July 1 2017), TV Vlaanderen. In March 2016, Orange also started to provide Internet and TV services using wholesale access on Telenet's and VOO's cable networks.

Over the last decade, Proximus, Telenet, and VOO have managed to move from their historical markets of fixed telephony and cable TV, respectively, and become the main players in the fixed broadband market. Proximus has also successfully entered the TV market, with a 29% market share in 2017 of digital and analogue TV subscriptions, and a 33% market share of digital TV subscriptions.

Figure A1.6 and Figure A1.7 show the evolution of market shares in the Belgian fixed broadband and TV markets, respectively. Figure A1.6 also shows a more detailed breakdown on the market shares of cable operators for 2017 only.

Figure A1.6 Market shares for fixed broadband in Belgium, 2008–17

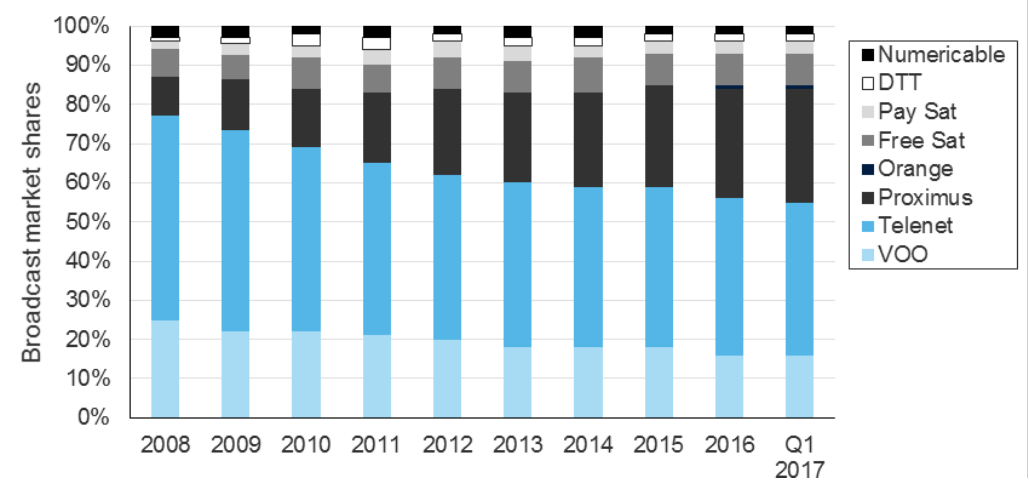


[83] The migration from Orange Belgium's RAN (radio access network) to BASE's RAN is ongoing.

Note: The grey bar labelled 'Cable/other' covers both cable and alternative DSL operators.

Source: Belgacom/Proximus annual reports and Telenet.

Figure A1.7 Market shares in the TV market in Belgium, 2008–17



Source: Liberty Global.

A1.2.2 Competition producing good consumer outcomes

Belgium is an example of a market where effective infrastructure competition is leading to good outcomes for customers. We present evidence below of infrastructure upgrades (of both fixed and mobile networks), higher broadband speeds, prolific product innovation, all delivered at low, affordable prices. In particular, the competitive constraints faced by Proximus, Telenet and VOO in the different markets have resulted in significant customer benefits in terms of the flexibility to switch providers, Internet speed and price.

Infrastructure upgrades (direct competition between Telenet, VOO and Proximus)

Key outcomes: Belgium has significantly greater coverage of NGA broadband than the average for EU countries (99% in 2016 compared with an EU average of 76%). Overall, it is ranked third in its connectivity score of all EU countries by the European Commission's Digital Economy and Society Index (DESI) in 2017.[84]

Infrastructure competition has led Telenet, VOO and Proximus to successively upgrade their network, leading to significant increases in download speed over the last decade.[85] Figure 2.6 in section 2 shows this technology leapfrogging between Telenet and Proximus, as well as the parallel rollout of LTE (4G) mobile networks

Proximus introduced VDSL in 2004 (which involved upgrading the network to a combined copper–fibre network). Telenet started rolling out DOCSIS 2.0, which enabled an upgrade to 10Mbps, and up to 20Mbps by late 2005. To counter this competitive pressure, Proximus invested further to deploy VDSL2 to all its customers, while running FTTH tests in 2008 and 2009.

