Prospective competition and deregulation

An analysis of European approaches to regulating full fibre

for BT

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Executive summary

The UK Government and Ofcom have committed to promoting full fibre broadband in recent policy statements.[1] Infrastructure-based competition[2] in full-fibre will be a key element in achieving this. In this context, Ofcom has proposed to strengthen regulation of physical infrastructure (duct and pole access (DPA));[3] and recently published proposals on how it plans to take geographic differences in the expected degree of infrastructure competition into account in its market analyses.[4] Ofcom intends to complete its consolidated review of residential and business telecoms markets and physical infrastructure by 2021.

In pursuing a strategy based on promoting infrastructure-based competition including through physical infrastructure access, the UK authorities are following the example of countries such as Spain and Portugal, which have achieved considerable success in promoting FTTH deployment.[5] This study provides an overview of the approach regulatory authorities in Spain and Portugal took towards the regulation of access to fibre and geographic segmentation, and the role these policies played (alongside physical infrastructure access) in supporting deployment and sustainable competition in fibre rich networks. Key measures included:

- **A policy of initial forbearance on ultrafast broadband access** regulation **nationally** to enable commercial deployments, co-investment, reciprocal access and/or risk sharing[6] deals to emerge. In a UK context, forbearance would provide flexibility for all actors (altnets such as CityFibre as well as Openreach) to efficiently organise full fibre deployments and *compete* in offering attractive terms for access and/or co-investment.
- **Introducing geographically segmented wholesale access regulation of ultrafast broadband only after the initial forbearance period** (i.e. once some build has taken place).

The Spanish and Portuguese cases also provide **useful insights as to how geographic segmentation could be calibrated to preserve investment incentives while protecting consumers**. For example, when setting geographic boundaries for the prospectively competitive zone, regulators in Spain and Portugal did not focus exclusively on the presence of parallel ultrafast broadband networks but also:

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1 Ofcom (2018), Regulatory certainty to support investment in full-fibre broadband, July; DCMS (2018), Future Telecoms Infrastructure Review", July; DCMS (2019), Public consultation on the Statement of Strategic Priorities for telecommunications, the management of spectrum and postal services, February.

2 When referring to infrastructure competition in this report, we refer to competition on the basis of end-to-end duplication of the access network at least up to the connection to the in-building wiring. We include own infrastructure installed through duct and pole access, or access to utility infrastructure, as well as through own civil infrastructure.

3 Ofcom (2018), Physical infrastructure market review, December

4 Ofcom (2018), Promoting investment and competition in fibre networks - Approach to geographic markets, December

5 We refer to FTTH when discussing policies adopted in France, Spain and Portugal, as investment in new FTTH networks was the focus of the policies adopted in the context of the Wholesale Physical Infrastructure Access/Local Access market reviews in the period considered (2008-2018). Cable was also considered to offer similar capabilities. As in the UK, markets will be defined with reference to spped and capabilities (rather than technology). In this report we refer to "ultrafast" when discussing the relevance of the policies pursued. Which technologies are included by a regulatory's assessment as "ultrafast" will depend on the expected technological and commercial developments.

6 Risk sharing deals could involve long term and/or volume discounts.

- Provided scope for competition to develop further by **setting a relatively low threshold for "prospective competition"** based on partial coverage by overlapping networks; and[7]
- Considered the impact on consumer outcomes of **co-investment, reciprocal access or other long term access deals** which achieve a similar effect to parallel networks for consumer choice at retail level. [8]

For zones where competitive ultrafast build was not in prospect, **the Portuguese regulator continued to forbear from access regulation on ultrafast broadband so as to not deter deployment by the incumbent or other operators which could become first movers in those areas**.[9] Although the Spanish regulator eventually mandated fibre access in non-competitive zones after the forbearance period, it took into account the risks investors took when they made the initial investment as part of setting wholesale charge controls.[10]

The deployment of fibre in Spain and Portugal was also supported by broadly stable copper prices and in Spain, a relatively supportive approach to migration from copper to full fibre.

Regarding regulation of business markets in the presence of DPA, the Spanish and Portuguese cases (alongside France) offer the following insights.

- **DPA and mass-market investment in full fibre could both affect competition in business access.** Experience from France, Spain and Portugal suggests that mass-market FTTH broadband and potentially cable broadband with business grade SLAs could, to a degree, substitute for dedicated leased lines, while DPA could expand the business zones which are competitively supplied. Following practice elsewhere, such developments, if present in the UK, could warrant an extension of the 'deregulated' zones for business, as well as lighter touch regulation elsewhere.
- **Experience in Spain and Portugal suggest that the potential for self-supply (or commercial supply) of dark fibre backhaul are likely to increase in countries where FTTH is deployed and DPA is available**. The presence of a wholesale only competitor to the incumbent may also increase competition in dark fibre provision for business and backhaul, as should the potential for self-supply through use of utility infrastructure. With only a few exceptions,[11] most European countries have decided against regulating dark fibre for mobile backhaul for these reasons.

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7 Spain uses 20% coverage, while Portugal 50% alongside other metrics to assess competitive potential.

8 Article 68 of Directive (EU) 2018/1972 of 11 December 2018 (The European Communications Code) requires NRA to consider the impact of commercial deals including co-investment which influence competitive dynamics when considering imposing SMP obligations. The geographic segmentation and Spain and Portugal relies only in part on the existence of parallel infrastructure and reflects also retail competitive dynamics (which is affected not only by duplicate infrastructure, but also commercial wholesaling and reciprocal access deals).

9 This justification was provided by the Portuguese regulator for not applying access regulation on FTTH even in areas which were not considered to be prospectively competitive.

10 For example, following a 7 year forbearance period, FTTH VULA in Spain was regulated in non-competitive zones on the basis of Equivalence of Input and economic replicability tests. Charge controls were based on a regulatory WACC taking into account the project specific risk of investing in fibre.

11 Austria (Dark fibre mandated in market 4) and France (Dark fibre as backhaul for LLU – and usable for mobile backhaul) are exceptions to the rule. DF for mobile backhaul is not regulated in ES, PT, IT, DE, SE, NL.

Overview of the report

I. Aim of the study

In this study, we describe in detail, the regulatory strategies which have been pursued in countries which have succeeded in promoting deployment of fibre-rich networks, alongside the outcomes these countries have achieved for consumers and businesses.

A key focus of our analysis is the market-oriented approach taken in Spain and Portugal. We contrast this with the more interventionist approaches to fibre regulation which have been taken in France, Germany and Italy.

Our aim is to identify insights that may be relevant in the implementation of the UK's strategy for gigabit capable networks.[12]

II. Fibre-rich networks require a different approach to the ladder of investment

Experience from the UK as well as elsewhere in Europe has demonstrated that competitive conditions in a fibre environment can be different from those which historically existed in copper. Specifically, given the right conditions,[13] there is a greater prospect for infrastructure competition in fibre than was present for copper.[14] Commercial wholesaling and co-investment deals may also emerge in a contested market for fibre-based broadband.[15]

This experience has spawned changes to the regulatory approach for fibre to move away from a presumption of access regulation, towards an approach which aims at *enabling investment* in networks and fostering commercial solutions to competitive challenges. In line with this change, the recently agreed EU Electronic Communications Code[16] advocates a 'DPA first' strategy, where other remedies would be applied only if DPA alone would not be sufficient,[17] and if commercial risk-sharing and co-investment solutions do not address competition problems in the market.[18]

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12 DCMS July 2018 statement "Future Telecoms Infrastructure Review", DCMS February 2019 Consultation on the Government's proposed "Statement of Strategic Priorities for telecommunications, the management of spectrum and postal services", 15 February.

13 The prospects for infrastructure competition are affected inter alia by regulatory approaches, such as the availability of duct and pole access, alongside other factors affecting revenues and cost including retail price and willingness to pay, labour costs, the availability of reusable duct, housing density and the prevalence of multi-dwelling units (MDUs).

14 For example, within the UK, companies such as CityFibre and Hyperoptic have engaged in the deployment of their own FTTH infrastructure – while infrastructure-based competition is prevalent in certain dense regions of Spain, France and Portugal.This differs from the copper environment, in which infrastructure competition did not develop beyond unbundling of the copper local loop.

15 Examples of commercial wholesaling arrangements can be seen in the agreements reached between CityFibre and retail broadband providers in the UK. Incumbents as well as alternative operators have engaged in commercial agreements on access to fibre in Spain and Portugal.

16 http://data.consilium.europa.eu/doc/document/PE-52-2018-INIT/en/pdf

17 Article 73 EU Electronic Communications Code.

18 Article 68 EU Electronic Communications Code.

III. Countries where fibre investment progressed at pace applied complete forbearance nationally on ultrafast access regulation in the initial period

The positive experience in countries such as Spain and Portugal provides support for the 'DPA first' approach.[19] Rather than regulating every rung of the ladder for ultrafast technologies, NRAs in Spain and Portugal focused in the initial stage *only* on regulating access to ducts, poles and in-building wiring.[20] To be clear this meant full forbearance (*no access regulation*) on FTTH or ultrafast broadband (>30Mbit/s) initially.[21] In Spain this strategy lasted for a period of 7 years;[22] in Portugal, it is still in place.[23]

The forbearance strategies in Portugal and Spain provided freedom for investors to deploy fibre and make commercial arrangements for co-investment and access. This meant that regulators did not need to make predictions about where competitive fibre deployment may have been viable in an uncertain environment (avoiding the risk that the act of regulating could itself affect incentives and outcomes). At the same time, customers were nonetheless protected as the market transitioned to ultrafast by the ongoing access regulation of copper.

As the figure below shows, forbearance in fibre access pursued in Spain and Portugal contrasts with the approach in France, which entailed dark fibre regulation to around 90% of households from the outset. Meanwhile, regulators in Italy, Germany and the UK pursued approaches based on promoting service competition through access to the incumbent's NGA network alongside access to passive infrastructure such as ducts and subloop unbundling (a "full ladder" approach).[24]

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19 These cases are cited in support of the strategy pursued in the Code both in the Impact Assessment to the Review of the EU Framework for Electronic Communications, and in a 2016 study conducted by WIK-Consult with IDATE and Deloitte for the European Commission on "Access, in particular regulatory, regimes for network investment in Europe".

20 In Spain and Portugal, as in the UK, duct and pole access was mandated under SMP regulation in the WLA market. Access to in-building wiring was mandated through separate 'symmetric' legislation applying to all operators. This symmetric legislation provided the inspiration for provisions on in-building infrastructure which were included in the 2014 EU Broadband Cost Reduction Directive.

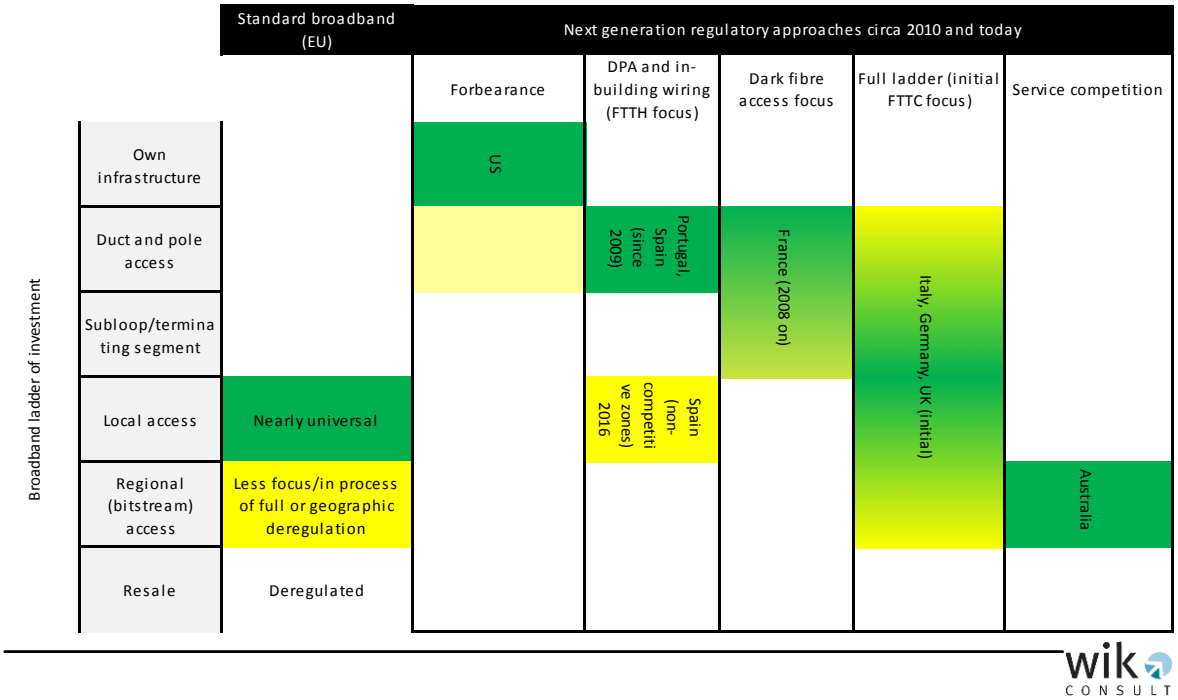
21 ANACOM, the Portuguese NRA initially (2009) refrained from regulating FTTH, and instead addressed the question in a parallel consultation, leaving the option to impose access under a subsequent decision, once the networks had been further deployed. CMT (later CNMC), the Spanish NRA, initially in 2009 refrained from mandating access to speeds >30Mbit/s on the grounds that demand for higher bandwidths was at that time still very low, and alternative operators were increasingly using their own infrastructure to provide higher bandwidths. Regulation on the copper network in the form of LLU was maintained in both countries.

22 In 2016, Spain regulated access to speeds above 30Mbit/s in some geographies – thereby lifting the forbearance that was initially in place on these speeds.

23 In 2012, ANACOM considered applying a virtual FTTH access obligation, but planned to limit this intervention so that it would not cover the areas where alternative operators had already invested in FTTH or where investment was expected to take place based on a statistical cluster analysis. It ultimately abandoned this proposal and maintained forbearance as it observed market developments, which included mergers, acquisitions and the voluntary agreement of co-investment. Forbearance was further confirmed in 2017 on the basis that competition was present in 466 parishes covering 56% of households, while the incumbent's coverage outside those areas was very limited, and it did not want to disincentive investment in those areas. ANACOM also took into account a voluntary wholesale offer made by the incumbent.

24 When we refer to "full ladder" in this report, we mean a strategy of mandating several remedies on fibre access at different points in the value chain simultaneously, and often on a nationwide basis.

Figure 0-1: Regulatory strategies towards NGA[25]



Source: WIK-Consult

IV. When ultrafast access regulation was introduced in Spain, it focused on specific geographies where there was no prospect of competition

Forbearance continues to play a role in Spain and Portugal. In 2017 in Portugal, the regulator identified different competitive conditions in the provision of retail ultrafast broadband services, based on where cable and alternative operators had deployed rival ultrafast networks,[26] yet maintained forbearance even in the non-competitive area. The regulator justified this approach on the basis that the incumbent's FTTH coverage was limited in the non-competitive zones, and it did not want to deter further investments by applying pre-emptive regulation.

When access to fibre was mandated for the first time in Spain in 2016 after seven years of build, it was restricted to geographic areas[27] where the regulator considered – through a forward-looking analysis – that there was no prospect of effective competition.[28] Due to the

25 The reference to "dark fibre access" in the context of France, includes the obligation to provide IRUs for fibre access in addition to short term rental of fibre access – at prices that were determined by the regulator during the resolution of disputes.

26 Parishes with at least two operators in addition to the incumbent with 50% coverage or parishes where there was one additional operator with 50% coverage and where the incumbent had less than 50% market share were considered to be prospectively competitive.

27 CNMC distinguished competitive conditions applying to standard vs ultrafast broadband within the nationwide WLA market, and geographically segmented FTTH remedies (but not duct or copper remedies).

28 See CNMC (2016): Resolución por la cual se aprueba la definición y análisis del Mercado e acceso local al por mayor facilitado en una ubicación fija y los mercados de acceso de banda ancha al por mayor, la designación de operadores con poder significativo de mercado y la imposición de obligaciones específicas, y se acuerda su notificacion a la Comisión Europea y al Organism de Reguladores Europeos

prior period of forbearance, the Spanish regulator was able to take into account actual and planned competitive investment in fibre (alongside the presence of cable), as well as commercial deals when differentiating remedies by geography. Still, regulation was applied cautiously: it provided flexibility for competition to continue to develop, for example by maintaining forbearance in municipalities in which at least two (ultrafast) competitors to the incumbent had 20% coverage.[29]

Conversely, in France, rather than forbearing from fibre regulation, the regulator pursued geographic segmentation and fibre access remedies from the outset. As fibre deployment was still in its infancy, ARCEP relied on announcements from operators as well as an analysis of factors affecting viability (such as the size of buildings and urban density), to predict the zones in which different forms of infrastructure competition could develop. Outside the zones which it considered to be prospectively competitive, ARCEP applied detailed regulatory rules for for co-investment and access to passive FTTH infrastructure.[30] The French approach carries a greater risk of over-regulation (if the extent of prospectively competitive zones is underestimated), potentially limiting and slowing down investment, compared to the approaches that were taken in Spain and Portugal.

V. FTTH coverage in Spain and Portugal are amongst the highest in Europe, and significantly exceed coverage in countries which maintained a full ladder of remedies

In the period following the decision of regulators in Spain and Portugal to forbear from ultrafast regulation, FTTH deployment expanded rapidly – and coverage now stands at 71% and 89% of households respectively.[31]

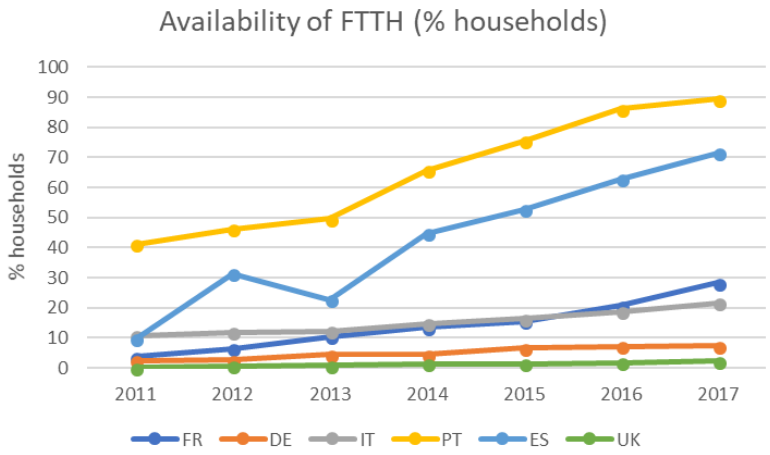
de Comunicaciones Electrónicas (ORECE), (ANME/DTSA/2154/14/MERCADOS 3a 3b 4), downloadable at: https://www.cnmc.es/file/170783/download.

29 CNMC introduced FTTH VULA in its 2016 market analysis subject to EoI and flexible pricing (similar to Ofcom's approach with respect to FTTC in the early years of BT's investment). However, it is notable that this regulation was introduced 7 years after the first deployments of FTTH were made, and CNMC excluded 66 municipalities covering around 35% households from any regulation. In addition to looking at existing market shares of Telefonica and alternative operators, CNMC assessed for each commune, whether there was at least one Main Distribution Frame (MDF) in which there were two or more ultrafast competing operators to the incumbent (FTTH or HFC) with at least 20% coverage. CNMC made an allowance to reflect the potential for further competitive investment, in that it required only partial coverage by competing investors.