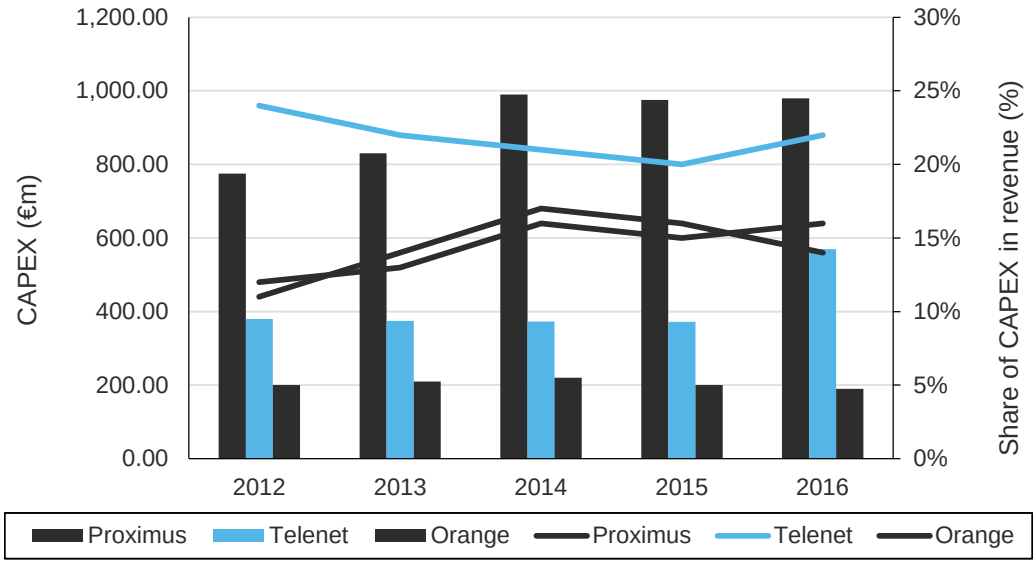
[84] European Commission (2017), 'Europe's Digital Progress Report (EDPR) 2017, Country profile Belgium'. The connectivity score is based on eight metrics: fixed broadband coverage; fixed broadband take-up; mobile broadband take-up; 4G coverage; spectrum; NGA coverage; subscriptions to fast broadband; and fixed broadband price. NGA includes VDSL, Cable Docsis 3.0 and FTTP.
[85] Van der Wee, Verbrugge and Laroy (2014).

In 2010, DOCSIS 3.0 allowed Telenet to upgrade its download speed to 100Mbps, and over the period 2010–15, Telenet invested over €30m to upgrade its network and be able to increase the data rates to 120Mbps from June 2012. Telenet is investing €500m in its network over the period 2014–19, as part of project Grote Netwerf, with the objective of upgrading its network to a speed of potentially up to 1Gbps.

In parallel, in 2012 Proximus invested in dynamic line management (DLM)[86] and in vectoring, involving an extensive fibre rollout, from 2014 onwards. Through a combination of DLM and vectoring, Proximus can now offer a maximum download speed of 100Mbps. In December 2016, it unveiled its 'Fibre for Belgium' project, a €3bn investment plan over the next decade with the objective of rolling out ultra-vectoring in 2018 and reaching speeds of 200Mbps.

These competitive network upgrades mean that the main broadband infrastructure operators (including Orange, which owns and operates its own mobile network) have been investing continually to upgrade their networks (see Figure A1.8).

Figure A1.8 Investment by Belgian broadband infrastructure operators, 2012–16



Source: Liberty Global.

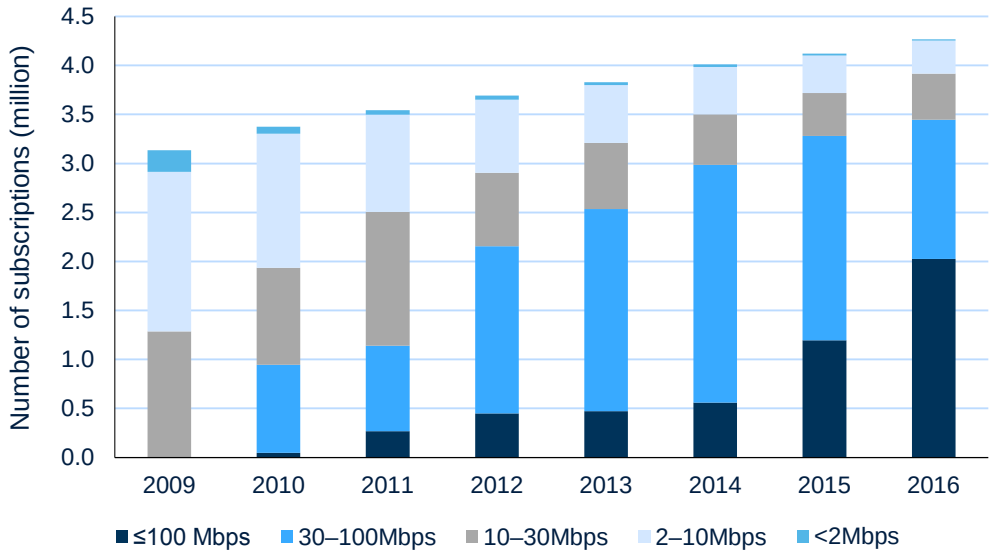
Increasing coverage and take-up of higher broadband speeds

Key outcomes: Belgium leads Europe in fast (at least 30Mbps) broadband household penetration (Figure A1.2) and is among the leaders in ultrafast (at least 100Mbps) broadband household penetration (Figure A1.3).

Figure A1.9 shows that households in Belgium are increasingly subscribing to broadband offers providing high download speeds.

[86] DLM finds the optimal balance between performance and stability over copper lines and is used to provide DSL services such as ADSL and VDSL.

Figure A1.9 Number of subscriptions to fixed broadband services in Belgium by download speed, 2009–13



Source: Eurostat, BIPT.

Significant levels of product innovation and consumer choice

Key outcomes: Belgium shows significant levels of innovation in service offerings, in terms of new and improved (2P, 3P and 4P) bundle combinations and in TV services.