30 Outside very dense areas, where only access to in-building wiring is shared, the French government and regulator put in place a detailed access regime for FTTH through symmetric legislation. The rules require all operators installing FTTH in buildings to deploy it in such a way as to allow access to be provided to passive (dark fibre) at concentration points aggregating at least 1,000 lines. Offers must include the potential for co-financing (on the basis of IRU) before the investment occurs, after the investment – or on the basis of short term rental. Terms and conditions as well as prices were set in practice through a series of disputes resolved by the regulator in 2011. Prices were cost based, but with mark-ups on the WACC to account for increased risk. These mark-ups differ depending on whether IRUs were purchased before or after the installation of fibre – and are higher for access rental without commitment than for IRU-based access. Further details are described in the WIK (2017) study for Ofcom "Risky bottleneck assets".

31 EU Digital Agenda Scoreboard. Data as of 2017.

Figure 0-2: FTTH homes passed in % of households



Source: EU Digital Agenda Scoreboard (2018).

However, FTTH deployment in France has been more gradual, outside the limited areas (covering around 10% households) where no FTTH access regulation applied because the regulator concluded that end-to-end infrastructure-based competition was viable. Deployment in the 'less dense' zones in France which were considered to be commercially viable, but subject to symmetric access regulation, has been much more limited than in equivalent areas in Spain and Portugal.

FTTH deployment was more limited still in countries such as Italy and Germany. In these countries, the limited FTTH deployment sparked Governments to act to address the perceived fibre deficit, through state involvement[32] and/or providing State Aid.[33]

Regulation is not the only factor affecting outcomes in these markets. Other factors include competition from pre-existing cable networks and the practicality of deploying FTTC as an alternative to FTTH,[34] factors affecting costs including housing density, labour costs, and the quality of ducts, as well as factors affecting revenues including retail prices and take-up which is in turn affected by willingness to pay.

However, it seems reasonable to conclude that regulation may have played a role, amongst these other factors, in influencing the investment outcomes observed.

32 FTTH deployments in Italy were triggered by the entry of the wholesale only operator Open Fiber – which is jointly owned by the energy utility Enel and the publicly owned investment fund Cassa Depositi e Prestiti.

33 Italy's planned state aid programme for fibre has a total budget of round €4 billion and has been approved by the Commission as in line with EU state aid rules. The ruling German coalition has proposed investment of €10-12 billion for the current legislative period that would be provided to foster broadband upgrades in rural areas.

34 In countries with long subloops the speed enhancement available via FTTC may have been too limited to warrant this approach, favouring a step change to FTTH from the outset

VI. In Spain and Portugal consumers have benefited from sustainable infrastructure-based competition (facilitated by commercial agreements)

As operators in Spain and Portugal responded to the need to invest in fibre-rich networks for fixed residential and business connectivity as well as for mobile backhaul, there was a period of consolidation resulting in three large-scale converged players serving serving all three segments.[35]

In this environment, consumers have benefited from the investments brought about by this type of competition and consumer choice has been maintained. Around 10% of French households and more than one third of Portuguese households have a choice or three or more ultrafast providers based on end-to-end duplication of infrastructure.[36] In addition, in Spain and Portugal, long-term commercial reciprocal access agreements (between networks with assets in different geographic areas) resulted in over a third of households being served by at least three retail providers in this way.[37] Commercial fibre wholesale offers have also been made by incumbents in both Spain and Portugal. These outcomes were enabled by the initial strategy of regulatory forbearance, which strengthened incentives for the operators to reach commercial agreements to facilitate deployment (for example through co-investment or other forms of risk sharing), and to build penetration on their network through wholesaling deals.[38]

A summary of the estimated choice available from infrastructure-based competition and commercial agreements is shown in the table below.

35 Consolidation in Portugal occurred between Optimus and ZON (the cable operator) in 2013. Consolidation in Spain occurred between Vodafone and ONO (the cable operator) in 2014 and between Jazztel and Orange Spain in 2015. Commitments arising from the Jazztel/Orange Spain merger ensured the continued presence of a fourth challenger in fixed infrastructure.

36 In France, at least 9% of premises already have access to 3 or more FTTH infrastructures to the base of the building (this figure refers specifically to FTTH/B – cable networks may run in parallel). In Portugal, competition based on three or more ultrafast (HFC or FTTH) networks is estimated to be around 36%. The degree of overlapping ultrafast networks in Spain is harder to gauge.

37 Estimated at 38% of households in Spain and 44% in Portugal. In Spain reciprocal access agreements have been signed between Orange Spain and Vodafone and between Orange Spain and Masmovil. The proportion of households in Spain with a choice of three or more ultrafast providers is likely to lie at a minimum of 38%, and is likely higher as this figure is based on households served through swap deals and excludes areas which are served by three independent infrastructures. In Portugal, reciprocal access agreements have been signed between the incumbent PT (now MEO) and Vodafone, and in 2017, between Vodafone and the cable operator. ANACOM reports that in Q1 2018 44% households had access to 3+ ultrafast broadband operators on the basis of own infrastructure or co-investment deals. This proportion is likely to increase on the basis of the NOS/Vodafone agreement. In France as of Q22018, we estimate that around 30% of premises may have had access to three ultrafast broadband offers (based on FTTH and cable), when competition through co-investment agreements is included.

38 Vodafone and Orange have both reached agreement with Telefonica on a commercial FTTH wholesale offer in the unregulated zone.

Table 0-1: Estimated choice available via parallel infrastructure and co-investment

	FTTH coverage % households	% HH with choice of 3+ ultrafast offers based on parallel infrastructure	% HH with choice of 3+ offers based on parallel infrastructure and co-investment	Availability of ultrafast bitstream offers on regulated or commercial terms
France	36% (Q2 2018)	~10%	~30%	Wholesale cable, subject to merger control remedies
Spain	71% (2017)	Not known	38% +	Available from incumbent nationwide – some areas regulated, others offered on commercial basis
Portugal	89% (2017)	~36%	44% Q1 2018 ~80% possible in view of announced network sharing	Available from incumbent on commercial terms, low take-up

Source: WIK-Consult based on data from national regulatory authorities, and press statements concerning co-investment

It is possible that incentives to build FTTH and reach commercial deals may have been more limited had the regulators applied access regulation from the outset.[39] For example in France, the regulatory regime for co-investment and access to full fibre effectively may have substituted commercial deals that may otherwise have arisen between some or all of the parties.

VII. Prices for ultrafast broadband do not seem to have increased as a result of forbearance

While prices for ultrafast broadband bundles in Spain and Portugal are higher than in many of the other countries surveyed, this seems to reflect historically higher levels of broadband prices at all bandwidths in these markets.[40] Hier These relatively higher prices may have supported the business case for more widespread deployment of FTTH, compared with countries where broadband prices were (and remain) lower.

Broadband and ultrafast broadband prices have not increased[41] in Spain and Portugal since the policy of forbearance was applied in 2009, suggesting that operators did not have the ability to price ultrafast broadband independently of competitors and consumers,[42] or if they did, did not choose to exploit this ability.

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40 The reasons for higher broadband prices in Spain and Portugal are unclear. In Spain, higher prices have persisted despite high levels of competition in basic broadband through LLU.

41 According to data available through studies for the European Commission on prices for broadband Internet access (2017 study at https://ec.europa.eu/digital-single-market/en/news/fixed-broadband-prices-europe-2016), prices for double and triple play bundles in Spain and Portugal have not increased in absolute terms or relative to other countries studied in this report.

42 Ultrafast broadband retail prices may have been constrained by continued copper regulation as well as by actual and potential infrastructure-based competition

The strategies pursued in Spain and Portugal and resulting convergence in the sector, have been associated with a significant increase in bundled offers combining not only broadband and content, but also mobile services.[43]

VIII. Physical infrastructure access has contributed to greater competition, and reduced regulation in business markets

Access to physical infrastructure and the resulting deployment of FTTH has had effects not only on residential broadband markets, but also on business access markets. This is explicitly recognised in Spain and France, which have combined their (previously separately conducted) analyses of the wholesale local access, wholesale central access (bitstream) and high quality (business) access markets in recent years.

France, Spain and Portugal have all concluded that Ethernet bitstream over mass-market FTTH can be a substitute for some leased line products going forward, resulting in a 'high quality' market encompassing active services provided over both dedicated and shared infrastructure.[44]

Physical infrastructure access has also been used in these markets for the deployment of dedicated fibre leased lines. The resulting competition has been reflected in decisions in France and Portugal, for example in distinguishing between the competitive conditions for higher and lower speed (or copper vs fibre)[45] connections (although the precise break-points are expected to differ between countries); and in the geographic segmentation of the market or of remedies. Fibre-based business access in most or all areas within France, Spain and Portugal is not subject to an ex ante charge control, but only to potential checks and ad hoc intervention if needed to ensure that prices do not squeeze competitors out of the market.[46]

In turn, market consolidation and fixed mobile convergence in France, Spain and Portugal may also have supported the economic case for and thus the ability of operators to self-provide dark fibre backhaul for fixed as well as mobile connectivity.

43 Quadruple play bundled offers made up 35% of total broadband bundles in Spain and 45% of total broadband bundles in Portugal as of 2016.

44 The expansion of the leased line market to include high-quality bitstream is also foreseen in the 2014 Commission Recommendation on Relevant Markets.

45 In France, ARCEP has tighter regulatory controls on copper-based terminating segments of leased lines compared with lines provided over fibre. In Portugal, ANACOM distinguishes its analysis of competitive conditions for business access by speed, with a break point of 24Mbit/s, which roughly equates to the speeds possible via copper vs fibre connections.

46 For example, regulators could intervene under the ex ante regulatory framework to adjust wholesale prices set by the incumbent if they found that these prices created a margin squeeze when compared with retail prices.

1 Introduction

The UK Government and Ofcom have committed to promoting full fibre broadband in recent policy statements.[47] Infrastructure-based competition[48] in full-fibre will be a key element in achieving this. In this context, Ofcom has proposed to strengthen regulation of physical infrastructure (duct and pole access (DPA)),[49] and recently published proposals on how it plans to take into account within its market analyses, geographic differences in the degree of infrastructure competition that are expected to emerge. [50] Ofcom intends to complete its consolidated review of residential and business telecoms markets and physical infrastructure by 2021.

In this study, we describe in detail, the regulatory strategies which have been pursued in countries which have succeeded in promoting deployment of fibre-rich networks, alongside the outcomes these countries have achieved for consumers and businesses.

A key focus of our analysis is the market-oriented approach taken in Spain and Portugal. We contrast this with the more interventionist approaches to fibre regulation which have been taken in France, Germany and Italy.

Our aim is to identify insights that may be relevant in the implementation of the UK's strategy for gigabit capable networks.[51]

The report is structured as follows:

- Chapter 2 describes the different approaches that European regulators have taken to the ladder of investment for ultrafast broadband
- Chapter 3 describes criteria used to identify emerging geographic differences in the level of competition in ultrafast broadband
- Chapter 4 examines the impact of DPA and FTTH on business access and backhaul markets
- Chapter 5 examines what steps NRAs have taken towards copper regulation to foster migration from copper to full fibre
- Chapter 6 examines the effects of different regulatory strategies for ultrafast broadband on wholesaling, co-investment and retail choice

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47 Ofcom strategic policy position July 2018 "Regulatory certainty to support investment in full-fibre broadband", DCMS July 2018 statement "Future Telecoms Infrastructure Review", DCMS February 2019 Consultation on the Government's proposed "Statement of Strategic Priorities for telecommunications, the management of spectrum and postal services", 15 February.

48 When referring to infrastructure competition in this report, we refer to competition on the basis of end-to-end duplication of the access network at least up to the connection to the in-building wiring. We include own infrastructure installed through duct and pole access, or access to utility infrastructure, as well as through own civil infrastructure.

49 Consolidation: Physical infrastructure market review https://www.ofcom.org.uk/consultations-and-statements/category-1/physical-infrastructure-market-review

50 Ofcom (Dec 2018), Promoting investment and competition in fibre networks - Approach to geographic markets

51 DCMS July 2018 statement "Future Telecoms Infrastructure Review", DCMS February 2019 Consultation on the Government's proposed "Statement of Strategic Priorities for telecommunications, the management of spectrum and postal services", 15 February.

- Chapter 7 examines outcomes for end-users in terms of availability, price and take-up of ultrafast broadband

Key findings and relevant insights are summarised at the beginning of each chapter.

2 A new approach to the ultrafast broadband ladder of investment

In this chapter we consider what is meant by 'prospective' market analyses, and discuss options available to address uncertainty over future developments and provide regulatory predictability. Turning to cases, we highlight differences in the approaches taken to the regulation of ultrafast broadband by regulators in Spain, Portugal, France, Germany and Italy – and discuss the provisions of the EU electronic communications Code on this point.

The main findings are as follows:

- Under EU Guidelines, NRAs are required to conduct market analyses on a prospective basis i.e. taking into account *expected or foreseeable market developments* over the review period (due to be extended to 5 years)
- Regulators must weigh the risks of action vs inaction in an uncertain future. Literature suggests that regulatory action when unnecessary can run the risk of undermining investment, while inaction when action is necessary could harm consumers. Predictability in regulation is also important for investor certainty. Predictability requires clear guidance on when and how regulation might evolve in future, whether from a starting point of regulation or forbearance.
- Spain and Portugal took a cautious view and applied forbearance on regulation of ultrafast broadband at least for an initial period. Only duct and pole access, and access to in-building wiring were mandated. Their regulatory approach remained consistent over subsequent review periods, with a preference for forbearance, but allowing the prospect of regulation (adapted to reflect risk) if justified by evidence of actual competitive developments.
- France applied partial FTTH forbearance (exempting 10% households from regulated access), but applied detailed rules for passive access to fibre by any provider (symmetric regulation) for the remaining households from the outset.
- No forbearance on FTTH access was applied in Germany and Italy. Regulators in these countries aimed to promote competitive investment only by differentiating the pricing of different wholesale products along the ladder of investment. Political and regulatory strategies in these countries later changed to address the perceived lack of investment in full fibre.
- The EU electronic communications Code provides some support for the solution pursued in Spain and Portugal – NRAs must consider whether DPA alone is sufficient before applying other remedies.

2.1 What is meant by a prospective approach?

The focus on "prospective" analyses is an important aspect of market reviews that are conducted in the context of the *ex ante* regulation of the communications sector.[52]

The 2018 SMP Guidelines clarify[53] that a prospective analysis involves "a *forward-looking, structural evaluation* of the relevant market over the relevant period."

According to the Guidelines, the length of the period should be the period between one market review and the next. This has been set at 3 years in the current EU Framework for electronic communications. However, in the EU communications Code[54], the period has been extended to 5 years,[55] which would entail a longer term perspective on developments that might arise in the market.

This analysis should take into account not only existing market conditions, but also "*expected or foreseeable market developments* over the review period".[56] The Guidelines note that both static and *dynamic* considerations should be reflected, and obligations should be based on principles which include the promotion of innovation and infrastructure-based competition.[57]

The effects of other applicable regulation and legislation should also be taken into account in the market analysis.[58] This might for example include expected market developments resulting from the 2014 Broadband Cost Reduction Directive, implemented in the UK through the 2016 Access to Infrastructure Regulations.

The prospective element of the analysis is particularly important when conducting reviews of markets in which market dynamics might change as a result of the entry and

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52 European Commission (2014): Explanatory note accompanying the document 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 of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, SWD(2014) 298, downloadable at: https://ec.europa.eu/digital-single-market/en/news/explanatory-note-accompanying-commission-recommendation-relevant-product-and-service-markets; European Commission (2018): Commission Staff working document accompanying the document Communication from the Commission, Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services (draft), downloadable at: https://ec.europa.eu/digital-single-market/en/news/revision-guidelines-significant-market-power-commission-publishes-drafts-revised-guidelines-and.

53 Section 1.3 SMP Guidelines. European Commission (2018): Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services (draft), downloadable at: https://ec.europa.eu/digital-single-market/en/news/revision-guidelines-significant-market-power-commission-publishes-drafts-revised-guidelines-and.

54 http://data.consilium.europa.eu/doc/document/PE-52-2018-INIT/en/pdf

55 Article 67 EU electronic communications Code

56 Ibid.

57 Section 1.3 SMP Guidelines. European Commission (2018): Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services (draft), downloadable at: https://ec.europa.eu/digital-single-market/en/news/revision-guidelines-significant-market-power-commission-publishes-drafts-revised-guidelines-and.

58 Ibid.

expansion of infrastructure-based competitors, as is the case for FTTH and business access.

2.2 The risk of over-regulation leading to under-investment

When developing an approach to assess prospective competition, NRAs need to (i) assess which market outcomes are likely on a forward-looking basis; and (ii) decide how to respond from a regulatory perspective if the outcomes of this exercise are too uncertain to predict.

On the question of how to handle uncertainty, it has been noted[59] that intervening to regulate dynamic industries when no intervention is required risks 'Type I errors' (over-regulation which fails to appropriately incentivise investment and innovation), whereas failing to intervene may risk 'Type II' errors (under-regulating and thereby failing to intervene when intervention was in fact necessary to protect consumers).

In weighing up these relative risks, regulators also need to take into account that actions which may appear to protect consumers in the short run e.g. by protecting existing forms of competition and limiting prices to reflect existing costs, could harm consumers in the longer term, if investment and innovation (and thereby the quality and range of products, as well as potentially the entry of new more cost-efficient technologies) are undermined as a result of regulation. This is commonly referred to as the trade-off between static and dynamic efficiency.[60]

A further issue that regulators face concerns predictability. Clarity about the regulatory approach from the outset should serve to increase investor certainty by reducing regulatory risk. [61] This argument could be used to support the application of regulation from the outset, on the basis that it provides certainty for investors around the effects of regulation on returns. However, this argument may not support investment, if the initial regulatory terms do not support the investors' ability to make a fair return under a range of scenarios,[62] or if the terms of regulation, such as price controls, are altered in an unpredictable way in subsequent reviews. Equally, regulatory predictability could be

59 There is a range of literature which has emerged in the context of antitrust and merger interventions in dynamically competitive industries such as ICT See for example http://ec.europa.eu/competition/antitrust/art82/057.pdf http://ec.europa.eu/dgs/competition/economist/stockmarket.pdf.

60 Static efficiency involves minimising the cost of current production, whereas dynamic efficiency may involve innovation which may improve quality and variety, and potentially to reduce costs over time through the creation of cost reducing new technologies. A range of literature exists on the links between access regulation and static and dynamic efficiency in the sector. Examples include https://pdfs.semanticscholar.org/f6f3/d651da7853f9b8cccb0a53c28af8b8a30f5d.pdf and http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.477.412&rep=rep1&type=pdf.

61 Regulatory risk was identified as a specific risk factor for telecom investors e.g. in the context of setting the WACC for fibre unbundling in the Netherlands – see WIK (2018) study on "Risky bottleneck assets".

62 Ofcom has described the "fair bet" principle as a regulatory approach under which the rewards from successful investments within the portfolio are expected to be sufficient to pay for the losses associated with unsuccessful investments, and additionally to allow an adequate return overall across the diversified set of investments. See for example https://www.ofcom.org.uk/__data/assets/pdf_file/0019/50743/cost_capital.pdf.

compatible with an initial policy of regulatory caution and forbearance, providing the regulator provides credible guidance on when, in what circumstances and how it would regulate in subsequent reviews.

2.3 FTTH strategy in France, Spain and Portugal

An analysis of approaches in countries such as Spain and Portugal, which have aimed to foster FTTH deployment and infrastructure competition through DPA, shows that these NRAs have given considerable thought to the risks of under vs over-regulation and the trade-off between static and dynamic efficiency.

A key feature of their strategy was to single out FTTH[63] and apply a cautious and gradual approach to the regulation of this technology, prioritising investment incentives and forward-looking objectives over measures which might have been seen to protect consumers in the short term.

The different approach reflects the elevated risks associated with FTTH deployment compared with continued use of the copper network, as well as the different competitive conditions that were anticipated for FTTH. Specifically, there was an expectation by the regulators in Spain and Portugal that if DPA was mandated and effectively implemented,[64] duplication of the fibre access network could be expected at least in some portions of the country. This contrasts with the expectation that there would not be duplication of the historic copper network.