As discussed in section 4.2 and shown in Table 4.1, we observe a significant number of product bundles available across 2P, 3P and 4P bundles in Belgium. There is also rapid product innovation driven by technical and external market forces, with products and services added (such as OTT services).

Rapid product innovation driven by technical and external market forces, with products and services added (including quality innovations) and reconfigured in different packages. This is illustrated in Figure 4.8 in section 4.3. This intense competition to offer flexible and innovative products is reflected in various offers by the operators. For example, Telenet has removed contract durations and has implemented a proactive migration process to the best tariff plan.

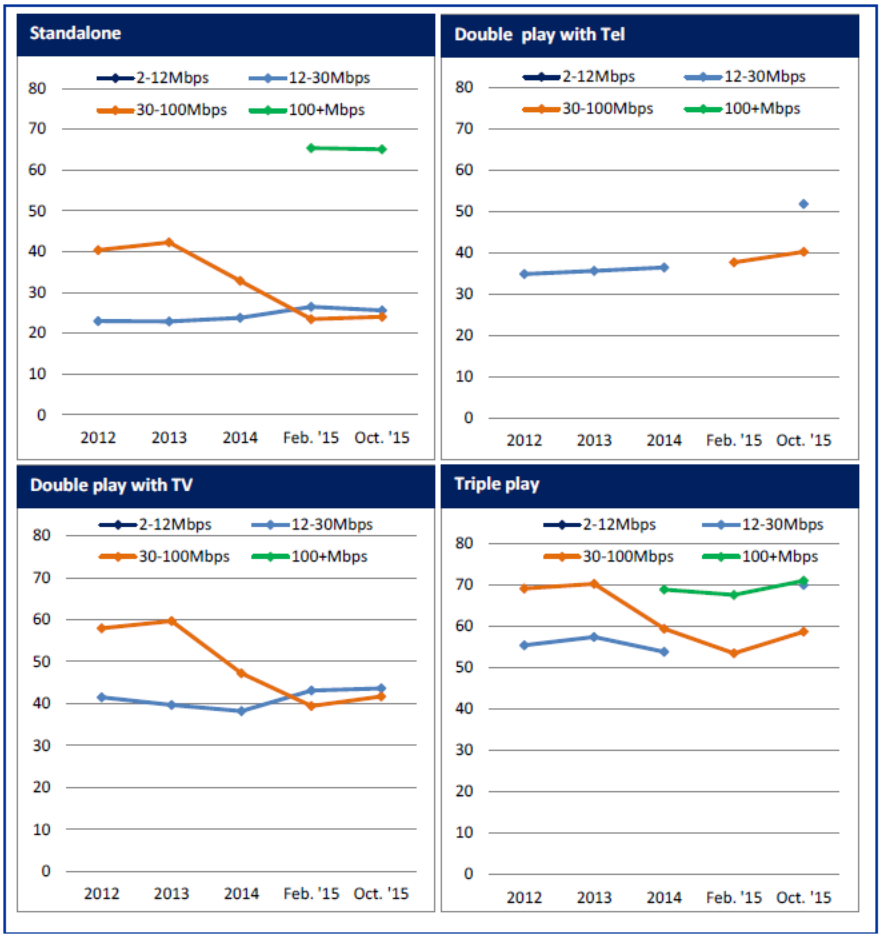
Higher broadband speeds and product innovations are available at prices similar to or lower than previous years

Key outcomes: fixed broadband prices in Belgium compare well to prices in other EU countries, representing an average of 1.3% of income in Belgium compared with an EU average of 1.2% of income.[87] Prices of the least expensive offers in the speed range 30–100Mbps decreased significantly in Belgium between 2012 and 2015 (-42% for standalone offers; -32% for 2P including TV and -23% for 3P). The prices of triple play above 100Mbps slightly decreased between 2014 and 2015 by 2%.[88]

Figure A1.10 below shows a decrease in price for various bundles including fixed broadband.

[87] European Commission (2017), 'Europe's Digital Progress Report (EDPR) 2017, Country profile Belgium'.
[88] European Commission (2016), 'Broadband Internet Access Cost (BAIC) Autumn 2015', Figure 20.

Figure A1.10 Recent evolutions in broadband prices (€/ month) in Belgium, 2012–15