As discussed below, the French NRA also singled out fibre and took a radically different regulatory approach to FTTH, departing from the standard practice of SMP regulation applied to the copper network. Like Spain and Portugal, France also took some steps to forbear from regulation on the basis of expectations about developments in infrastructure competition. However, the French approach placed more emphasis on the protection and promotion of access-based competition than in Portugal and Spain.

Specifically, France used specific legislation (outside the scope of the EU framework for electronic communications), to create the conditions that ensured that fibre networks would be built in a way which allowed physical unbundling, and mandated such fibre unbundling from the outset for the majority of the territory. The main difference compared with the copper unbundling regime was that regulation was applied on all operators installing fibre (and not just SMP operators) and there was a greater focus on long-term agreements for fibre unbundling (based on IRU), rather than relying only on access rental.

Further details on how the approaches evolved in these three countries and the rationales given follow.

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63 Spain initially segmented broadband access remedies according to speed, but later focused on distinguishing treatment of FTTH as a technology.

64 An advantage in France, Spain and Portugal has been the relatively good quality and completeness of the duct access network. Infrastructure competition could not have been expected to this degree in the absence of this factor.

2.3.1 Initial approach

Regulators in all the countries covered in this report – as well as in most other markets in Europe – considered around 2010 that investing in FTTH entailed additional risks compared with investments in existing infrastructure. However, they pursued different regulatory strategies to compensate for these perceived risks.

In the earliest market reviews which encompassed FTTH,[65] NRAs in Portugal and Spain forbore entirely from mandating access to the incumbent FTTH infrastructure (in the case of Portugal) or to speeds exceeding 30Mbit/s, in the case of Spain. The Spanish NRA also applied an FTTH risk premium of 4.81% on the WACC of the cost-oriented price of fibre-based bitstream at speeds of less than 30Mbit/s.

Table 2-1: Regulatory treatment of FTTH 2009-2011[66]

Early NGA review 2009-2011		France	Germany	Italy	Portugal	Spain	UK
year		2011	2011	2009/12	2009	2009	2010
Remedies		FTTH terminating segments	WBA*	FTTH unbundling/ VULA	na	FTTH WBA***	VULA**
Relevant market		symmetric	5	4&5		5	4
Abnormal business risks?		Yes	Yes	Yes		Yes	Yes
Regulatory treatment	No regulation (full forbearance)				✓		
	Partial forbearance					✓	
	NRA intervention only on dispute	✓	✓				
	Pricing flexibility (no cost orientation)		✓				✓
	Long term pricing permitted	✓	✓				
	Cost-based with risk allowance	✓		✓		✓	
	Cost-based without risk allowance						

Partial forbearance refers in Spain to forbearance on regulated access to FTTH at speeds above 30Mbit/s.
Long term pricing refers to flexibility to offer discounts based on long-term commitments of 5 years or more.

Source: WIK-Consult

The Portuguese regulator ANACOM noted at the time of its 2009 WLA review, that FTTH deployments had been announced[67] and it could be expected that fibre would play an important role in the market over the time horizon of the market analysis. However, ANACOM responded to the early stage of deployment and associated uncertainties by choosing to postpone the decision on mandating access to FTTH. ANACOM instead conducted a parallel consultation on the approach to NGA regulation and included in its review the *possibility* of an access obligation under a subsequent decision, once NGA networks had been further deployed.

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65 In Spain, the NRA did not initially include FTTH in the wholesale physical infrastructure access market, but did include it within the scope of the wholesale broadband access market (now WCA). Anacom included FTTH in both of these markets.

66 *Imposed in theory, but not implemented in practice due to limited FTTH deployment, ** Imposed, but limited FTTH deployed, *** Access obligations apply only on FTTH WBA up to 30Mbit/s. FTTH terminating segments refers to passive (unbundled) access to the FTTH line from the customer premise to the first concentration point – which in France is required to aggregate 1,000 households.

67 For example, the incumbent PT was expected to reach 1.6m Households by 2011. Furthermore, ANACOM referred to an investment plan of Sonaecom for new generation networks amounting to € 240 m in 3 years and targeting a network coverage of 1 m households.

Meanwhile, in Spain, CNMC forbore from mandating wholesale access to speeds above 30Mbit/s on the grounds that the demand for high bandwidths was very low and alternative operators were increasingly using their own infrastructure to provide higher bandwidths. Before imposing FTTH access regulation on all bandwidths, CNMC saw the need for a more detailed analysis to assess whether the obligations imposed on the WLA market (including duct and pole access) provided efficient incentives for innovation and investment in NGA.

Unlike Spain and Portugal, the French NRA ARCEP did apply regulation on FTTH networks from the outset. The French FTTH access regulation, was mandated not through SMP obligations applied under the WLA market review, which focused on DPA as a remedy for competition in fibre-based broadband, but rather through separate symmetric legislation governing access to FTTH terminating segments, which was later elaborated by the NRA from 2009-2010.[68]

The symmetric access regulation on FTTH in France required all operators installing FTTH (and not just SMP operators) to pursue a specific architecture and offer access or co-investment at a risk-adjusted cost-oriented price[69] at aggregation points specified by the regulator, similar to unbundled access to a passive fibre subloop.[70] However, ARCEP excluded “very dense areas” from the scope of this regulation. In these areas, ARCEP only mandated access to in-building wiring on the basis that in very dense areas it was economically viable for several operators to deploy their own infrastructure up to customer premises, and that some existing deployment could be observed in these areas.[71] In other words, ARCEP had concluded that these areas were prospectively competitive.[72]

68 ARCEP Decisions ° 2009-1106 et n°2010-1312.

69 ARCEP’s 2009-2010 Decisions provide that tariff conditions for access to fibre at the mutualisation point should be ‘reasonable and comply with the principles of objectivity, relevance, efficiency, transparency and non-discrimination’. According to ARCEP, these principles imply that the access supplier should publish an access offer which sets out technical and pricing conditions which do not discriminate against third parties in comparison with its own services and which are justifiable according to the cost of relevant network elements as adjusted for risk. It is assumed that in intervening to set prices for access to the terminating segment in the context of disputes, ARCEP followed the principle of cost-orientation with a risk adjustment on the WACC. This was confirmed by the publication by ARCEP of a draft cost model which was intended to aid in the calculation of prices for terminating segment access by operators in the market.

70 In less dense areas, operators installing fibre are required to offer access at concentration points which aggregate at least 1,000 lines (or 300 with backhaul to 1,000). This degree of aggregation is greater than a typical copper subloop, which may aggregate hundreds of lines, but aggregates fewer lines than are typically available for copper LLU at the MDF.

71 http://www.arcep.fr/uploads/tx_gsavis/09-1106.pdf

72 Regulation of prices and terms and conditions for access to the FTTH terminating segment in France was also applied ‘ex post’ – with the regulator intervening only to resolve disputes rather than setting these terms from the outset. In practice ARCEP intervened to set the conditions through a series of disputes between the major operators during the course of 2011.

2.3.2 Subsequent evolution in regulatory approach to FTTH

The effective forbearance on FTTH (or high speed) access regulation continues to this day in Portugal, and remains in a significant portion of the territory in Spain covering 35% of the population.

ANACOM raised the prospect of mandating virtual fibre access to be provided by the incumbent in a draft WLA market analysis in 2012.[73] However, areas where alternative operators had invested in FTTH (achieving 35% coverage) and areas in which prospectively (based on statistical cluster analysis) FTTH investment was expected to take place[74] were proposed to be exempted from this fibre regulation.[75]

In the event, ANACOM never adopted or applied this market analysis. ANACOM explained that the market analysis had been overtaken by market developments including acquisitions and co-investment agreements which affected the competitive landscape,[76] as well as the adoption of the new (2014) Commission Recommendation on relevant markets. ANACOM also cited the need to gather more granular data concerning NGA coverage at the level of parishes (a geographic unit which is smaller than a municipality), in order to ensure an adequate analysis. This analysis required the collection of geo-referenced data from operators.

ANACOM ultimately waited until 2017 to adopt a further market analysis[77] covering the WLA market (8 years following the initial WLA decision addressing NGA). Although in its 2017 analysis, ANACOM identified differences in competitive intensity in different areas in the retail market for broadband access (see below), it decided, despite objections from the European Commission,[78] to maintain forbearance on access to

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73 See ANACOM (2012): Mercados grossistas de acesso à infrastrutura de rede num local fixo ede acesso em bande larga, Definição dos mercados do produto e mercados geográficos, avaliações de PMS e imposição, manutenção, alteração ou supressão de obrigações regulamentares, downloadable at: https://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE.

74 See for more detail ANACOM (2012): Mercados grossistas de acesso à infrastrutura de rede num local fixo ede acesso em bande larga, Definição dos mercados do produto e mercados geográficos, avaliações de PMS e imposição, manutenção, alteração ou supressão de obrigações regulamentares, p. 89 ff. downloadable at: https://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE.

75 ANACOM observed increased investment in NGA, both based on cable networks as well as FTTH networks. According to ANACOM's market analysis this was in part a result of duct and pole access imposed in the 2009 review.

76 For example, there have been several acquisitions of companies accompanied by decisions of the National Competition Authority, the takeover of Portugal Telecom by Altice and co-investment agreements for the roll-out of FTTH networks. See ANACO M (2017): Decisao final sobre a análise dos mercados de acesso local grossista num local fixo e de acesso central grossista num local fixo para produtos de grande consumo, downloadable at: https://www.anacom.pt/streaming/anexo2finalM3a3b.pdf?contentId=1407278&field=ATTACHED_FILE.

77 ANACOM (2017): Decisao final sobre a análise dos mercados de acesso local grossista num local fixo e de acesso central grossista num local fixo para produtos de grande consumo, downloadable at: https://www.anacom.pt/streaming/anexo2finalM3a3b.pdf?contentId=1407278&field=ATTACHED_FILE.

78 ANACOM maintained this position despite a serious doubts letter and subsequent Recommendation from the European Commission challenging ANACOM's decision to forbear from regulation of fibre in non-competitive zones.

PT/MEO's FTTH network on a nationwide basis. ANACOM justified this decision on the grounds that competition was present or was in prospect[79] in 466 parishes covering 56% households. In the remaining areas ANACOM argued that PT/MEO had limited FTTH coverage (FTTH in these areas represented just 3% of PT/MEO's total fibre lines) and that it did not want to disincentivize FTTH investment in those areas. Furthermore, ANACOM noted that in 2010, FTTH roll-out in rural areas had been awarded to alternative network operators which offered open access in line with state aid rules. ANACOM also noted that PT/MEO had published a commercial fibre access offer in March 2016, although this offer is understood not to have been extensively used .

Thus, in confirming the approach of forbearance, ANACOM took account of the conduct of PT/MEO (voluntary offer), and lack of proportionality of regulation (in the presence of a small number of lines) alongside the need to provide incentives for further FTTH investment.

The Spanish NRA did move to mandate access to FTTH at speeds higher than 30Mbit/s. However, it waited 7 years after the initial analysis in which it applied forbearance, and restricted FTTH access regulation (in the form of VULA) to areas which were not considered prospectively competitive. 66 municipalities covering around 35% of the population were exempted from this regulation.

Table 2-2: Regulatory treatment of FTTH 2015 - 2018 [80]

Latest NGA review 2014-2015		France	Germany	Italy	Portugal	Spain	UK
year		2017	2014	2015	2017	2016	2018
Remedies		FTTH terminating segments	Local WBA*	FTTH unbundling, VULA	na	VULA, WBA**	VULA
Relevant market		Symmetric	3b	3a/3b		3a/3b	3a
Abnormal business risks?		Yes	Yes	Yes		Yes	Yes
Regulatory treatment	No regulation (full forbearance)				✓		
	Partial forbearance					✓	
	NRA intervention only on dispute	✓					
	Pricing flexibility (no cost orientation)		✓			✓	✓
	Long term pricing permitted	✓	✓				
	Cost-based with risk allowance	✓		✓			
	Cost-based without risk allowance						

* Imposed in theory, but not implemented in practice due to limited FTTH deployment.

** Whereas in 2009-2011 Spain applied partial forbearance on the basis of speed, in 2016, CNMC switched to an approach of partial forbearance based on a geographic assessment of competitive conditions. Red indicates changed approach compared with 2009-2011.

Source: WIK-Consult. Changes highlighted in red.

79 ANACOM referred to the fact that MEO's retail market share in 'competitive' zones had declined from 39% in 2013 to 36% in 2015, while the cable operators' market share in these areas had gone from 44% in 2013 to 43% in 2015. In contrast, MEO's share in non-competitive areas had risen to 84% in 2015 – although the European Commission observes that a direct comparison was not possible between 2013 and 2015 due to different market definitions.

80 Regulators in all countries considered continued to view FTTH as a risky investment, relative to investment in existing infrastructures, in their most recent analyses of the relevant markets.

In contrast with the more cautious approach taken in Portugal and Spain, the French NRA, which had mandated a form of access to FTTH outside very dense areas from the outset (in 2009), intervened twice in subsequent years to limit the area covered by forbearance.

In 2011[81] ARCEP identified "less dense" pockets within the very dense areas which would be subject to more stringent access rules on FTTH terminating segments,[82] and in 2014[83] reduced the overall footprint of the ‚very dense' areas. The result was that as of 2014 17% of premises were deemed to be in "very dense areas", and only 10% of premises were in dense pockets[84] where no FTTH access beyond access to in-building wiring was mandated. In all other areas nationally, symmetric regulation was applied to any commercially deployed FTTH network. These changes were made to reflect the developments in end-to-end infrastructure competition that had taken place at that stage.

2.4 Regulation at all rungs of the ladder: Germany and Italy

The DPA focus coupled with forbearance on FTTH access regulation that was applied in Spain and Portugal contrasts with the regulatory strategies pursued in countries such as Germany and Italy, which regulated access at multiple rungs of the ladder of investment.

Specifically, Germany and Italy mandated SMP access regulation on the FTTH incumbent network from the outset, [85] *in addition to* detailed regulation of other upstream access products including sub-loop unbundling (in both Germany and Italy) and duct access (in Italy),[86] which were designed to encourage alternative operators to climb the ladder of investment.

These regulators relied on using *differentiated pricing* along the ladder of investment to incentivise NGA investment by alternative operators while at the same time aiming to adequately reward the investment risk of the regulated firm.

- In Italy, SLU was priced at two thirds the rate for LLU to foster FTTC competition.[87] Active access to the incumbent's FTTC and FTTH networks was mandated and subject to cost-orientation, but in order to reflect the risks associated with investment, AGCOM added a risk premium of 2% to access based on FTTC and 4% for FTTH.[88]

81 http://www.arcep.fr/uploads/tx_gspublication/20110614-Recommandation-petits-immeubles-ZTD-post-consultation.pdf
82 Access must be provided at concentration points aggregating at least 300 households.
83 http://www.arcep.fr/uploads/tx_gspublication/recomd-FttH-immeubles-moins-12-log-ZTD-janv2014.pdf
84 Large MDUs or premises accessible via visitable sewers within very dense areas.
85 Although FTTH bitstream access has in theory been required through the market analysis in Germany, the wholesale product was not specified due to the limited coverage of this technology.
86 Duct access in Germany was mandated only as an associated facility to SLU for the deployment of FTTC/VDSL, and therefore cannot be used to deploy end-to-end FTTH infrastructure.
87 This approach was subject to a phase II investigation and 2013 Recommendation by the European Commission – see article 7 C(2013) 5418 C(2013) 8862.
88 Case IT/2014/1585-1587.

- In Germany, SLU prices were also reduced relative to LLU prices, while pricing flexibility was initially permitted on downstream FTTC and FTTH-based bitstream. Later on, BNetzA mandated local bitstream and set the price for FTTC/VDSL local bitstream on the basis of cost-orientation,[89] but with a 15% mark-up (as a proxy for non-excessive pricing). BNetzA also proposed in 2017 that FTTH bitstream should be subject only to a "replicability approach" e.g. based on retail minus, in order to enable the market to factor in investment risks, and set prices in a manner which would support take-up.

89 Cost-orientation implies setting the price on the basis of an assessment of the efficient cost of provision including the cost of capital. In the German context cost-orientation involves setting the price on the basis of a bottom up LRIC+ model – the price consists of the incremental cost with a mark-up to make a contribution to common costs.

3 Geographic segmentation in the context of FTTH regulation

In this chapter we discuss the approaches that have been taken towards geographic segmentation of ultrafast broadband markets and/or remedies and the criteria that have been used.

The main findings are as follows:

- WLA markets have been found to be nationwide in Spain, Portugal and France, due to the inclusion of copper and (in the French case) ducts within the market definition. However, all three regulators observed that competitive conditions in ultrafast broadband were likely to vary in different geographic areas.
- Regulators in Spain and Portugal waited until FTTH deployment was advanced before conducting geographic analysis on competition in ultrafast broadband. This enabled them to assess the contestability of different geographic areas based on *actual data*. In areas defined as 'prospectively competitive' these regulators required only partial coverage of duplicate networks (providing scope for further investment), and took into account competition resulting from commercial agreements in addition to network overlap.
- In its 2017 WLA market analysis, the Portuguese regulator continued to forbear from regulatory intervention even in areas which were not prospectively competitive for ultrafast broadband, on the basis that the incumbent's FTTH coverage was low in these areas, and it did not wish to undermine investment incentives. While the Spanish NRA did mandate FTTH VULA in non-competitive zones in 2016, it permitted flexible pricing subject to replicability tests.
- Conversely, the regulator in France made predictions about expected competition and applied geographic segmentation on the regulation of ultrafast broadband networks from the outset. Its criteria for segmentation were therefore primarily driven by theoretical considerations about the replicability of networks. As regulation pre-empted the potential for commercial deals to address competition problems in less dense areas, these could not be taken into account in the regulator's assessment of the 'prospectively competitive zone'.

3.1 Relevance of geographic segmentation for ultrafast broadband

The WLA market has generally been found by NRAs in Europe to be nationwide.[90] NRAs in France, Spain and Portugal also found this to be the case. However, the main reason why NRAs have found that this market has nationwide scope is the inclusion of copper infrastructure as well as (in the case of France) telecom ducts and poles within the relevant market,[91] for which the competitive conditions across the territory are relatively uniform.[92]

When it comes to looking at the specific competitive characteristics of ultrafast broadband networks, all three NRAs observed[93] that there were actual and/or expected competitive differences at regional level resulting from FTTH competition based on the DPA remedy or other forms of passive access such as sewers (in the case of Paris).[94] Thus, NRAs in Portugal, France and Spain have identified geographical market segments which reflect prospective competition in NGA.

3.2 Criteria used to assess prospective competition in ultrafast broadband (FTTH and HFC)

While Spain and Portugal waited seven years or more to assess geographic differences in competition until FTTH deployment was under way, France analysed the expected competitive differences at the outset, before major deployments had occurred.[95]

The timing of the geographic analysis had a major impact on the methodology used. Whereas Spain and Portugal were able to rely on actual data on the location of deployment and advanced deployment plans, the French regulator had to rely on data about housing type, population density and other factors which it considered affected the viability of deployment, thereby relying more on theory than on practice.

In addition, the Portuguese and Spanish regulators were able to take into account the impact of commercial deals (including reciprocal access arrangements) on competition

90 A summary of the main elements of the WLA market analyses across 12 European countries can be found in the study conducted by WIK, IDATE and Deloitte for the European Commission: Regulatory, in particular access, regimes for network investment in Europe.

91 For example, its 2017 WLA review, ARCEP explicitly noted that differences in competition could be observed between zones already served by FTTH and those where deployments were not planned. However, they maintain that these differences were not such as to justify the identification of a subnational market inter alia due to Orange's ownership of ducts and copper nationwide.

92 NRAs have generally not considered that the presence of two basic broadband infrastructures (e.g. incumbent xDSL and copper), or two parallel duct networks provide sufficient competitive distinction to segment areas in which cable is present. NRAs have mandated LLU and access to the incumbent duct and pole infrastructure on a nationwide basis.

93 In the context of retail broadband markets wholesale broadband access markets – or in the case of France, symmetric regulation.

94 If the competitive conditions for the underlying irreplicable physical infrastructure (ducts and prove) prove to be significantly different from the cables deployed within them, it cannot be excluded that in time, DPA might be considered as a distinct market.

95 The French NRA ARCEP segmented symmetric remedies applying to the fibre terminating segment from the outset of the NGA regulatory regime (2009) – and thus before FTTH deployment was widespread.

in the market. In contrast, the symmetric regime of regulated access up front may have pre-empted commercial deals that might otherwise have occurred in France. In turn, the absence of commercial deals on co-investment meant that the potential for these deals to support competition could not be reflected in ARCEP's analysis of prospective competition in different geographies.

A summary of the indicators and criteria used for the geographic segmentation of markets or remedies relating to NGA/FTTH is shown in the table overleaf alongside the implications for remedies and the affected number of households.

Table 3-1: Geographic approaches to ultrafast broadband regulation

	Relevant market and segmentation	Criteria for prospective competition	Competition finding	Associated remedies
France	Symmetric regulation (of any FTTH provider) 2008-10 National market with geographically differentiated remedies	Ex ante assessment based on urban centres, % flats, location within city and announced deployment plans	10% premises prospectively competitive 7% premises limited prospects for competition 83% premises non-competitive	Access to in-building wiring only Access to dark fibre (IRU or rental) at points aggregating <1,000 HH Access to dark fibre (IRU or rental) at points aggregating 1,000HH Pricing set through guidelines and dispute resolution, cost-based + risk adjustment on WACC
Portugal	Retail broadband and Wholesale Broadband Access (bitstream) 2017 Sub-national markets	Market is competitive if **EITHER** >=2 altnets each with NGA coverage >50% + incumbent in parish OR 1 altnet with NGA coverage >50% and incumbent retail Broadband share (all speeds) <50%	There are 286 municipalities with 2.7 m premises (46% of all premises in Portugal) to which the first criterion applies (2 altnets with >50% NGA coverage). Further there are 131 municipalities where the incumbent has less than 50% market share and there is 1 altnet with >50% NGA coverage. In total 73% of broadband customers are located in competitive areas.	No FTTH access remedies nationwide – i.e. forbearance nationwide due to limited FTTH coverage by incumbent in non-competitive areas
Spain	Wholesale local access WLA 2016 National market with geographically differentiated remedies	First step: At retail level competitive zone (zone 1) includes MDFs with • >=2 altnets based on LLU or own infrastructure (incl. infrastructure based on co-invest) each with >=10% retail broadband market share (all bandwidths) AND • <50% retail broadband (all speed) share of incumbent In a second step definition of Ultrafast Broadband municipalities considered to be prospectively competitive with • >=1 competitive MDF which fulfils criteria of zone 1 AND • at least 3 ultrafast networks (FTTH or HFC) each with >=20% coverage (incl. coverage based on co-investment)	66 municipalities (~35% population) prospectively competitive	No FTTH access remedies in prospectively competitive zone (apart from in-building wiring) Elsewhere FTTH VULA subject to EoI and economic replicability test (no price control)

As elaborated in the table above, the main criteria used by ARCEP to designate prospectively competitive zones were: a high population with an urban zone, the location within the urban zone (central core vs surrounding communes), and the prevalence of multi-dwelling units. ARCEP also took into account announcements by operators concerning widespread deployment. The degree of wholesale and retail competition in broadband services were not considered within ARCEP's criteria – and may have been challenging to predict given the limited status of ultrafast deployment at the time when ARCEP's projections were made. Based on these criteria, around 10% of premises (mainly MDUs in dense urban areas), were considered to be capable of being competitively served without regulation on the terms of access or co-investment (except for provisions requiring access to in-building wiring).

Criteria for geographic segmentation in ultrafast broadband analyses in Spain and Portugal focused instead on a combination of coverage and competitive factors.

In Spain, after a 7 year period of forbearance nationwide on ultrafast broadband regulation, in 2016, CNMC developed a two step system for analysing geographic differences in broadband and ultrafast broadband competition.

First of all, CNMC distinguished non-competitive and competitive zones for fixed broadband access (all speeds) at retail level based on the criteria that there are ≥3 operators (including incumbent + ≥2 altnets based on LLU or own infrastructure with ≥10% individual market share and the retail market share of the incumbent was <50%.

In a second step, CNMC identified within the competitive broadband zone (zone 1), MDFs which were prospectively competitive for ultrafast broadband. Prospectively competitive MDFs for ultrafast broadband were defined as those in which (i) there were at least 3 NGA networks (FTTH or HFC) deployed and (ii) each of the 3+ NGA networks had coverage of at least 20%.[96]

CNMC established the boundaries for the prospectively competitive ultrafast broadband zone on the basis of "ultrafast broadband Municipalities", which were municipalities in which there is at least one prospectively competitive ultrafast broadband MDF.

Under these criteria, 66 municipalities covering some 35% of Spanish households fell into areas which were defined as prospectively competitive for ultrafast broadband. Although there are undoubtedly factors such as the prevalence of dense housing, and potential for façade cabling, which are likely to have reduced the cost of deploying

96 In reaching the figure of 20% coverage, CNMC first conducted a test whereby they identified those MDFs with 3 NGA operators and more than 10% and 20% coverage respectively. Then they compared how many of those MDFs were competitive MDFs according to the criteria for competitive zones. In the second case the correlation was stronger, i.e. there were fewer MDFs with 3 NGA operators each with 20% market share outside the competitive zones. The rationale behind this procedure was to assess where prospective competition is to be expected resulting from investment in NGA networks, CNMC assumes that operators will continue to invest in those areas where they already succeeded in gaining market share.

FTTH (and the viability of duplication) in Spain compared with France, it seems unlikely that these could explain all the difference. Rather the difference in the size of the zone could also have been influenced by the choice of criteria and the fact that the assessment was performed some years after large-scale deployment of FTTH began.

The Portuguese NRA ANACOM used similar criteria to those used by CNMC for its geographic analysis of competition in ultrafast broadband. In its 2017 market review (the first market analysis since the initial 2009 market review which applied nationwide forbearance on FTTH regulation), ANACOM segmented the retail broadband market and Wholesale Central Access (bitstream) market with a focus on the *number of alternative operators*[97] *within a parish*[98] *having more than 50% NGA (FTTH or HFC) coverage* and a retail broadband market share of the incumbent less than 50%.

3.3 Approach to remedies in non-competitive zones

As described in the previous chapter (see section 2.3.1), the French NRA applied from the outset relatively detailed rules governing short term access to and co-investment in unbundled fibre access in zones which were deemed to be not capable of being competitively supplied (less dense areas).[99] ARCEP also applied relatively strict regulatory conditions on access and co-investment on buildings and areas within the 'very dense areas', which it deemed were not competitively served.[100]

In contrast, in addition to delaying regulation in 'non-competitive' zones, regulators in Spain and Portugal took a much more flexible approach to access regulation on FTTH networks.

The Spanish NRA mandated FTTH VULA in non-competitive areas, but allowed flexible pricing, subject to replicability (margin squeeze) tests.

Despite identifying retail (and WCA) geographic market segments in which competition was not seen to be in prospect, ANACOM nonetheless continued to apply forbearance on FTTH regulation nationwide, on the basis that the incumbent's FTTH coverage in these areas was limited and that applying regulated access could undermine investment incentives.

97 At least two alternative operators in addition to the incumbent.

98 Parish is the lowest administrative level in Portugal. In 2017 there were 3092 parishes in Portugal. The metropolitan area of Lisbon has 111 parishes and the metropolitan of Porto 173.

99 ARCEP required FTTH networks to be constructed in a way that allowed access to be offered at larger concentration points (serving 1,000 fibre access lines in less dense zones). Access and co-investment is offered at cost-oriented rates with an adjustment to the WACC to account for risk.

100 Aggregation points for these buildings and areas could accommodate less than 1,000 lines, but other regulatory conditions were similar.

4 Regulation of business access markets in France, Spain and Portugal

In this chapter we discuss the approaches that have been taken towards business access markets in France, Spain and Portugal, and examine how regulation was adapted to take into account the impact of unrestricted DPA[101] and mass-market FTTH deployment on competition.

The main findings are as follows:

- In countries where FTTH is prevalent, Ethernet bitstream over mass-market FTTH offers a substitute for dedicated leased lines – at least for some applications.
- The competitive impetus from FTTH as well as unrestricted DPA in France, Spain and Portugal has also supported trends towards geographic segmentation and deregulation of fibre-based active business access in certain areas.
- Where fibre-based business access has been regulated, it is not subject to charge controls, but rather to requirements for "non-excessive" pricing or avoidance of margin squeeze - thereby maintaining incentives for both the incumbent and alternative operators to invest in fibre access for business.
- Regulators in France and Spain have conducted combined analyses of business and broadband markets. The WLA market in France is treated as a generic market for passive wholesale inputs – which feeds into separate downstream markets for active business and active mass-market bitstream services.
- Most EU regulators do not mandate dark fibre for business access or mobile backhaul – on the basis that DPA and/or commercial offers e.g. from wholesale only providers offer a competitive solution.

101 Although mandated in the context of the WLA market, no restrictions were placed on the use of DPA in France, Spain and Portugal. In the network segments where DPA was mandated, it could thus be used for the deployment of mobile backhaul and business access.

4.1 Business access is increasingly migrating to mass-market FTTH infrastructure

An important development in markets which have experienced large scale deployment of mass-market FTTH, is that the high quality levels possible on this infrastructure have caused boundaries on both the supply and demand side to blur between dedicated point to point fibre Ethernet leased lines and Ethernet bitstream offered over mass-market FTTH PON networks with a premium SLA.

This has been recognised in recent market reviews, by NRAs in France, Spain and Portugal, which found that high quality Ethernet bitstream was in the same wholesale market as dedicated leased lines. Indeed, the transition towards FTTH for business has meant that the main SMP remedies for business access in Spain and Portugal are now business-grade ethernet bitstream offers provided over the incumbent's FTTH PON network.[102]

There are trends in the same direction in France. In its latest 2017 review of the WLA market, ARCEP overlaid the 2009 symmetric regulation which requires all operators installing fibre to offer unbundled access to fibre terminating segments[103] (see section 2.3.1) with an additional SMP obligation requiring Orange to provide a business grade SLA for these mass-market FTTH circuits. ARCEP justified this obligation on the basis that mass-market FTTH would be an important input for business access, and was likely in time to substitute for dedicated fibre leased lines.

4.2 Increased competition from FTTH and DPA has allowed geographic deregulation and pricing flexibility in leased line terminating segments

The increased competition in 'high quality' access from mass-market FTTH and cable operators (such as Vodafone, ZON, Orange Spain and SFR), as well as the potential for specialist business operators to use DPA to deploy leased lines,[104] has also

102 ANACOM noted that high quality access services had historically been supplied through leased lines, particularly to guarantee dedicated and symmetric capacity. However, more recently, broadband connections with guaranteed QoS (such as Ethernet connections over GPON or cable networks) were considered equivalent. In its latest high quality market review, CNMC mandated a business form of the NEBA regional bitstream product that had been mandated as a remedy for residential broadband services.

103 Terminating segments entail the portion from the customer to the first distribution point, which in France is required to aggregate at least 1,000 households outside dense areas.

104 There are no restrictions on the usage of the duct in France, Spain and Portugal, and thus it may be used for the selective deployment of leased lines. However, access and pricing rules for DPA in France, make use for dedicated access more expensive than for mass-market leased lines. Specifically, following its 2014 market review, ARCEP determined that, given limitations in space within ducts, priority should be given to fibre installations which make use of 'mutualised' fibre infrastructure. ARCEP therefore applied an obligation that those installing infrastructure for other uses such as for business fibre or other network elements or fibre for FTTC or coaxial termination must leave space available for the deployment of a shared FTTH network. This is termed the 1+1 rule – and requires those installing a separate dedicated infrastructure to incur decongestion costs to make space for others. In addition, in non-mutualised zones (MDUs in very dense areas), the duct access

contributed to an environment in which regulation of fibre-based dedicated leased lines could be relaxed.

Both ANACOM and ARCEP have distinguished fibre-based (or higher bandwidth)[105] business access lines from copper-based lines and identified geographic areas within this ultrafast business access segment which they consider to be competitive.

The competitive business zone[106] in France has been assessed on the basis of (i) business density (20 businesses with 10+ employees per sq km) – a measure which aims to gauge potential competition; and (ii) at least half of the high quality alternative interface lines supplied over fibre identified in the municipality were built by alternative operators.

In Portugal, ANACOM used similar criteria and indicators to geographically segment the higher speed (>24Mbit/s) business market as were used to segment the retail broadband market.[107] Interestingly, when assessing coverage, ANACOM has taken a broad view of potential competitors for high quality 'business' access – including operators with significant (>50%) coverage of premises through mass-market FTTH and cable technologies, as well as operators connecting a point of presence with fibre. This reflects ANACOM's experience that ultrafast mass-market networks can substitute for or be overlaid with dedicated fibre leased lines, while specialist operators deploying fibre to a point of presence are considered to have the potential to deploy dedicated fibre infrastructure using DPA.

The criteria for segmentation in the French and Portuguese market for wholesale high quality access, are shown in the table below.

prices in the transport and distribution segment are volume based, reflecting the need to provide incentives for efficient usage of space. This tends to lead to higher costs for dedicated (point to point) fibre lines. In contrast, the duct access prices in the mutualised zones (smaller buildings, less dense areas), where economics render network duplication difficult, are charged on a flat-rate basis. See discussion at https://www.degroupnews.com/internet/arcep-regulation-fibre_optique-france_telecom-reseau.

105 In Portugal, the NRA found a bandwidth break at 24 Mbit/s, which distinguished copper-based business lines, from those offered over fibre or cable.

106 ARCEP identifies competitive zones within a nationwide market. ARCEP notes that Paris accounts for more than 10,000 dedicated fibre lines, and nearly half of all lines within the competitive zone.

107 Concerning the high speed market ANACOM took into account (i) At least 2 networks of two different altnets in addition to MEO service at least 50% of households within the area through fibre or cable – the existence of a PoP connected with fibre was also taken into account; (ii) at least 2 alternative operators with installed/provided access; and (iii) MEO's share must be below 50%.

Table 4-1: Summary of segmentation criteria for the wholesale high quality (business) access (HQA) market in France and Portugal

Country	Relevant product market and year	Result of analysis	Geographical unit used	Indicators used to identify geographical differences in competitive conditions	Criteria used to identify geographical differences in competitive conditions
France	Market 4 of the EC 2014 Relevant Market recommendation (High quality access provided via fibre) Last reviewed in 2017	Areas within national market	Municipalities	Business density	20 businesses with 10+ employees per sq km
				Altnet's coverage of dedicated fibre	>=50% of the high quality alternative interface dedicated fibre lines in the municipality provisioned by alternative operators
Portugal	M4 (high quality access >24Mbit/s) 2016	Sub-national markets	Parishes/PoP	Number and type of operators	A competitive segment is defined as: at least 2 alternative FTTH or cable networks with 50% or more premises passed in a parish (or PoP served by fibre), and at least one altnet installed at a PoP and at least one altnet effectively providing access in area covered by a PoP (of the incumbent). ANACOM argues that for effective competition the altnet does not only need to be co-installed at the PoP. There also have to be commercial offers in the market which are used by customers.
				Retail high quality access market share of incumbent	PT/MEO's share <50%

The competitive zones for ultrafast/fibre-based business access have been exempted from high quality (business) access regulation entirely in Portugal,[108] and from price regulation in France.[109]

Even outside competitive zones, NRAs in Portugal and France have pursued pricing policies for business access which aim to offer investment incentives, rather than prioritising the shorter-term interests of customers and competitors for wholesale fibre-based leased lines to be offered at a regulated cost-oriented price.

- France: outside competitive zones, ARCEP has pursued "non-excessive"[110] pricing on dedicated fibre access (leased lines) coupled with an obligation to ensure "non-eviction" pricing[111] on the grounds that this approach would foster the development of infrastructure-based competition based on DPA as well as the development of competition for business connectivity based on passive fibre terminating segments.
- Portugal: outside the competitive areas, ANACOM has distinguished between prospectively competitive and non-competitive zones for high speed (>24Mbit/s) business access. In the prospectively competitive zones, it applies only a requirement to ensure replicability, through a margin squeeze test which is not applied 'ex ante', but only on request. Cost-orientation has been limited to those areas in which competition does not appear to be in prospect.

In Spain, Ethernet leased lines are regulated across the national territory, but are only subject to price controls on the basis of retail minus.

108 ANACOM (2016): MERCADOS DE COMUNICAÇÕES ELETRÓNICAS DE ELEVADA QUALIDADE NUM LOCAL FIXO (ACESSO E SEGMENTOS DE TRÂNSITO) Definição dos mercados do produto e mercados geográficos, avaliação de PMS e imposição, manutenção, alteração ou supressão de obrigações regulamentares, downloadable at: https://www.anacom.pt/streaming/DecisaoF1set2016Mercado4.pdf?contentId=1394146&field=ATTACHED_FILE.

109 ARCEP (2017): Décision n° 2017 - 1349 de l'Autorité de régulation des communications électroniques et des postes en date du 14 décembre 2017 portant sur la définition des marchés pertinents de gros des accès de haute qualité, la désignation d'opérateurs exerçant une influence significative sur ces marchés et les obligations imposées à ce titre, downloadable at https://www.arcep.fr/uploads/tx_gsavis/17-1349.pdf.

110 ARCEP does not define what is meant by non-excessive pricing in this context, but it is implied that prices which are non-excessive allow an access-seeker to compete in the retail market. As such, non-excessive could be interpreted as meaning that prices do not create a margin squeeze.

111 ARCEP clarifies that non-eviction pricing means that the operator must offer pricing conditions for access that make it viable for a competitor to make an alternative offer based on its own infrastructure, including infrastructure constructed on the basis of DPA. ARCEP states that it would assess compliance with the principle of non-eviction with reference to the average costs incurred by an efficient third party operator (REO concept).

4.3 The impact of DPA and mass-market FTTH on business access has been reflected in the structure of market analyses

The linkages between what were previously considered separate "business" and "residential" markets have been recognised in the structure of the market review process in France and Spain.

Since its market analysis of 2014, ARCEP has analysed business access (high quality) markets in tandem with the markets for Wholesale Local Access (market 3a of the EU Recommendation on Relevant Markets) and Wholesale Central Access (market 3b of the EU Recommendation on Relevant Markets – formerly the Wholesale Broadband Access market). ARCEP takes a specific approach whereby passive access (including passive access to the mass-market FTTH network with business-grade SLA) as well as dark fibre backhaul (for LLU, ODF and mobile) have been addressed as part of the WLA market. Thus, the WLA market is effectively an upstream passive access market addressing both residential, business and (fixed and mobile) backhaul needs.

WCA and High Quality Access (HQA) are treated as downstream markets, which encompass only active access respectively for mass-market and business-specific purposes. This approach is illustrated in the following diagram.

Table 4-2: Structure of fixed access markets in the French market review procedure

<table>
<tr><td colspan="2">WCA market (mass-market bitstream with regional handover, no SMP remedies on fibre)</td><td>HQA market (active, high quality bitstream and leased lines)</td></tr>
<tr><td>Residential segment</td><td>Mass-market business segment</td><td>Specialised business segment</td></tr>
<tr><td colspan="3">WLA market, duct and pole access, dark fibre access and backhaul, copper unbundling</td></tr>
</table>

Similarly, in Spain, in 2016, the wholesale high quality market review was conducted alongside the market 3a (WLA) and 3b (WCA – mass-market bitstream) reviews. In the discussion on remedies applying in the wholesale high quality market, CNMC makes reference to the relevance of the duct and pole access obligation imposed in market 3a which enables alternative operators to deploy fibre and expand their network infrastructure for the provision of services in the high quality access market 4.