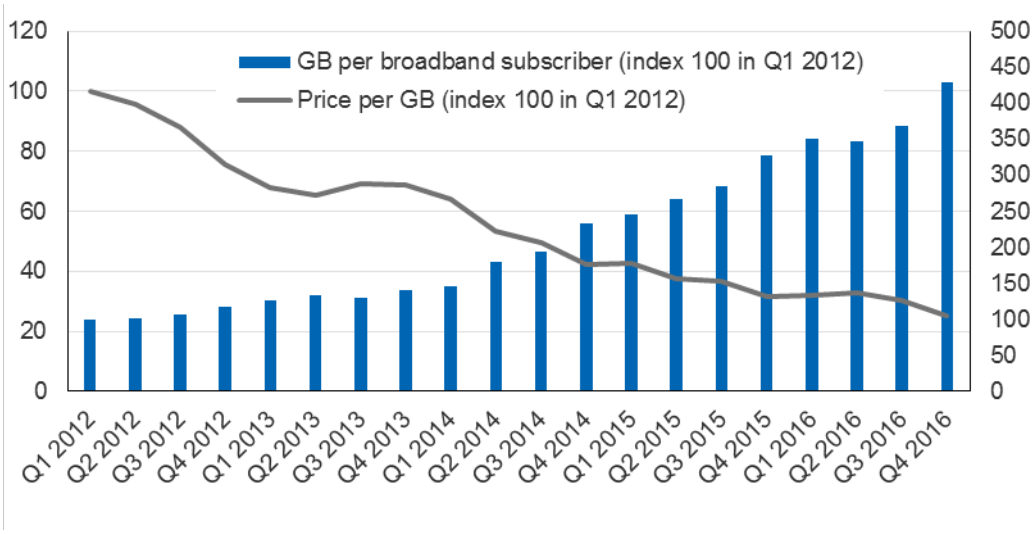


Note: The least expensive offer in € (with a purchasing power parity conversion used for countries with a different currency) as at February 2012, 2013, 2014, 2015 and October 2015. In the study, each offer is assigned to only one speed basket/usage profile, depending on its download speed. This implies that, when identifying the least expensive offers per basket and offer type, each offer is considered only for the usage profile corresponding to its speed. If a higher-speed offer is cheaper, a rational consumer may choose that offer. As stated in the study, the chosen approach has the advantage of highlighting market dynamics by identifying for which speed categories the competition between the operators is the highest, leading to lower costs.

Source: European Commission (2016), 'Broadband Internet Access Cost (BAIC) Autumn 2015', Figure 20.

Competition has driven price decreases over the last decade, while the amount of data in fixed broadband packages has increased. Figure A1.11 below shows that the cost of 1GB of data for consumers in Belgium has dropped over the past four years. Telenet's lowest-priced product in 2016 was €2.50 cheaper (per month) than its equivalent in 2005 and offered 60 times higher download speeds, while the data cap was 375 times higher.

Figure A1.11 Fixed broadband price per GB and GB usage per broadband subscriber in Belgium, 2012–16



Source: Telenet.

A1.2.3 Future evolution

Consumer demand for telecoms services is continuing to change rapidly, with increasing demand for fast connectivity and flexibility (especially for accessing TV services). Revenues in TV and fixed telephony are declining, as are revenues for mobile calls and texts. Infrastructure providers will therefore have to continue to innovate and compete in order not to lag behind and miss out on new customers and markets. Operators are (therefore) investing in innovative content, entertainment offers and content services, spending more on their own content production, own TV channels and innovative apps.

For example, Proximus is investing €3bn to accelerate the roll-out of fibre in Belgium, and as mentioned above Telenet is investing €500m in its network over the period 2014–19 with the objective of upgrading its network to a speed of potentially up to 1Gbps. Proximus and Telenet also plan to roll out 4.5G in a number of municipalities in 2017, and Proximus was also the first player to test 5G technology in Belgium, reaching speeds of up to 70Gbps. [89]

Competition from new entrants such as (OTT) providers is forcing the traditional providers to keep innovating. Netflix became available in Belgium in 2014, and as at 2016, 23% of the population subscribed to it.[90] This has led competing operators such as Telenet to invest in local content and strengthen its entertainment offer. For example, Telenet recently partnered with De Vijver Media, a company owning the TV production studio Woestijnvis, which develops a wide range of Dutch-language TV programmes and channels, Vier, Vijf, and, since October 2016, Zes, which, among others, broadcast local content.[91]

Other entrants include Medialaan, a company offering audio-visual services as well as magazines and newspapers. Medialaan recently acquired Base's MVNO, Mobile Vikings, and the customers of branded reseller, Jim Mobile, with the

[89] Proximus (2016), Group Annual Report.
[90] Profacts (2016), 'Watching Televesions – Awareness, usage & perception of different providers', 16 December.
[91] The acquisition by Liberty Global of joint control over De Vijver Media was approved by the European Commission on 24 February 2015.

ambition to expand into telecoms market, building on a strong presence in the content market and its own OTT app, Stievie.

A1.3 Hungary

We first explain the existing electronic communications market structure in Hungary and how competition in this market is delivering good consumer outcomes. We then discuss the future dynamic evolution of the market.

A1.3.1 Market structure

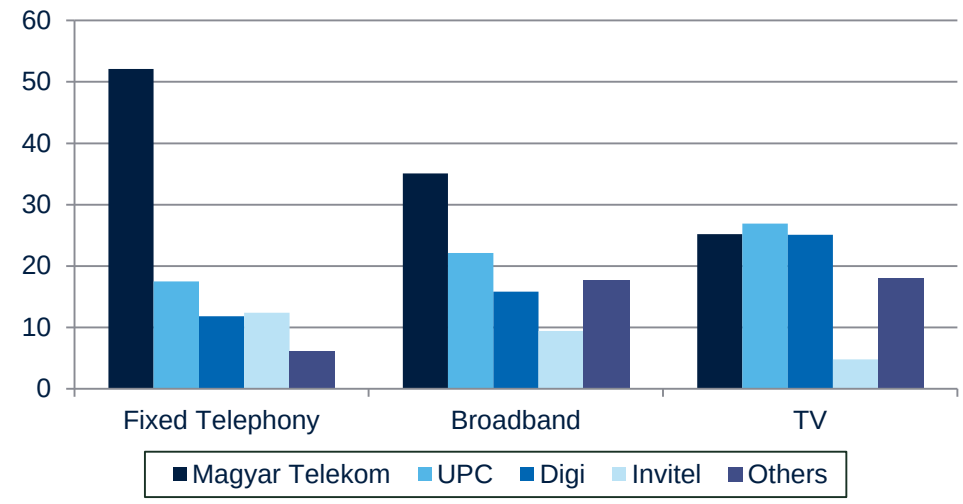
The fixed broadband market in Hungary is split between four network operators and several medium and small operators. The four main network operators are: Magyar Telekom, Invitel; Liberty Global backed UPC; and DIGI.

Invitel has been investing extensively in the development of its networks in the last couple of years. In May 2015 it announced a €30m investment plan to expand its footprint to more than 500,000 households in 98 cities. This is expected to lead to even greater infrastructure competition in Hungary in these 98 cities.[92]

The mobile market in Hungary is served by three MNOs—Magyar Telekom, Telenor and Vodafone—of which Magyar Telekom is also present in the fixed market and has the largest market share. DIGI, a Hungarian-based cable operator, acquired spectrum in 2016 and can be seen as a potential entrant, but has not yet started to offer services.

While Magyar Telekom, has a leading market position in fixed telephony and broadband, the situation in the TV market is different—Magyar Telekom, UPC and Digi all hold roughly equal market shares, and there is a relatively larger competitive fringe, including Invitel (see Figure A1.12).

Figure A1.12 Product market shares for operators in Hungary, Q4 2016



Source: Liberty Global data and Oxera analysis.

[92] Telecompaper (2015), 'Invitel starts EUR 30 mln network development programme', 8 May, https://www.telecompaper.com/news/invitel-starts-eur-30-mln-network-development-programme--1081287, accessed 19 July 2017.

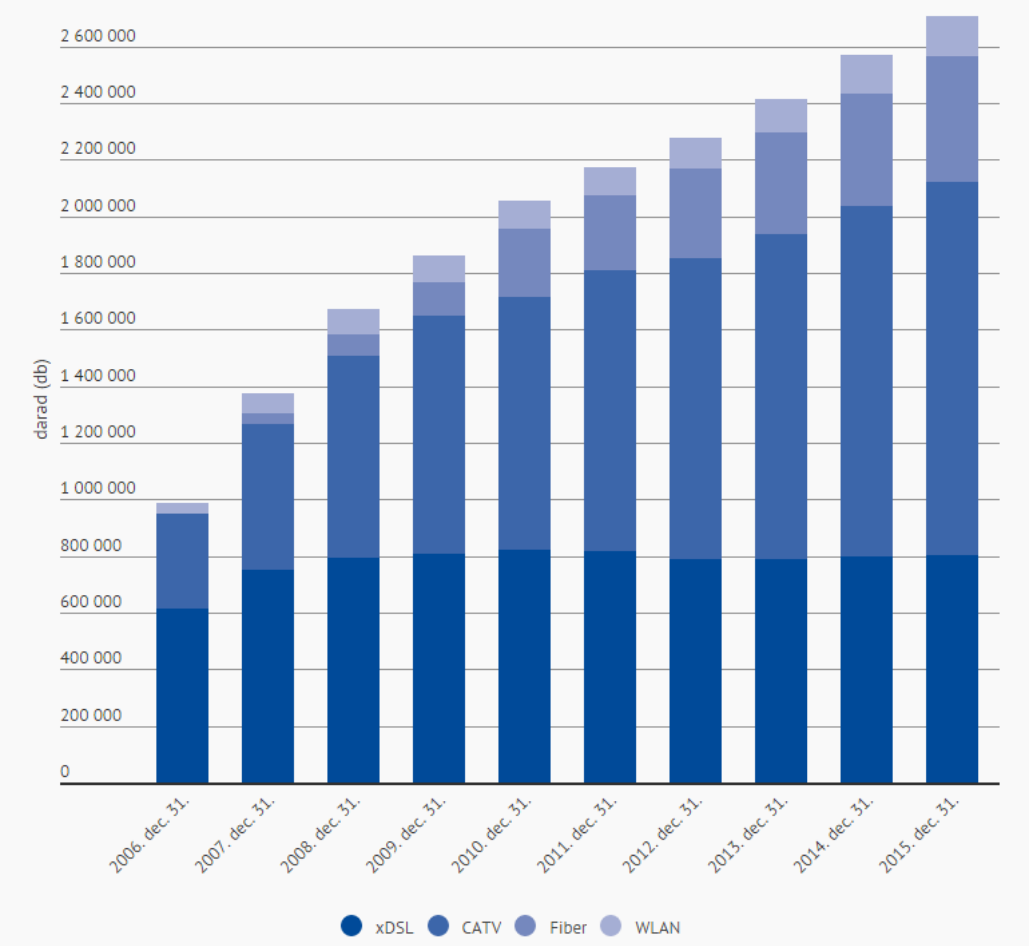
A1.3.2 Competition producing good consumer outcomes

Infrastructure upgrades

Key outcomes: Hungary has greater coverage of NGA broadband than the average for EU countries (81% in 2016 compared with an EU and CEE[93] average of 76%).[94]

Competition between infrastructures in Hungary in the last ten years has resulted in both an expansion in infrastructure coverage and improvements in network speeds.