It is also notable that in 2016 CNMC built on the existing mass-market FTTH bitstream (NEBA) remedy, imposed in the WCA market (market 3b), to establish a core remedy

for the provision of enterprise access.[112] Bitstream is considered to meet the needs of business customers seeking 'high quality' when it provides premium service level agreements and traffic of higher priority than best effort.

4.4 Forbearance from FTTH regulation and fixed mobile convergence have supported the economics of dark fibre backhaul

Another interesting development in Spain and Portugal, which may have been influenced by the high investment requirements needed for FTTH deployment as well as 4G, has been the consolidation of the market towards a structure in which there are three major operators with fixed mobile converged networks and services (see section 6.2).

In turn, as observed in WIK's 2016 study for the European Commission,[113] these consolidated and converged market structures provide increased economies of scale and scope which appear to improve the case for investments in dark fibre backhaul.

From interviews conducted with telecom operators, we understand that in Spain and Portugal, dark fibre backhaul for both mobile and broadband is often self-supplied by converged operators, or provided on a commercial unregulated basis. Dark fibre for mobile backhaul is also not subject to regulation in other European countries including Sweden, the Netherlands, Italy, Germany, due to perceptions by the regulator that there is adequate scope for self-supply and/or availability of commercial dark fibre offers e.g. from specialist fibre providers or wholesale only operators.

While dark fibre backhaul has been available on a regulated basis in France since 2006 as an associated facility to LLU,[114] and its use was extended to ODF[115] backhaul (through the market analysis conducted 2014) and mobile backhaul (through a 2015 dispute brought by Iliad), it is not subject to cost-orientation, nor is its pricing linked to other products which are subject to cost-orientation. Rather, it must be made available on a long-term basis (through IRUs) at prices which are "non-excessive".[116]

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112 The wholesale broadband services previously in place already allowed for use by both residential and business customers. Thus, they had business specific quality of services features (Such as SBR traffic and connection admission control in the case of GiGADSL, gold traffic in ADSL-IP and NEBA and real-time high flow traffic in the case of NEBA) as well as symmetric flow modes. For business access SLAs have been defined for activities such as service provision and repairs. Finally, as an optional extension to the deadlines defined for the resolution of incidents due to breakdowns, operators can request the provision of a maintenance service similar to that provided by Telefónica at retail level (premium maintenance). There are also penalties associated with non-compliance with these SLAs.

113 Regulatory, in particular access, regimes for network investment in Europe https://publications.europa.eu/en/publication-detail/-/publication/c0da75d9-9a8c-11e6-9bca-01aa75ed71a1/language-en

114 Between MDFs or MDF and PoP.

115 Optical Distribution Frame.

116 Case FR/2017/2030.

5 How have NRAs adapted copper regulation to foster migration to fibre?

In this chapter we examine how regulators have addressed the challenge of migration from legacy copper networks to fibre networks e.g. in their approach to enabling copper switch-off and in the relative pricing of copper vs fibre.

The main findings are as follows:

- Regulators in France, Spain and Portugal have all pursued strategies that aim to achieve stability in copper pricing, although they have used different mechanisms to achieve this. Prices of copper LLU have fluctuated around the €8-10 range identified in the Commission's 2013 Recommendation on cost methodologies and non-discrimination.
- Regulators have followed guidance in the 2010 Commission NGA Recommendation that closure of exchanges with co-located operators should be subject to a 5 year notice period. Significantly shorter periods are however possible in exchanges without co-located operators in Spain, and the French NRA has set out broad conditions under which it would permit an earlier switch-off.
- Copper switch-off is progressing at a steady pace in Spain (with more than 650 exchanges due for closure by 2020), but has been very gradual in Portugal, and has experienced set-backs in France.

5.1 The migration challenge

Traditionally, regulation of copper access has focused squarely on how promote competition in broadband and telephony (based on LLU) and protect consumer interests. The justification is that the ubiquitous copper networks of incumbents were mainly financed and installed before the telecom sector was liberalised, at a time when the companies were typically state-owned monopolies. The status of this infrastructure could thus considered to be different from fibre infrastructure, which has been newly constructed at a time when the sector is fully liberalised. As they were installed some decades ago, it has also been recognised in the UK (as well as in the EU through the 2013 Recommendation on cost methodologies and non-discrimination),[117] that some of the copper lines and underlying ducts may have been fully depreciated. This is reflected inter alia in the cost calculation for LLU.

117 Para 40 Recommendation on consistent non-discrimination obligations and costing methodologies https://ec.europa.eu/digital-single-market/en/news/commission-recommendation-consistent-non-discrimination-obligations-and-costing-methodologies.

More recently, in the context of NGA deployment, it has been acknowledged that pricing copper in a manner that purely reflects consumer welfare in copper-based retail services, could have a negative impact on FTTH investment and migration. More specifically, if the FTTH retail price is constrained by a low copper wholesale charge, this may limit the viable scope of deployment, while if FTTH wholesale and/or retail charges are set significantly above those charged for copper, this may impact alternative operators' incentives to invest in FTTH (rather than relying on access to the cheaper legacy infrastructure) and retail customers' incentives to migrate to the more modern technology.[118]

Another challenge that NRAs have faced in pricing copper in the transition to FTTH is that volumes of the legacy infrastructure inevitably fall, which would normally result in increased per line costs, unless adjustments are made to the price control methodology to prevent this.

Finally, in countries in which FTTH deployment has become more widespread, there is a clear economic case to move towards copper switch-off in order to maximise take-up on the fibre lines, thereby improving the business case, and minimise duplicate network costs. This raises regulatory questions as regards the treatment of alternative operators relying on LLU at copper exchanges which are due to be closed, as well as how to handle the switch-off of legacy analogue equipment that may be in use – especially for businesses.

5.2 Approaches in France, Spain and Portugal

Migration from copper to fibre is a live issue, especially in Spain and Portugal, which have achieved widespread FTTH deployment, and commercial developments are ongoing towards this goal. However, regulatory approaches on this issue in France, Spain and Portugal, mainly reflect the guidelines set out in the 2010 NGA Recommendation and 2013 Recommendation on cost methodologies and non-discrimination, and pursue a cautious and gradual approach, which may limit disruption

118 There is a range of literature on this subject. A summary is provided in WIK (2016) Regulatory, in particular access, regimes for network investment in Europe. In a 2011 study by Hoernig et al, WIK modelled the business case for an incumbent operator operating copper and FTTH networks in parallel and concluded that a forced migration strategy from copper to fibre would be economically rational from the perspective of the FTTH investor and desirable from a welfare perspective, as the business case of a fibre network critically depends on the degree of penetration. A similar argument concerning the case for copper switch-off was made by Hausman et al. (2008) in the US context. They concluded that if the local access operators in the US were not permitted to retire their copper loops, they would be forced to maintain a duplicative network and would be burdened with the cost of maintaining that network. By scrapping obsolete copper loops, access investors could focus their resources on deploying a more powerful fibre network. Hausman concluded that restrictions on switch-offs would disincentivise investment to a next generation platform. In a study conducted by CRA on behalf of the Commission and published in July 2012, CRA found that in the case of parallel operation, the relative charges for copper and fibre access would be key to determining the pace of (voluntary) migration to fibre. Specifically, CRA found that if copper access charges were too low relative to fibre access charges, customers may not be incentivised to switch.

for consumers and alternative operators, but lead to the inefficient parallel operation of networks for some years to come.

The table overleaf summarises the approaches taken towards copper pricing, the allocation of duct costs between fibre and copper, which is relevant for the migration process, and the rules governing copper switch-off.

Table 5-1: Overview of approaches to copper pricing, allocation of duct costs between fibre and copper and to copper switch-off

	France	Spain	Portugal
Copper prices	ARCEP took measures to provide for copper pricing stability. However, LLU tariffs have risen from €8.80 per month in Jan 2012 to €9.50 in Jan 2019.	Price stability Since 2009 Top down cross-checked with bottom-up LRIC model, in 2016 switch to BU-LRIC+	Price stability. In latest WLA analysis, ANACOM warned the incumbent that unless it gave assurances that current RO LLU prices would not increase, it would apply a BU LRIC+ model, which ANACOM considered would ensure predictability and stability of wholesale prices.
Allocation of duct cost between technologies	In calculating the charge for duct access, civil engineering costs in the access network are allocated between copper and fibre according to the respective number of retail lines (residential, business and mobile backhaul) using copper and fibre.	Duct cost allocation between copper and fibre networks is based on duct usage – namely the fraction of subducts in the total number of subducts for each street segment used by the given technology.	
Copper switch-off?	5 years notice required providing that at least on fibre provider and “equivalent offers” available over fibre. Shorter notice period can be requested in areas (called ‘fibred zones’) where in addition to these criteria, fibre has been installed to the end-customer, and an enhanced SLA is available for business use. ARCEP also considers competitive factors when considering whether requests for a shorter period would be reasonable.	5 years if alternative operators connected to the exchange (to allow migration). Where no alternative operators: 1 year + 6 months grace period if there are active copper lines in a given MDF.	5 year notice required. PT/MEO plans to reduce COs 4:1 by 2030

All three countries have pursued an approach of copper pricing stability, but have achieved this outcome in different ways. In France, ARCEP adjusted the depreciation periods for copper (on the basis that copper would ultimately be phased out) and ducts (whose depreciation period was extended). ARCEP also excluded from the cost-base more costly copper lines that were too long to provide a DSL service.

ARCEP also provided for a gradual rebalancing of duct costs between copper and fibre reflecting demand, by allocating costs on the basis of the proportion of active lines which rely on these technologies.[119]

In Spain, a theoretical BU-LRIC+ copper/NGA overlay model was used to avoid disruptive volume changes[120] – while the Portuguese NRA warned the incumbent that it would pursue the same approach if the incumbent did not ensure pricing stability.

As regards copper switch-off, all three NRAs apply a 5 year notice period for exchanges in which there are co-located operators. However, a considerably shorter period of 1 year is available in Spain for exchanges with no co-location, while ARCEP has established conditions under which it could agree to a shorter period, including the availability of offers on the fibre network which provide satisfactory technical and economic access conditions allowing altnets to reproduce "in an equivalent manner" offers available on the copper network.[121]

In practice, switch-off has not yet occurred in France. This partly reflects the slower deployment and take-up levels in France, as well as reluctance from some consumers and businesses.[122]

However, the rules permitting a more rapid switch-off of MDFs without co-located operators has facilitated a progressive switch-off in Spain. The first copper exchanges were switched off in 2014 and a total of 27 exchanges (without collocated operators) had been closed by mid 2017. Another 160 exchanges are due to be closed by the end of 2018, and Telefonica's Faro Project is designed to enable the shutdown of 653 copper exchanges by 2020.

Telefonica notified the first closure of an exchange involving unbundled operators in 2016 –this closure should take place by 2021, according to the rules in force. In its 2016

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119 *The costs of local loops installed in ducts are allocated between copper and fibre according to the number of retail access lines based on copper and fibre* (ie the respective take-up) using the duct network. Such retail access lines include those used for residential and business purposes as well as other types of access such as mobile base stations.

120 Duct costs were allocated between copper and fibre based on % duct usage.

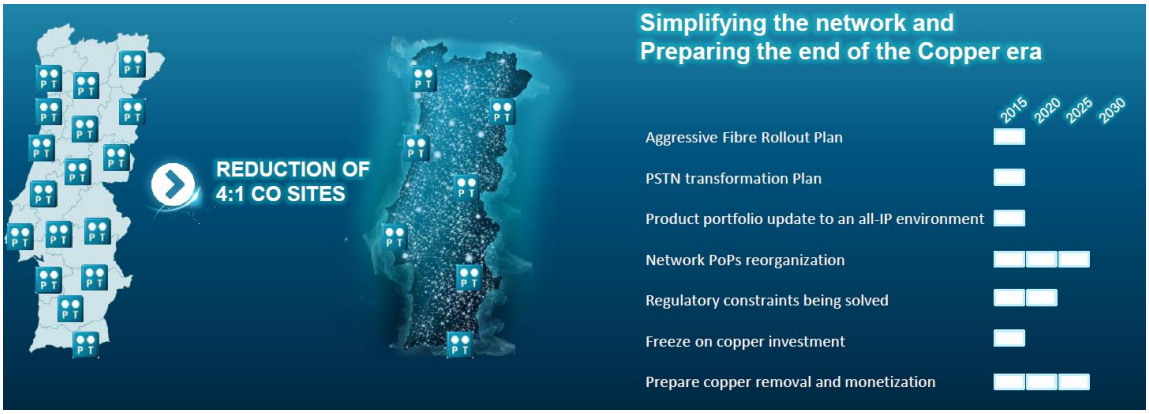
121 ARCEP notes that a shorter switch-off period could be allowed in 'fibred zones' which meet the following criteria (i) At least one fibre network fully constructed and reaching households; (ii) offers available on the fibre network which provide satisfactory technical and economic access conditions allowing alternative operators to reproduce „in an equivalent manner" offers available on the copper network; and (iii) availability of an enhanced SLA for business use.

122 This is illustrated in the Palaiseau copper switch-off trial, which was abandoned following changes in local Government and challenges servicing analogue equipment.

WLA market review, CNMC stated that when switch-off occurs, access seekers must migrate to other solutions such as rolling out their own infrastructure or relying on wholesale offers based on NGA infrastructure (in those geographic areas for which regulation applies).

Switch-off is also proceeding, but at a gradual pace, in Portugal. The Portuguese incumbent declared that it planned to reduce the number of copper exchanges to a quarter of those present from the period 2015-2030 (i.e. 15 years). The first steps – due to be completed by 2020 include PSTN switch-off, and migration to an all-IP environment.

Figure 5-1: Network transformation from copper to FTTH



Source: Alveirinho, L. (2016).[123]

123 Alveirinho, L. (2016): Portugal Telecom, An All-fiber Company in an All-Fiber Country, http://www.digiworldsummit.com/wp-content/uploads/2016/11/DWS16_Luis_ALVEIRINHO_Portugal_Telecom.pdf.

6 What have been the implications for competition, co-investment and wholesaling?

In this chapter we describe, based on available data, the implications of the regulatory approaches pursued in Spain, Portugal and France, on end-to-end infrastructure competition, and assess the degree to which further choice in ultrafast broadband has been achieved in these countries through access and co-investment offers.

The main findings are as follows:

- Experience from Spain and Portugal shows that competition models for FTTH can differ from the short term regulated access model that applied for unbundled access to the copper loop.
- Some end-to-end duplication of three or more ultrafast access networks appears to be feasible at least in very dense urban areas and to multi-dwelling units. In France end-to-end infrastructure competition has been achieved to around 10% of households, while we estimate that duplication with three or more ultrafast infrastructures could address more than one third of households in Portugal.
- In addition, examination of these countries shows that, in the absence of regulation, reciprocal access arrangements or other forms of commercial co-investment or wholesaling can emerge to ensure choice in retail services. In France, we estimate that around 30% of households may have a choice of three or more ultrafast broadband providers. This proportion is at least 38% in Spain and 44% in Portugal.
- Data from regulators in France, Spain and Portugal confirms the important role that DPA can play in supporting competitive investment in FTTH not only by alternative operators, but also by cable operators. Cable operators have expanded their footprint (or engaged in mergers with the same effect) through fibre deployment in all three of the countries assessed. Data from France also confirms that in the absence of restrictions on the use of DPA, it has been extensively used to deploy business access lines.

6.1 FTTH provides alternative models for competition

Competition in the copper environment was restricted largely to cable and competition based on short term contracts for regulated access to the unbundled copper loop. However, the move to FTTH has revealed that a number of alternative competitive models for ultrafast broadband are possible – many of which can arise from commercial negotiation rather than regulation.

Firstly, as demonstrated in section 6.3.1, and as indicated in various theoretical models[124] the availability of regulated access to ducts and poles could be expected to lead to some degree of end-to-end infrastructure-based competition. This could result in three or more parallel infrastructures (FTTH or FTTH and cable) although this duplication is likely to be restricted to very dense areas and/or for buildings housing multiple housing or business units.

Outside those areas, where duplication by three or more networks is not economically viable, the fact that FTTH networks are new investments, which are being conducted not only by the incumbent, but also potentially by other operators, allows for various forms of risk sharing or co-investment to be pursued amongst FTTH investors and between FTTH investors and former access seekers.

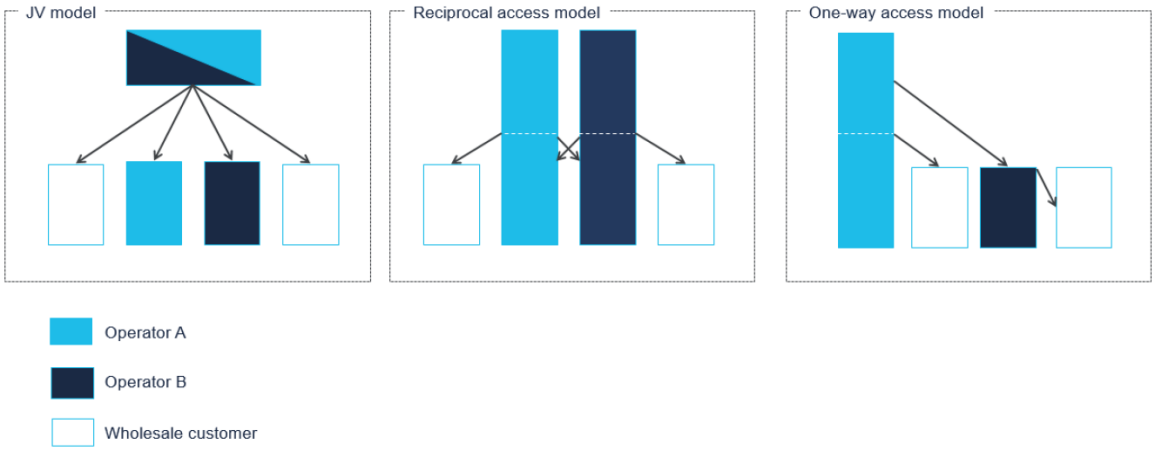
One feature that is common to both co-investment and risk sharing is that a single investor takes the lead in deploying FTTH in a given area (i.e. there may be no duplicative investment in fibre). However, the agreement enables end-users to have a choice in ultrafast broadband. Beyond that, there are differences between these models, which can be described as follow.

Co-investment typically refers to arrangements with a very long-term contract (often in excess of 20 years and taking the form of an indefeasible right of use, or IRU), involving capital outlays at the start, and often (although not always) occur amongst investors (which may previously have been access seekers).

Co-investment models can vary depending on the relationship between the co-investors (Joint venture, reciprocal access (regional swaps) or one-way access). These relationships are illustrated in the following diagram. Other factors which will be settled in a co-investment agreement include the nature of the access provided between the parties or to third party access seekers (passive vs active access), operational conditions and access pricing. Access pricing in co-investment agreements is often on the basis of Indefeasible Rights of Use (IRUs), which grant operators the right to use a given number or proportion of fibre access lines over a long period, typically of 20 years or more. There are often additional charges per active line to reflect operational costs.

124 See for example WIK (2008) Economics of Next Generation Access.

Figure 6-1: Models of co-investment



Source: Berkeley Research Group, for Vodafone 2016

Risk sharing agreements on the other hand typically refer to agreements between an investor and access seekers, which involve a longer period than is typical for access rental (but shorter than IRUs), and can involve a degree of up-front commitment e.g. by paying at the outset for the right to use access lines at a lower unit cost, than would be available to those renting without commitment. The pooling of capital associated with these arrangements not only serves to defray financial risk, but also, as a result of the upfront (sunk) payments, puts parties which are engaging in co-investment or risk sharing in a commercial position which is more similar to that of the infrastructure investor – enabling more dynamic competition in pricing and services than can occur in an access rental model, without upfront commitments.[125]

The recently agreed Electronic Communications Code acknowledges the positive role that can be played by commercial agreements including co-investment by requiring NRAs to consider the impact of such agreements on competitive dynamics, when they consider imposing SMP obligations.[126] Commitments to co-investment which meet certain criteria can also lead to a decision that no SMP obligations on very high capacity networks would be imposed.[127]

125 BEREC (2017): BEREC views on Article 74 of the draft Code Co-investment and "very high-capacity (VHC) networks"; BoR (17) 87, downloadable at https://berec.europa.eu/eng/document_register/subject_matter/berec/opinions/7033-berec-views-on-article-74-of-the-draft-code-co-investment-and-8220very-high-capacity-vhc-networks8221 and BEREC (2012): BEREC report on Co-investment and SMP in NGA networks, BoR (12) 41, downloadable at https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/333-berec-report-on-co-investment-and-significant-market-power-smp-in-next-generation-access-networks-nga.

126 Article 66 draft electronic communications Code.

127 Article 74 EU electronic communications Code.

6.2 Experience in France, Spain and Portugal

France, Spain and Portugal provide evidence of the degree to which DPA can support end-to-end infrastructure-based competition.

Additionally, because of their initial strategy of forbearance in regulating ultrafast broadband networks, Spain and Portugal offer a glimpse of how commercial deals amongst operators can evolve in an ultrafast broadband environment.

It is worth noting that there was a period of consolidation amongst the leading operators in the years after the regulatory regime for ultrafast broadband was established. The investment requirements associated with FTTH (and expectation that *all* operators should commit to making investments) coupled with the need to invest in fibre backhaul for the deployment of 4G mobile was a likely driver of this consolidation. In each case, consolidation resulted in three powerful fixed mobile converged operators, with smaller fourth converged players in Spain and France.

All of the largest operators in France, Spain and Portugal engaged in deploying FTTH directly,[128] although in line with the predictions from theoretical models, end-to-end duplication by three or more players appears to have been limited to very dense areas and especially multi-dwelling units.

Outside areas in which end-to-end infrastructure competition based on DPA or end-to-end duplication is viable,[129] France, Spain and Portugal all relied on co-investment in fibre access, rather than short term access rental, as the main source of competition in ultrafast broadband.

However, a key distinction amongst them, is that whereas in France, co-investment[130] in fibre terminating segments was mandated on all operators through legislation from the outset of the FTTH deployment, in Spain and Portugal, co-investment deals[131] emerged on a commercial basis amongst investing operators, during the period when there was forbearance on regulated wholesale access to the incumbent FTTH network.The co-investment models differ in each case, but all are long term, and framed in the context of an ”Indefeasible Right of Use” (IRU):

128 Even in very dense areas, in-building wiring has been shared to avoid inefficient duplication. Detailed standards and regulatory principles on this subject have been developed in France, Spain and Portugal. This is discussed in more detail in a 2018 study by WIK for the European Commission. WIK/VVA (2018) Implementation and Monitoring of the Broadband Cost Reduction Directive.

129 References to end-to-end infrastructure competition throughout the report, refer to self-built access lines, which may have been installed in own duct (e.g. by certain cable operators or business providers prior to the implementation of DPA), or using DPA from the incumbent or utilities.

130 Co-investment in the form of IRUs can take place before or after the installation of FTTH.

131 These deals covered access to some existing infrastructure as well as commitments to build infrastructure in non-overlapping areas and offer reciprocal access.

In Portugal, co-investment involved reciprocal access arrangements. The initial agreement was between the alternative operators Optimus/Sonaecom and Vodafone for a total of 200,000 households. Incumbent MEO reached a deal with Vodafone in 2014 which involved each company deploying fibre to 450,000 households and offering on a reciprocal basis passive (unbundled) fibre access over a period of 25 years. A 2017 deal between Vodafone and NOS aims to share access to 2.6m FTTH households.

Co-investment in Spain also involved reciprocal access arrangements, backed by IRUs. In Spain, the two main competitors Vodafone and Orange Spain, agreed a swap deal in March 2013 covering 3 million households, which was adapted following Vodafone's acquisition of the cable operator ONO. Orange Spain later in 2016 concluded a swap deal covering 2 million households with the fourth operator Masmovil. The agreements are understood to have been based on bitstream.

Co-investment in France, as previously stated, has been subject to regulation. The results of the process, which was subject to extensive dispute resolution procedures by ARCEP in 2011, were that standard offers were provided by the largest operators,[132] which included offers for IRUs giving the right to access a portion of fibre terminating segments.[133] Prices varied depending on when IRUs were purchased. Rental of dark fibre was also available at a price which was adjusted to take into account the lack of risk-sharing in this arrangement.[134]

6.3 Competitive outcomes

As described in section 3.2, in the course of their market reviews,[135] NRAs in France, Spain and Portugal each outlined zones which they considered to be 'prospectively competitive' for the purposes of ultrafast broadband (cable DOCSIS 3.0 and above and FTTH). However, with the exception of ARCEP in France, the NRAs do not give precise details about the proportion of households which have been reached by 2 or 3 (or more) parallel end-to-end ultrafast networks.

In section 6.3.1, based on publicly available information, we examine which operators have installed FTTH access lines and estimate the degree of choice available for consumers based solely on independent FTTH lines (excluding any effects from co-

132 Agreements involving Orange, SFR (later acquired by Altice/Numericable) and Iliad were signed in 2011.

133 In less dense areas co-financing operators are allowed to invest in 5% tranches of lines.

134 Prices are cost-based with an adjustment to the WACC to account for risk. Prices vary depending on whether the co-investment commitment occurs before or after the deployment of FTTH. Orange's offer is around €500 per line upfront with a €5 monthly fee for each active line in less dense areas. Access to the fibre terminating segment without up-front commitment is typically available for a monthly rental of around €15.

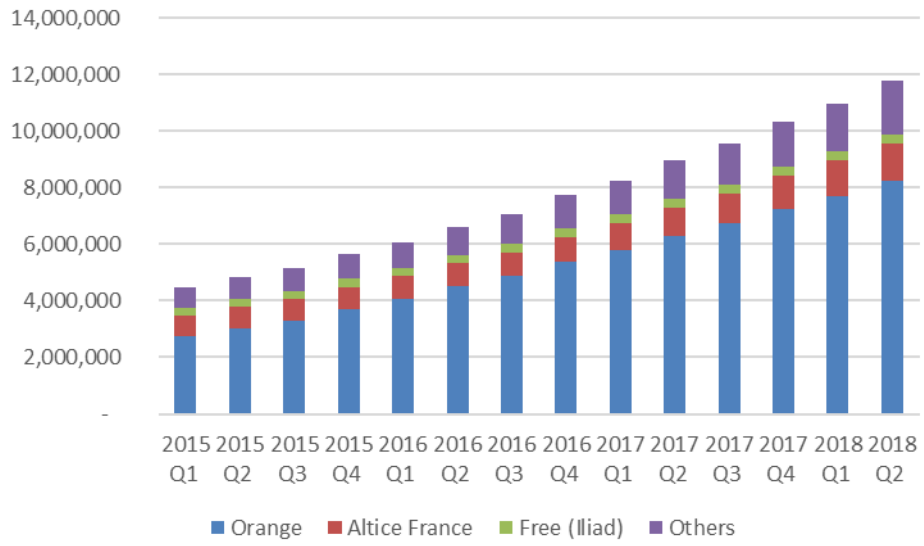
135 In the case of France, this review was conducted in the context of applying national legislation on the sharing of the fibre terminating segment – see section 2.3.1 for a summary of the provisions of that legislation.

investment and wholesaling). In section 6.3.2, we additionally consider what choice is available to customers when commercial and regulated co-investment and wholesaling arrangements are taken into account.

6.3.1 How much end-to-end infrastructure based competition has arisen?

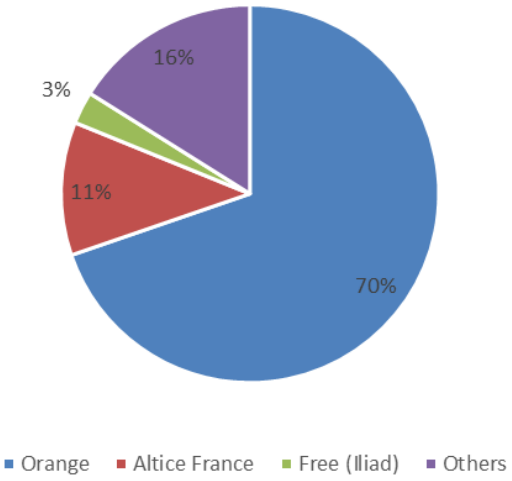
Data from ARCEP shows that the incumbent Orange deployed the highest number of commercially funded fibre access lines in France – 70% of the total. The cable operator Altice was the second largest investor, but other operators constructed nearly 20% of the lines.

Figure 6-2: FTTH lines deployed by commercial operators in France



Source: ARCEP broadband observatory

Figure 6-3: Share of total FTTH lines connected in France Q2 2018



Source: ARCEP broadband observatory

As of Q2 2018, ARCEP reports that 36% of French households were served with FTTH, while 27% of households were served with cable offering speeds of at least 100Mbit/s.

In practice, as of end June 3018, 3m households within the very dense areas (9% of households in France as a whole) had access to at least three operators based on FTTH. This is very close to ARCEP's estimate of 10% as the proportion of premises susceptible to competition in FTTH.[136] Because ARCEP excludes cable from this data, it seems reasonable to assume that many of these buildings might have four parallel ultrafast infrastructures installed when cable is included.

Outside the dense pockets in very dense areas, only one FTTH access infrastructure[137] is built under the French mutualisation (co-investment) regime. If the FTTH deployment overlaps the cabled area, which seems likely (assuming FTTH was deployed as competitive response), it could be assumed that around 18% of premises in France have access to 2 ultrafast end-to-end infrastructures (cable + 1 FTTH infrastructure). A further proportion of households (around 9% if cable and FTTH coverage overlaps) would have access only to one FTTH network (and no cable) in France. These are likely to include the lines which have been deployed in public initiative areas which are eligible for subsidies.

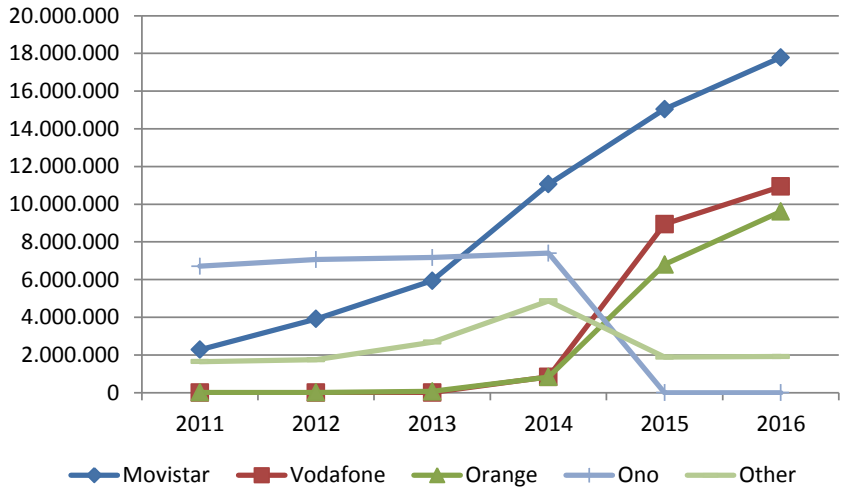
136 ARCEP defines zones which are susceptible to end-to-end infrastructure competition (with sharing only of in-building wiring) with reference to MDUs with more than 12 units or households accessible by visitable sewers within the largest urban centres. These zones represent around 10% of all premises in France.

137 However, the degree of aggregation required can vary depending on the level of perceived challenges associated with duplicating infrastructure.

In Portugal, ANACOM does not provide precise figures on the degree to which there is end-to-end duplication of ultrafast networks. However, it has provided information on the total coverage of FTTH and HFC lines, which allows us, coupled with data on the coverage of individual operators, to estimate the degree of overlap. Taking into account the tendency for network duplication to occur in the most dense areas (Lisbon and Porto), we estimate that around 36% of households could be expected to have access to at least three independent ultrafast (2 FTTH and 1 cable) networks in Portugal, while around 72% of households are likely to have access to at least two independent ultrafast networks (primarily the incumbent and cable).[138]

In Spain, CNMC has not to our knowledge, produced precise figures around the absolute number of households directly connected by 3+ ultrafast networks in Spain. However, it has published information about FTTH and cable coverage per operator (see figure below).

Figure 6-4: Spain: Ultrafast broadband coverage by operators



Source: CNMC (2018).[139]

138 ANACOM reports that in Q1 2018 89% of households have at least one NGA operator, FTTH coverage without overlaps was 77% HH and cable coverage without overlaps was 71%. FTTH has overtaken cable coverage. Assuming that MEO (which started from a lower level of coverage), deployed FTTH in cable areas, we assume that 71% of households are served by at least 2 ultrafast network operators. Data published by ANACOM on FTTH indicates that alternative operators mainly invest in dense areas. As a rule, the incumbent and cable operators also roll out their networks in those areas. This should mean that the households served by the FTTH network of Vodafone are served by at least 3 network operators. At the end of 2016, Vodafone had coverage of 44% households (2.3m), but it is not clear whether this figure included the 0.45m households covered by a co-investment agreement with MEO. If these households are deducted from Vodafone's coverage, this leaves 36% of households served by at least 3 operators on the basis of parallel networks.

139 CNMC (2018): Informe anual 2017, downloadable at: http://data.cnmc.es/datagraph/jsp/inf_anual.jsp.

If one assumes that the largest alternative operators, Vodafone and Orange Spain have between them overlapped the FTTH network of the incumbent Telefonica, [140] around 57% of households seem likely to be served by at least two ultrafast networks. However, making estimates of the proportion of households with three independent ultrafast networks in Spain is challenging, because – unlike in France and Portugal, the most densely populated areas – Madrid and Barcelona – are not well-served by cable.

6.3.2 Competitive outcome resulting from co-investment

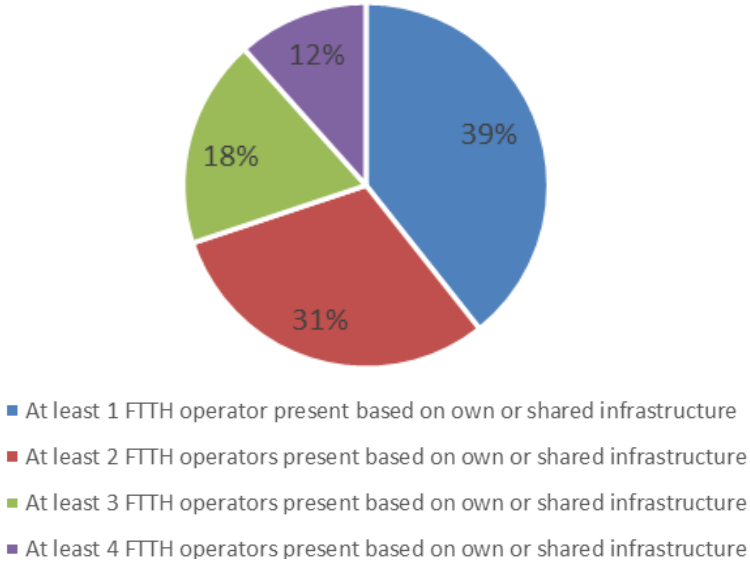
As discussed in section 6.2, the actual choice available to end-users in ultrafast broadband has also been affected by the co-investment arrangements which have been made in France, Spain and Portugal. Co-investment agreements, as well as voluntary risk sharing agreements, which were signed in areas where regulatory forbearance was applied, have served to increase the proportion of customers which have a choice of three or more ultrafast broadband service providers.

ARCEP has reported on the proportions of households with FTTH access that have a choice of more than 1, 2, or 3 FTTH providers based on the regulations governing 'mutualisation of the fibre terminating segment' i.e. regulations requiring co-investment and access offers to dark fibre by all operators.

As a result of FTTH infrastructure sharing agreements made under this regime, as illustrated in the following graph, as of Q2 2018, 31% of all premises had a choice of at least 2 FTTH operators (or 3 ultrafast operators if cable and FTTH overlap), while 18%% of premises had a choice of at least 3 FTTH operators (or potentially 4 ultrafast operators when cable is taken into account).

140 This should be a reasonable assumption given that Telefonica's coverage is significant and that it has not engaged in infrastructure swaps with Vodafone or Orange Spain – thereby requiring them to install their own infrastructure in parallel to remain competitive. The publications of the regulator also suggest this in that they state that altnets began by rolling out FTTH in dense areas where Telefonica was present.

Figure 6-5: Choice of FTTH operators available in France



Source: ARCEP broadband observatory

The effect of co-investment on choice is harder to gauge in Spain and Portugal, because the degree of choice available by technology is not reported by the NRA. However, based on information around commercial co-investment swaps in these countries, it seems likely that the effect would be significant.

Regarding Spain, swap agreements by Orange Spain give it access to more than 3.5m ultrafast lines in operation or due to be constructed, in addition to the 10m lines it had constructed by the end of 2016. Taking into account the reciprocal nature of these agreements, 7m individual subscribers (38% households) would have a choice of two or more ultrafast broadband providers (i.e. Orange Spain or Vodafone). This would likely be 3 ultrafast providers, if as seems likely, these lines overlap Telefonica's extensive deployment. These figures exclude premises for which Orange Spain and Vodafone and Telefonica have each deployed parallel infrastructure. The true proportion of households with access to three or more offers through own infrastructure or reciprocal access arrangements could therefore be higher.

In addition to the choice available via the reciprocal access agreements, a choice of at least three retail ultrafast providers in Spain has also been assured across the whole footprint of Telefonica's FTTH deployment through wholesale access offers. The introduction by CNMC in 2016 of regulated FTTH VULA in non-competitive areas has enabled a choice of at least three operators based on access-based competition in areas covering around 65% of the population, and access has been extended to areas not subject to FTTH regulation through the signature in 2017 of a commercial FTTH

wholesaling agreement between Telefonica and Vodafone as well as Orange Spain (in 2018), based on long-term guaranteed sales (i.e. effectively a risk sharing arrangement).[141]

The Portuguese NRA ANACOM reported that, as of Q1 2018, 44% of households had a choice of ultrafast broadband provider based on own infrastructure or co-investment agreements. However, information on deployment plans and co-investment agreements provided by operators suggests that this choice could expand in coming years. According to plans announced by the incumbent MEO, it intends to reach 5.3m homes with FTTH by 2020,[142] while Vodafone claims that plans for network sharing with the cable/FTTH provider NOS would take its footprint from 2.7m today to 4m (80%) of households.[143] The high degree of shared infrastructure coupled with evidence of end-to-end duplication in urban areas suggests that a very high proportion of end-users, perhaps as much as 80%, could in future have access to three or more infrastructures through sharing in Portugal.

Although the Portuguese incumbent made available a commercial wholesale offer for FTTH-based access in 2016,[144] the high degree of swap arrangements, suggests that it may not be utilized in practice meaning that it may not have an impact on end user choice at retail level.

As can be seen above, data about the choice available to end-users is not available or provided in a consistent format, but the following table provides an estimation of the implications of end-to-end infrastructure competition, co-investment and reciprocal access, and wholesale offers on choice in France, Spain and Portugal, based on available data.

141 https://www.telefonica.com/en/web/press-office/-/telefonica-and-orange-sign-a-commercial-wholesale-agreement-for-fiber-optic-network

142 https://www.telecom.pt/en-us/media/noticias/Pages/2017/setembro/anuncio_4_milhoes_casas_fibradas.aspx

143 http://www.vodafone.com/content/index/media/vodafone-group-releases/2017/vodafone-portugal-and-nos-fibre-network-share-agreement-in-portugal.html - notes that Vodafone had coverage of 2.7m in Oct 2017, 450,000 of which were based on a reciprocal agreement with the incumbent.