Figure A1.13 Number of fixed broadband subscribers by technology in Hungary



Source: Nemzeti média- és hírközlési hatóság (NMHH) research, http://english.nmhh.hu/article/187206/A_helyhez_kotott_internetelofizetesek_szamanak_alakulasa_a_hozzaferes_tipusa_szerint_ezer_db_2006_december_31_es_2015_december_31_kozott , accessed 19 July 2017.

Developments by the cable networks in Hungary have forced the copper/ADSL network owners to upgrade to fibre-based networks, such as FTTH. UPC upgraded to EuroDocsis 3.0 on its cable networks across the whole of Hungary,

[93] The average for CEE is calculated based on 10 out of the 11 CEE countries (excluding Lithuania). The 10 countries included are: Estonia, Latvia, Czech Republic, Slovakia, Hungary, Poland, Romania, Bulgaria, Slovenia and Croatia.

[94] The connectivity score is based on eight metrics: fixed broadband coverage; fixed broadband take-up; mobile broadband take-up; 4G coverage; spectrum; NGA coverage; subscriptions to fast broadband; and fixed broadband price. European Commission (2017), 'Europe's Digital Progress Report (EDPR) 2017, Country profile Hungary'.

forcing Magyar Telekom, to upgrade its network from copper to fibre. UPC has also been carrying out CMTS and CPE replacements over the last 10–15 years.

Magyar Telekom has also been taking steps to improve its position in the NGA market, including buying a number of smaller cable operators, to provide high-speed cable broadband.[95] Its overall objective is to ensure that its broadband services are available to all households by 2018.

In the mobile segment, Magyar Telekom entered into a partnership agreement with Telenor Hungary to deploy a shared 800MHz 4G LTE network across the whole of Hungary (with the exception of Budapest) with 1,600 base transceiver stations to be installed and managed by the end of 2015.

Increasing coverage and take-up of higher broadband speeds

Key outcomes: Hungary is also in the top 10 countries in Europe in fast (at least 30Mbps) broadband household penetration (Figure A1.2) and ultrafast (at least 100Mbps) broadband household penetration (Figure A1.3).

Demand for high-speed broadband has been increasing, in line with the trend observed elsewhere in Europe. For fibre offerings, a speed offer of 240+Mbps was introduced in Hungary in 2014 and an offer of 500+Mbps in 2015.

Figure A1.14 shows the evolution of UPC subscribers on different broadband speeds. Subscribers for speeds of [✂] and above have been increasing, while numbers for [✂] and below have been decreasing.

Figure A1.14 UPC subscribers by broadband speed

[✂

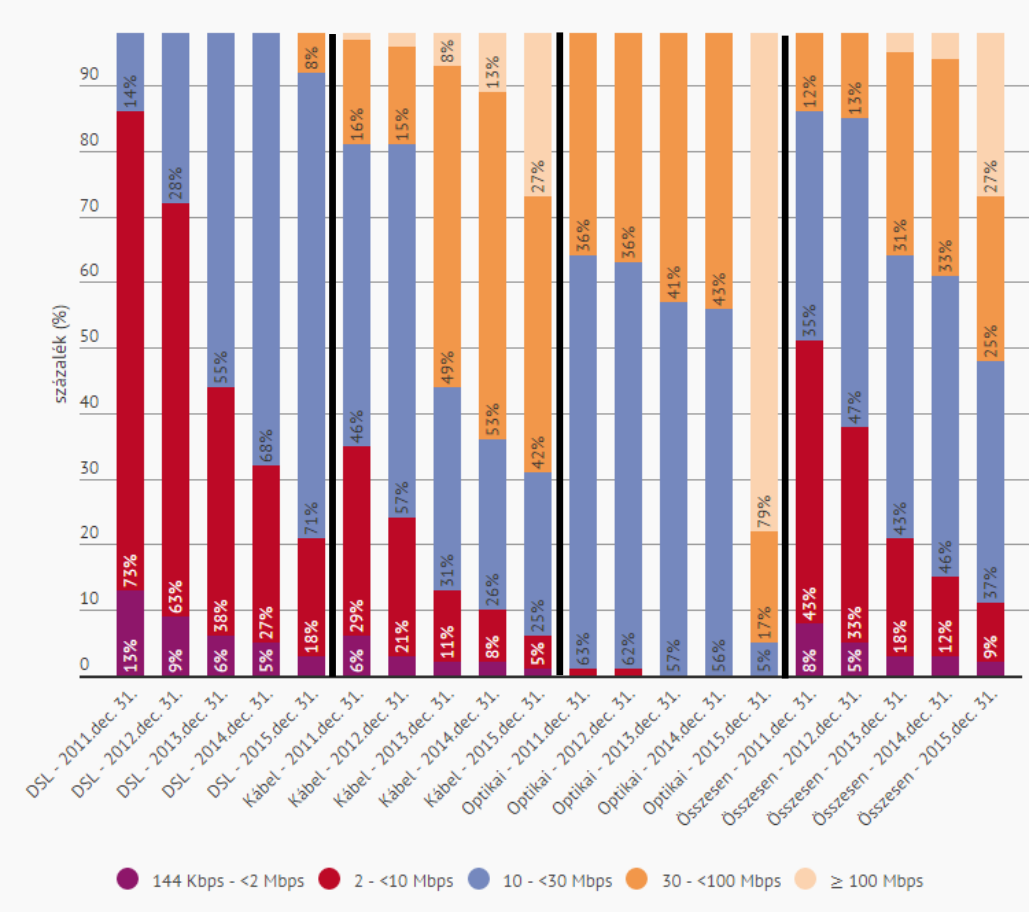
]

Source: UPC data.

Investments in infrastructure have resulted in increases in the network speeds available on the different networks, and users in Hungary are increasingly subscribing to these higher-speed services (see Figure A1.15 below).

[95] For example in 2013 Magyar Telecom acquired nine cable networks. Source: https://www.telegeography.com/products/commsupdate/articles/2013/12/13/mtel-snaps-up-nine-cable-networks-in-2013/ , accessed 19 July 2017.

Figure A1.15 Network speed increases by technology in Hungary



Source: Nemzeti Média- és Hírközlési Hatóság (2014), 'Az over-the-top tartalomszolgáltatások hatása a médiarendszerre', http://english.nmhh.hu/article/187189/Az_internethozzaferesek_savszelesseg_szerinti_megoszlasa_2011_december_31_es_2015_december_31_kozott, accessed 19 July 2017.

Significant levels of product innovation and consumer choice

Key outcomes: Hungary shows significant levels of innovation in service offerings, in terms of new and improved (2P, 3P and 4P) bundle combinations and in TV services.

As discussed in section 4.2 and shown in Table 4.1 we observe a significant number of product bundles available across 2P, 3P and 4P bundles in Hungary. For example, UPC has been steadily increasing the number of channels offered in its TV packages. Since 2015, 35 digital channels have been launched (6 digital and 1 analogue channels have been stopped). Competition in TV offerings is particularly strong with satellite broadcasters, where there is stiff competition in relation to both video content (e.g. sports rights) and related set-top-box functionalities.

UPC has added a number of features to its set-top box, including near video on demand; video on demand; Internet access on TV; PVR/DVR secure video-recording; high-definition TV; 3D TV; and personalise-able 'apps' similar to those used on smartphones.

Several OTT services compete in Hungary. Netflix was introduced in 2016, relatively late compared to other European countries. Other international OTT

services include HBO and iTunes. UPC introduced its own OTT service, Horizon Go, which competes with Netflix.

Higher broadband speeds and product innovations are available at prices similar to or lower than previous years

Key outcome: fixed broadband prices in Hungary compare well to average prices in the EU, representing an average of 1.1% of income in Hungary compared with an EU average of 1.2% of income.[96] *This percentage has also significantly declined in recent years, from 1.7% in 2015.* [97]

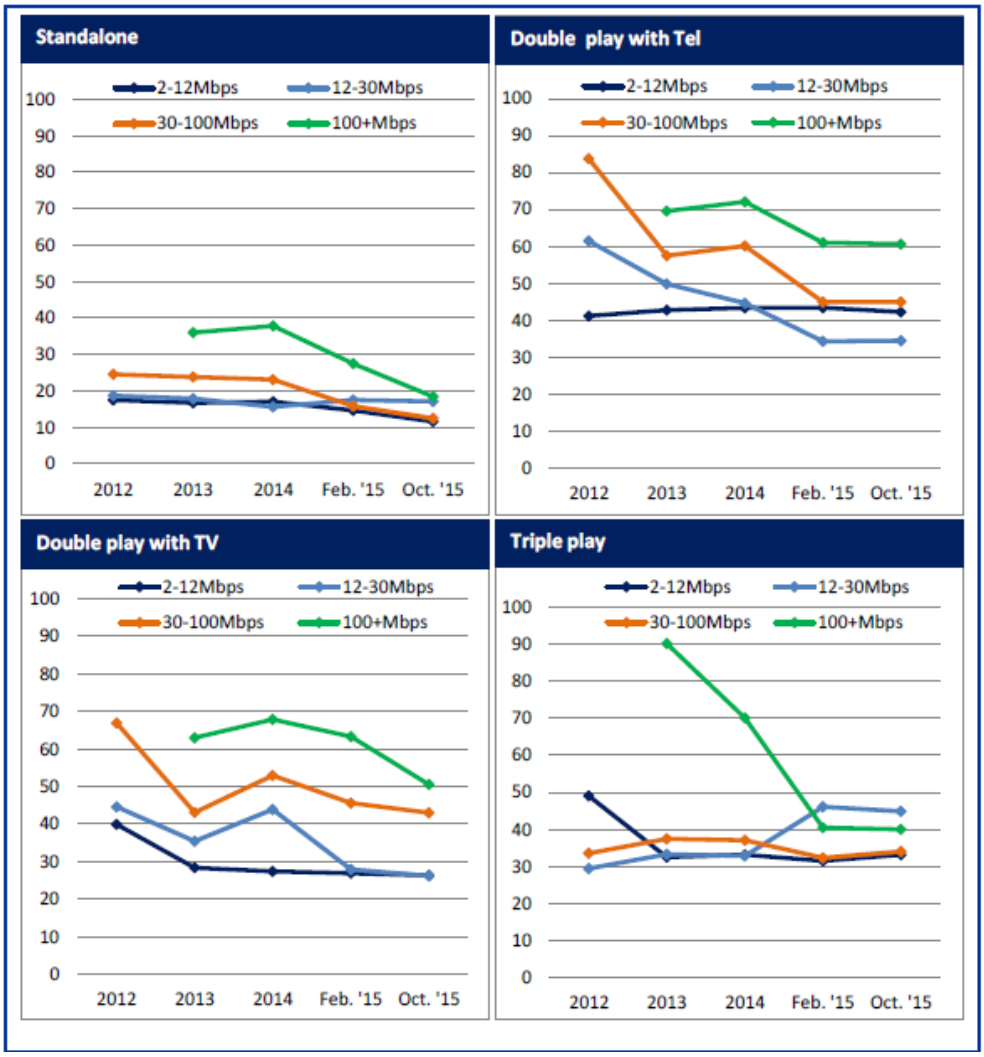
Figure A1.16 below shows that prices have been decreasing in Hungary, with particularly large reductions seen in products with high broadband speeds.