144 https://www.telecom.pt/en-us/media/noticias/Pages/2016/marco/pt_avanca_com_oferta_grossista_para_a_rede_fibra.aspx

Table 6-1: Estimates of choice available in ultrafast broadband provider based on parallel infrastructure and co-investment

	FTTH coverage % households	% HH with choice of 3+ ultrafast offers based on parallel infrastructure	% HH with choice of 3+ offers based on parallel infrastructure and co-investment	Availability of ultrafast bitstream offers on regulated or commercial terms
France	36% (Q2 2018)	~10%	~30%	Wholesale cable, subject to competition law remedies
Spain	71% (2017)	Not known	38% +	Available from incumbent nationwide – some areas regulated, others offered on commercial basis
Portugal	89% (2017)	~36%	44% Q1 2018 ~80% possible in view of announced network sharing	Available from incumbent on commercial terms, low take-up

6.3.3 Broadband and FTTH retail market shares of the incumbent

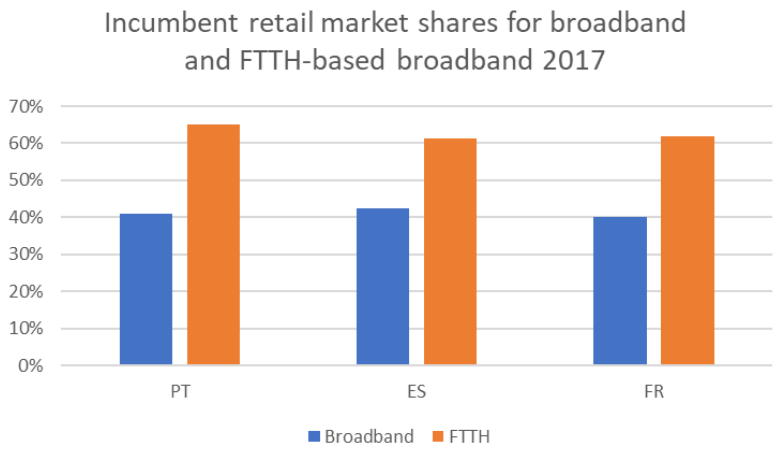
Incumbents' retail market shares in broadband generally have been lower than their FTTH market shares.

For example, in France, while Orange had a stable market share of around 40% in retail broadband services Orange had a share of 60-65% of all FTTH subscriptions as of mid 2017; its share of net FTTH adds was between 50%-70% of FTTH customers in the previous 2 years[145].

Incumbents in Spain and Portugal have also maintained retail market shares in FTTH of more than 60% compared with around 40% in broadband (based on xDSL, fibre and cable), as can be seen from the figure below.

145 ARCEP WLA market analysis.

Figure 6-6: Incumbent retail market shares for broadband (all speed) and FTTH-based broadband 2017



Source: WIK based on NRA data 2017

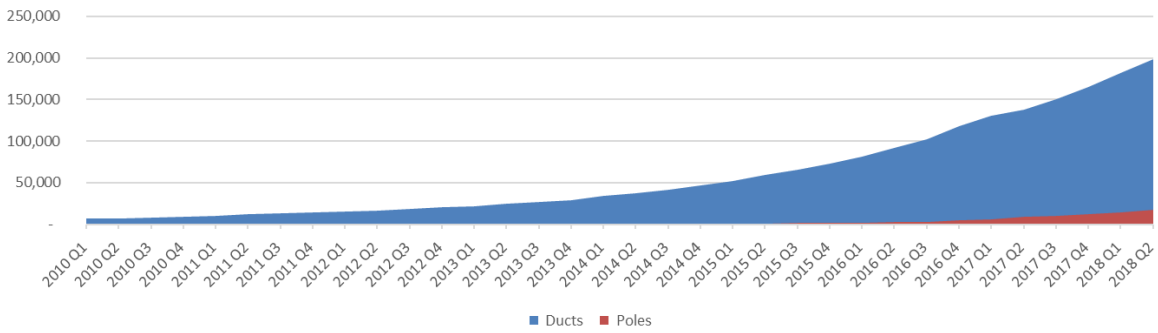
6.3.4 The role played by duct access

Duct access has played a significant role in enabling the development of a more sustainable competitive environment for mass-market ultrafast broadband in France, Spain and Portugal.

For example in France, by Q2 2018, nearly 200,000km of duct and 17,000km of aerial infrastructure access had been used to deploy FTTx networks.[146] The progression in usage of ducts and poles for FTTx in France since the entry into force of DPA regulation is shown in the figure below. These figures report the total length used by all operators purchasing DPA. In very dense areas and in portions of the network downstream from the aggregation point for regulated access to the unbundled fibre loop, use by multiple operators of the same duct or pole segment could be expected.

146 ARCEP wholesale broadband observatory.

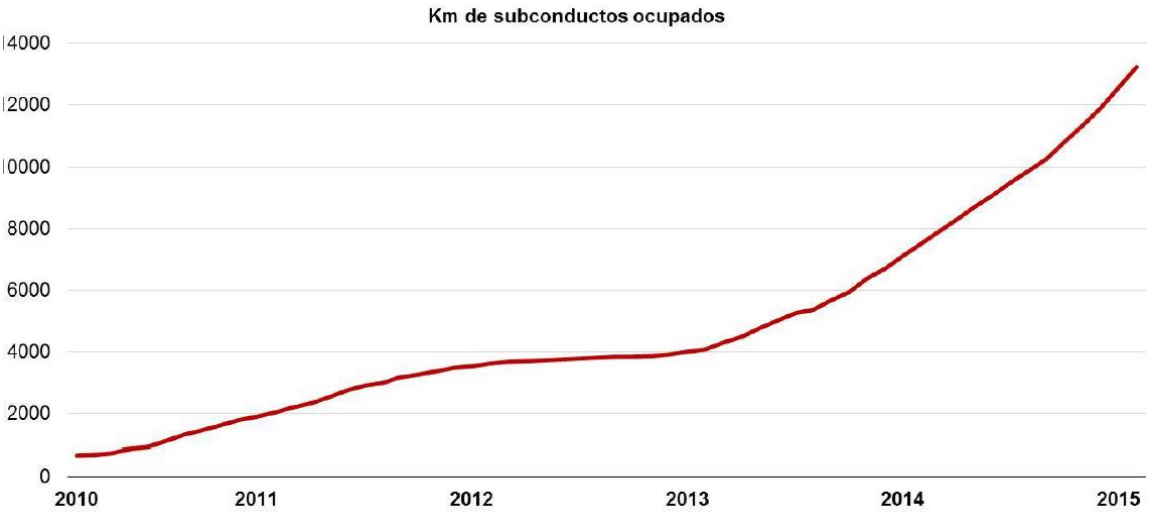
Figure 6-7: Duct and pole access usage in France: total km



Source: ARCEP broadband deployment observatory

The increasing demand for duct access in Spain can be seen in the figure below. Around 90 % of the requests for duct access are attributable to three operators: Orange, Jazztel and Vodafone.

Figure 6-8: Accumulated km of occupied subducts in Spain

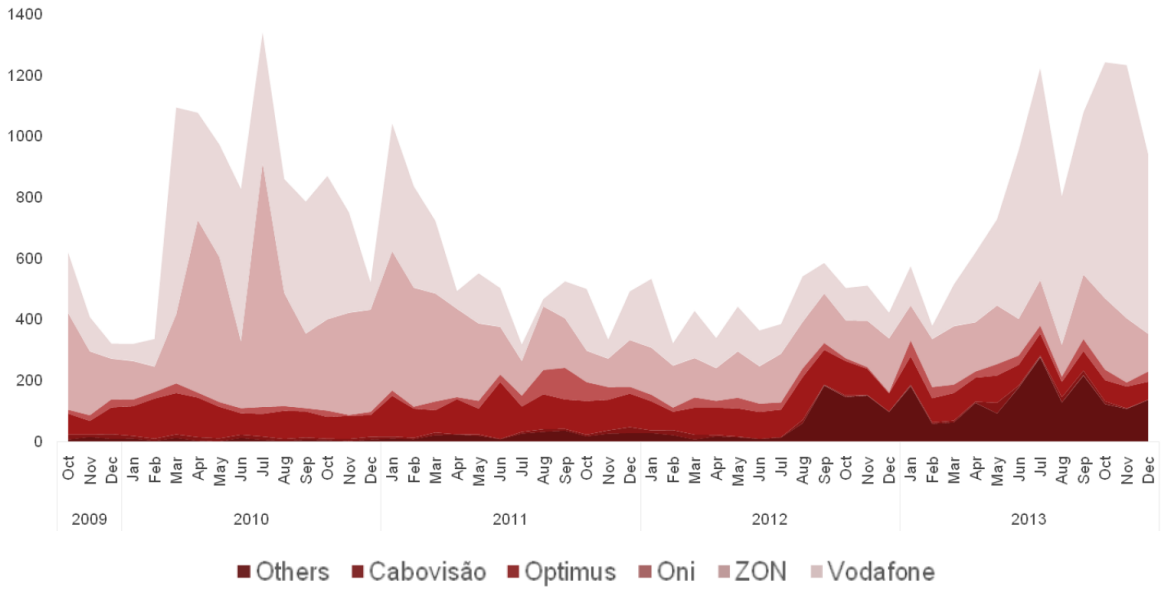


Source: CNMC (2016).[147]

147 CNMC (2016): Resolución por la cual se aprueba la definición y análisis del mercado de acceso local al por mayor facilitado en una ubicación fija y los mercados de acceso de banda ancha al por mayor, la designación de operadores con poder significativo de mercado y la imposición de obligaciones específicas, y se acuerda su notificación a la comisión europea y al organism de reguladores europeos de comunicaciones electrónicas (ORECE) (ANME/DTSA/2154/14/MERCADOS 3a 3b 4), downloadable at: https://www.cnmc.es/file/170783/download.

Data from the Portuguese NRA ANACOM shows that duct access also played an important role in stimulating the deployment of competing FTTH networks in Portugal Two waves of demand for duct access (linked to investment in deploying FTTH infrastructure) can be seen – around 2010 and then around 2013. In addition to high levels of demand for duct access from Vodafone, the role duct access played in extending the coverage (including FTTH deployment) by the cable operator ZON (now NOS) can also be seen.

Figure 6-9: Evolution of wholesale services demand (km of duct access requested based on reference duct access offer)



Source: ANACOM (2015): Fostering rollout of NGA networks - The Case of Regulation access to MEO's Ducts

When reporting the usage of duct and pole access, NRAs in Spain and Portugal did not separate out data showing to which extent duct and pole access were used specifically to deploy business access lines (dedicated fibre), as opposed to fibre for mass-market FTTH PON. This lack of distinction may reflect the fact that in these countries the major operators are offering business access over FTTH PON, with a more limited role for dedicated fibre.

However, the French NRA ARCEP has distinguished duct usage for mass-market FTTx from duct access used for the deployment of business access. Data from ARCEP shows that in Q2 2018, more than 100,000km of ducts had been used for business purposes (one third of the total), suggesting that specific business access use forms a significant part of overall demand for duct access.

7 What outcomes were achieved for end-users?

In this chapter we describe the outcomes for end-users in terms of the availability of ultrafast broadband, price and take-up in France, Spain, Portugal, Germany, Italy and the UK. We discuss the outcomes in the context of the different regulatory regimes that have been pursued.

The main findings are as follows:

- FTTH coverage and ultrafast broadband take-up in Portugal and Spain are amongst the highest in Europe. These are countries which pursued an initial approach of forbearance on FTTH regulation. Deployment progressed more slowly in France, and has been limited thus far in the UK, Italy and Germany – countries which regulated access to the incumbent FTTx network from the outset.
- Fixed mobile bundled offers have become prevalent in Spain and Portugal as well as in France. This could be associated with the consolidation and convergence which occurred in these markets to support investment by all operators in FTTH and 4G.
- Prices for ultrafast broadband offers including bundles are higher in Spain and Portugal than in the other countries examined. However, this may reflect generally higher pricing levels for broadband (including standard broadband) in these countries. There is no evidence to suggest that ultrafast broadband prices increased following the adoption of forbearance as a strategy to support fibre investment. Relatively higher broadband pricing levels may indeed have supported the business case for FTTH deployment in these countries compared with others.
- Regulation was not the only factor affecting outcomes in these markets. Other factors include the prevalence of cable competition, factors affecting costs including housing density, labour costs, and the quality of ducts – or those affecting revenues including retail prices and take-up, which is affected by willingness to pay, or simply factors which affect the practicality of deploying FTTC as an alternative to FTTH. However, it seems reasonable to conclude that regulation played a role, amongst these other factors, in affecting outcomes.

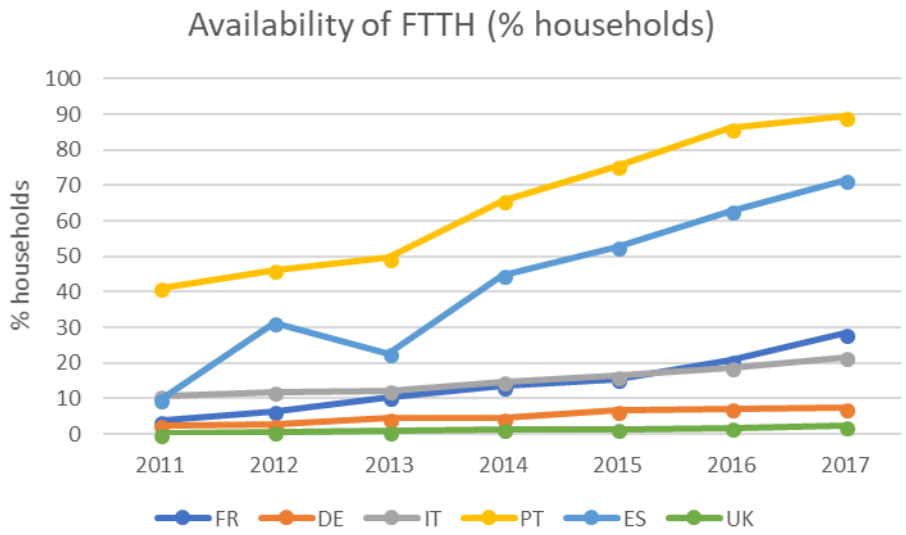
7.1 Ultrafast and superfast broadband coverage

7.1.1 Coverage of FTTH

The figure below shows the evolution in the availability of FTTH as a % of households in the period following the initial NGA market reviews.

The significant deployments in Portugal and Spain can be clearly seen – reaching respectively 89% and 71% of households in 2017.

Figure 7-1: FTTH homes passed in % of households



Source: EU Digital Agenda Scoreboard (2018).

Regulatory approaches are clearly not the only factors which influenced these outcomes. Other factors which supported the business case of widespread deployment in Spain and Portugal include competition from widespread cable networks, low costs due inter alia to a high proportion of large MDUs in major cities, lower labour costs, and the widespread availability of a pre-existing high quality duct network. Higher pricing was also likely to be a factor in influencing the widespread viability of FTTH (see section 7.4). Network architectures which impede the effectiveness of FTTC/VDSL also contributed to the selection of FTTH as a technology in preference to an intermediate investment in FTTC/VDSL.

However, it seems plausible that the pursuit of DPA coupled with a cautious regulatory approach – based initially on forbearance, may have provided incentives for more widespread deployment in these countries, than in France, which also promoted FTTH deployment and mandated DPA from an early stage, but pursued a more interventionist

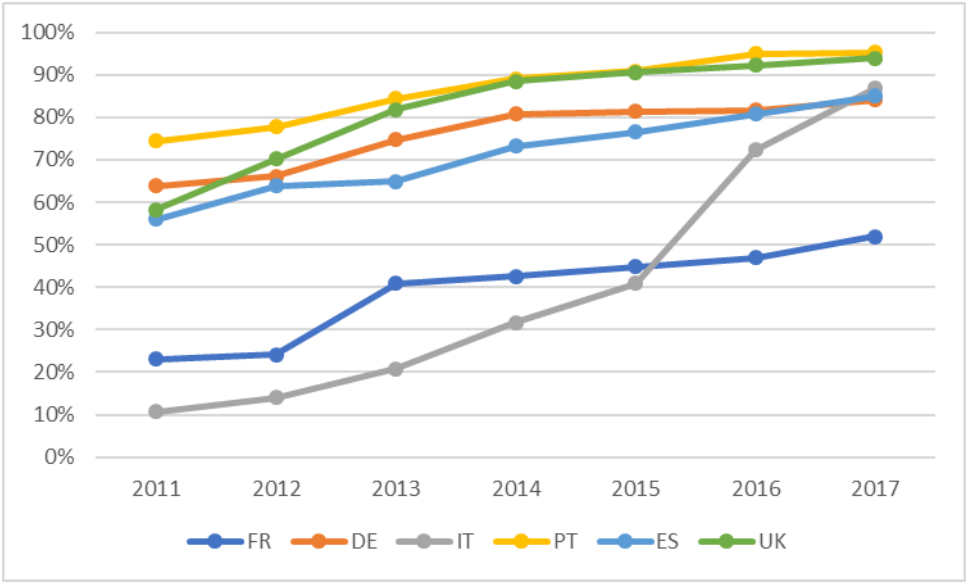
regulatory approach, as well as Italy and Germany, which mandated active access to the incumbents' NGA network, alongside rules which had the effect of promoting FTTC deployment.

7.1.2 Superfast broadband coverage

Portugal, which benefits from widespread cable alongside FTTH, also performs very strongly in coverage of technologies capable of delivering superfast broadband at speeds of more than 30Mbit/s. The UK also performs strongly at this speed, due to the widespread deployment of FTTC/VDSL technology.

The relatively high coverage in speeds of 30Mbit/s in Germany and Italy is also explained by FTTC/VDSL deployment. However, France lags in the availability of superfast broadband, as it has limited FTTC/VDSL coverage (which may in part[148] be explained by a political and regulatory preference for FTTH) while its FTTH and cable footprints are also relatively low.

Figure 7-2: NGA (FTTC/VDSL, FTTH and DOCSIS 3.0) homes passed as % of households



Source: EU Digital Agenda Scoreboard (2018).

148 Another explanation may be the relatively long loop lengths in France, which limit the speeds achievable via FTTC/VDSL.

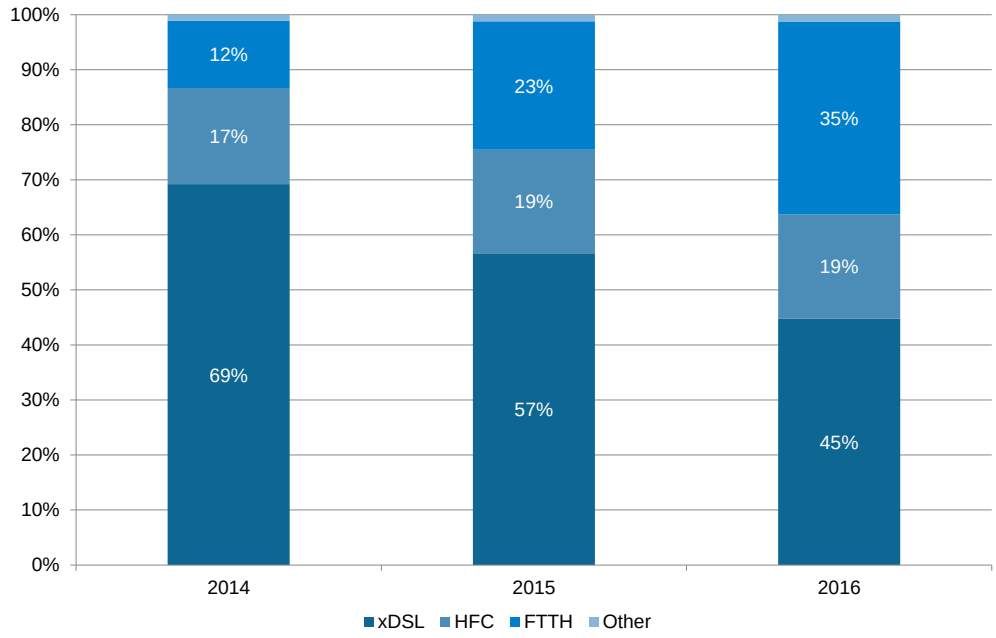
7.2 Take-up of fast and ultrafast broadband

7.2.1 Take-up of ultrafast broadband (100Mbit/s and above)

Customers in Portugal have exhibited strong demand for ultrafast broadband. As of April 2017, 50% of broadband subscribers received packages which offered broadband at speeds of 100Mbit/s or more, while in 2018 ANACOM reported[149] that 56% of households received broadband services based on FTTH or HFC. These high take-up levels may in turn have supported the business case for FTTH investment.