As stated in the European Commission's Broadband Internet Access Cost report for Autumn 2015 for Hungary:

> Standalone and Double play prices are in nearly all cases substantially lower than in 2012 (-8 to -49%). In the Triple play category, an extreme drop of over 50% can be observed for the speed range above 100 Mbps, but an upward evolution of the same order of magnitude can be spotted in the 12-30 Mbps range. When exclusively focusing on the evolution between the two most recent data collection periods, it can be concluded that Standalone offers of all speeds and Double play with TV offers of above 100 Mbps are considerably less expensive (decrease of around 20%), while in all other categories prices have evolved by only 5% or less.

[96] European Commission (2017), 'Europe's Digital Progress Report (EDPR) 2017, Country profile Hungary'.
[97] European Commission (2016), 'Digital Economy and Society Index 2016, Country profile Hungary'.

Figure A1.16 Recent evolutions in broadband prices (€/month) in Hungary, 2012–15



Note: The least expensive offer in € (with a purchasing power parity conversion used for countries with a different currency) as at February 2012, 2013, 2014, 2015 and October 2015. In the study, each offer is assigned to only one speed basket/usage profile, depending on its download speed. This implies that, when identifying the least expensive offers per basket and offer type, each offer is considered only for the usage profile corresponding to its speed. If a higher-speed offer is cheaper, a rational consumer may choose that offer. As stated in the study, the chosen approach has the advantage of highlighting market dynamics by identifying for which speed categories the competition between the operators is the highest, leading to lower costs.

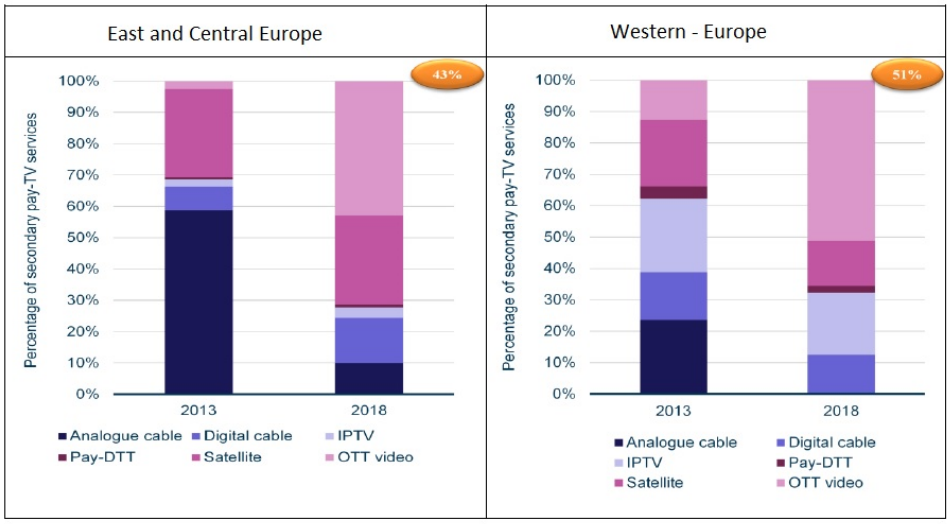
Source: European Commission (2016), 'Broadband Internet Access Cost (BAIC) Autumn 2015', Figure 63.

A1.3.3 Future evolution

With the next generation cable standard, DOCSIS 3.1, providing speeds similar to GPON or EPON services on fibre networks and 5G mobile, we can expect to see intense competition between these three infrastructures in Hungary in the future. We can reasonably expect that all three technologies will be able to provide customers with 1G speeds in the near future.

As in other European countries, OTT video content is expected to play a greater role in Hungary in the future. This comes mostly at the cost of analogue cable, which is expected to account for only 10% in 2018.

Figure A1.17 Forecast of TV services usage in Europe



Source: Nemzeti Média- és Hírközlési Hatóság (2014), 'Az over-the-top tartalomszolgáltatások hatása a médiarendszerre', http://nmhh.hu/dokumentum/165093/nmhh_ott_hatasa_a_mediarendszerre_nyilvanos_konzultacio_2014.pdf, accessed 19 July 2017.

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