In contrast, uptake of ultrafast broadband has been slower in Spain and France. In France, this reflects the comparatively limited coverage of both FTTH and cable. In Spain, the incumbent's policy of offering a basic 50Mbit/s offer over FTTH (i.e. an entry-level offer falling short of the full capability of the FTTH network), may have contributed to a lower take-up of ultrafast broadband at speeds of 100Mbit/s and above. Take-up of FTTH as a technology reached 35% of broadband access lines by the end of 2016 in Spain (see figure below).

Figure 7-3: Evolution in take-up of Broadband access lines by technology



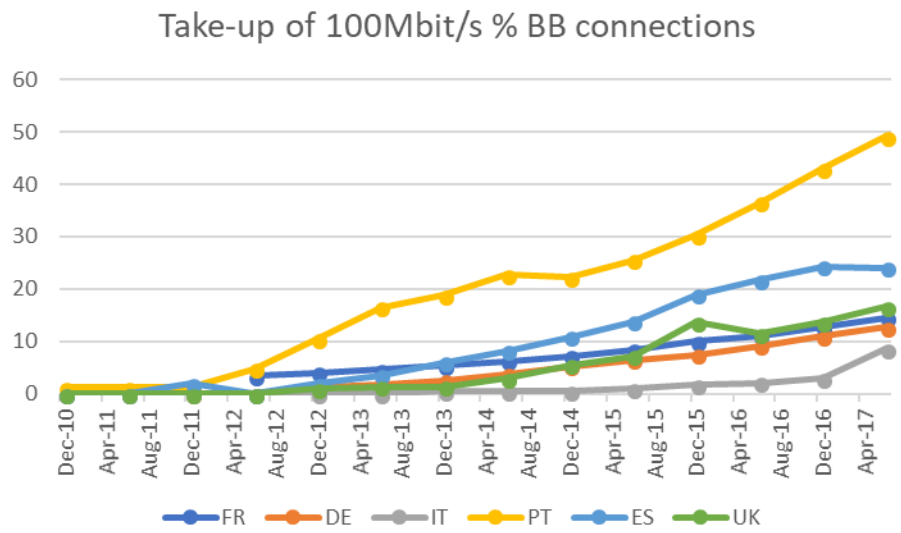
Source: WIK based on CNMC data.[150]

149 ANACOM (2018): Internet Access Service Statistical Information, downloadable at: https://www.anacom.pt/render.jsp?categoryId=520.

150 Based on CNMC data downloaded at http://data.cnmc.es/datagraph/jsp/inf_anual.jsp.

Take-up of ultrafast broadband in the UK, Germany and Italy has been primarily provided through cable offers, while in Italy, which has no cable network, take-up of ultrafast broadband started to increase, from a low base, following the entry of the utility-backed competitor Open Fiber and the resulting FTTH investment response from commercial operators.

Figure 7-4: Take-up of 100Mbit/s as a proportion of broadband connections

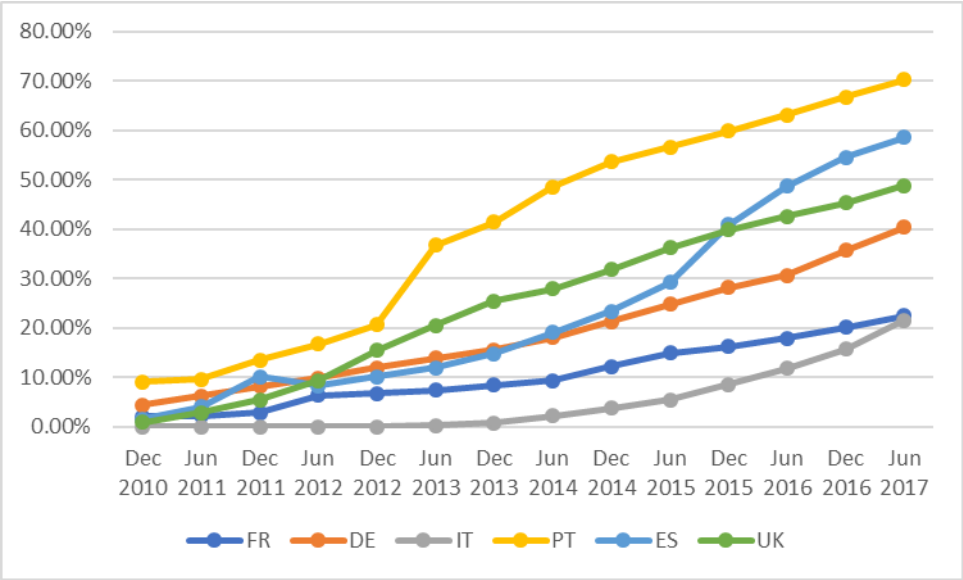


Source: EU Digital Agenda Scoreboard

7.2.2 Superfast broadband take-up

The combination of cable and FTTH infrastructure, coupled with apparent demand for higher speeds, has also supported high take-up of superfast broadband in Portugal and Spain. Take-up of broadband at speeds of more than 30Mbit/s stood at 70% and 59% of all broadband connections in Portugal and Spain respectively in 2017. This contrasts with a low take-up rate of these speeds in Italy and France. It is interesting to note that there is little difference in the take-up rate in France of 100Mbit/s and 30Mbit/s broadband. It is possible that the decision to focus on FTTH deployment (rather than FTTC) in France, coupled with an environment which made the economics of FTTH deployment more challenging, accentuated the broadband gap, creating an environment in which a limited proportion of households have very highly performing FTTH or cable infrastructure, while the remainder of households continue to be served with copper alone.

Figure 7-5: Take-up of 30Mbit/s as a proportion of broadband connections

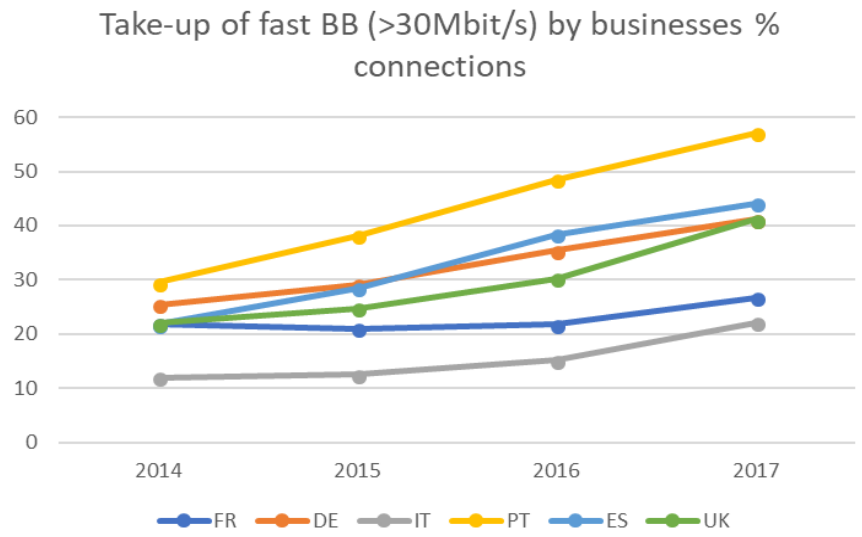


Source: EU Digital Agenda Scoreboard (2018).

7.2.3 Superfast broadband take-up by businesses

There is less comparable information on the take-up of ultrafast broadband by enterprises. However, available data on the take-up of superfast broadband connections (at speeds of 30Mbit/s) by businesses, shows that businesses in Portugal and Spain were better served than those in the other countries considered, although increases can be seen in the UK, following the widespread deployment of FTTC/VDSL technology. The limited coverage of fast broadband in France and Italy likely explains low take-up rates for businesses in those countries.

Figure 7-6: Take-up of fast BB (>30 Mbit/s) by businesses



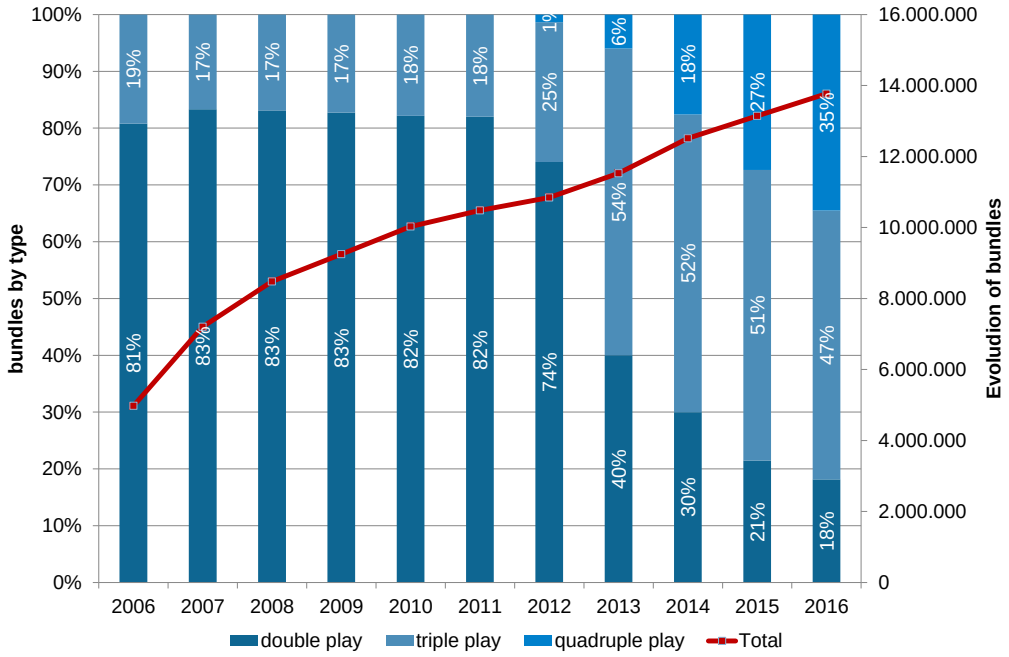
Source: EU Digital Agenda Scoreboard

7.3 The development of bundled offers

Data available from those countries which gather detailed information, shows that, following the deployment of FTTH and 4G and wave of consolidation which followed it, the take-up of quadruple play bundles – involving fixed and mobile telephony and broadband as well as TV – soared. This is evident from the charts below showing the evolution of broadband bundles in Spain as well as Portugal. In Portugal, for example, by 2017, the take-up of triple, quadruple and quintuple play bundles had reached nearly 80% of households. Triple and quadruple play bundles are also increasingly prevalent in France.[151]

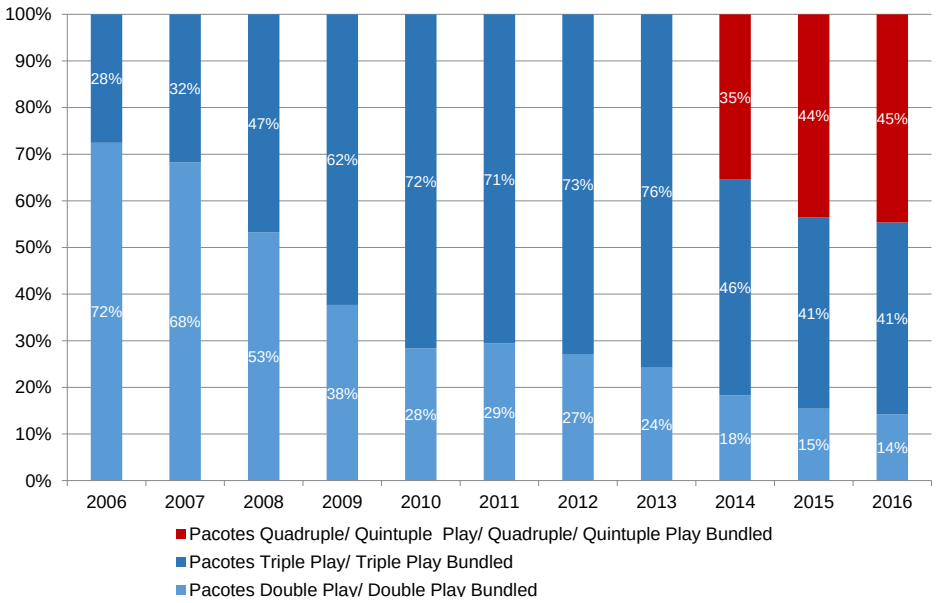
151 Bundles involving fixed (and often mobile) telephony alongside Internet and TV are those which are most heavily promoted in France. The 2016 e-communications household survey published by the European Commission shows that in 2015, 45% of respondents said that they purchased TV channels as part of a bundle.

Figure 7-7: Evolution of broadband bundles in Spain in % of total bundles



Source: CNMC (2018).[152]

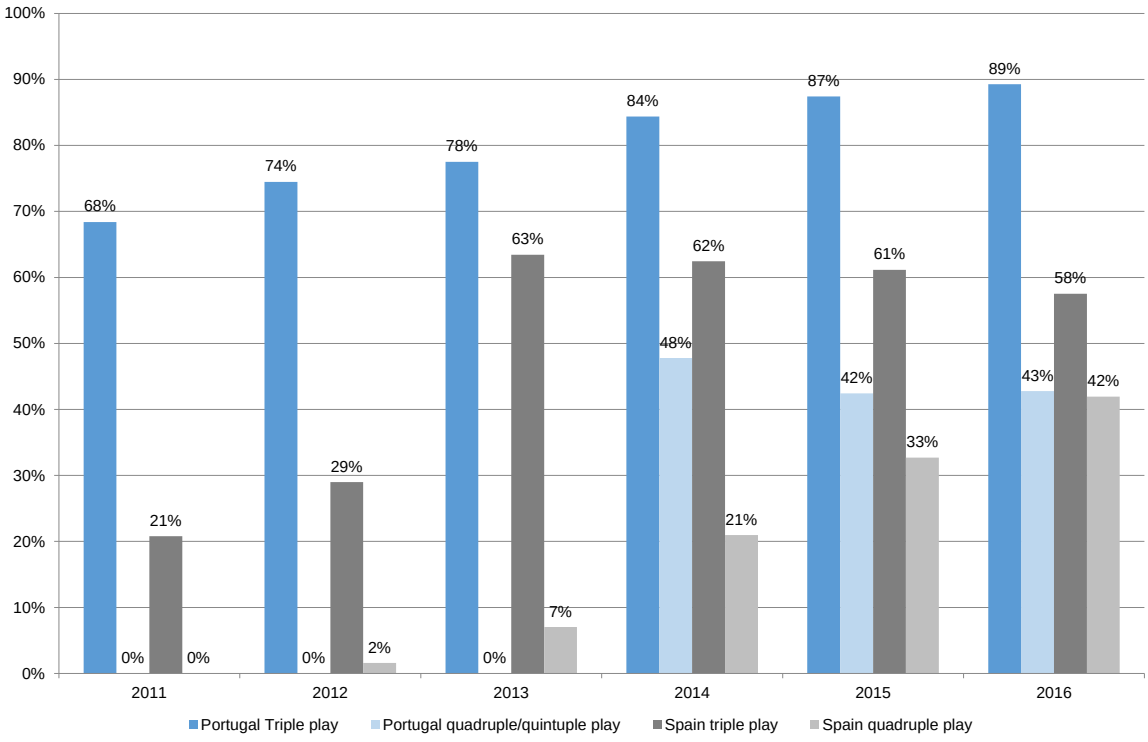
Figure 7-8: Evolution of bundles by type in % of total bundles in Portugal



Source: ANACOM (2018).[153]

[152] CNMC (2018).

Figure 7-9: Triple and quadruple play in Spain and Portugal in % of broadband connections



Source: ANACOM (2018) and CNMC (2018).

7.4 Pricing

Data on pricing for double play (broadband and telephony) as well as the prevalent triple play offers, shows that operators in Spain and Portugal maintained a significant premium for 100Mbit/s speeds above offers with lower speeds of between 30-100Mbit/s, and had higher pricing levels at all speeds than in France, Italy and Germany.[154]

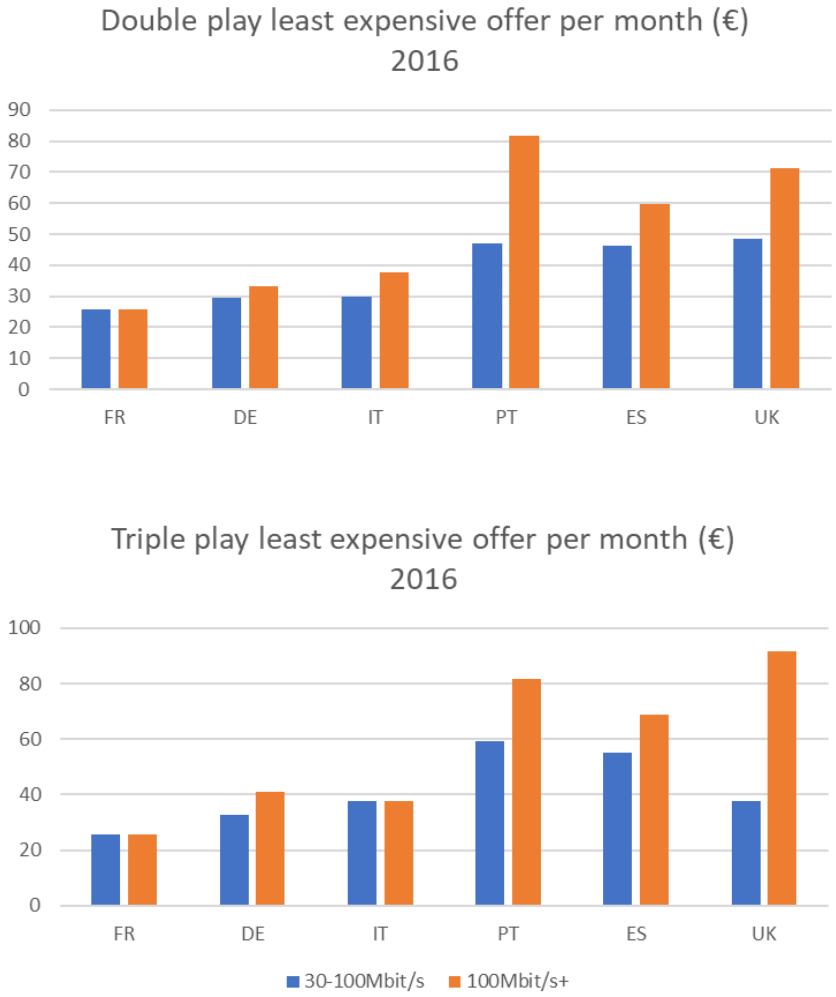
These higher charges coupled with the apparent willingness of customers to pay for higher speeds are likely to have been a significant factor influencing the viability of widespread investment, as well as infrastructure-based competition in FTTH in Spain and Portugal.

153 ANACOM (2018): Anexo estatístico Servicos de comunicacao 2016, downloadable at: https://www.anacom.pt/render.jsp?categoryId=520.

154 Price methodology and exchange rates are determined by the authors of the study for the European Commission. Prices refer to total monthly charges (in EUR / PPP, VAT included) and contain basic recurring charges, non-recurring charges, line rental or cable TV subscription, and additional usage-based charges for internet access and, if applicable for fixed telephony. Charges include discounts as defined in the methodology.

The lack of access regulation on FTTH networks or speeds of above 30Mbit/s may have been one factor that enabled operators to set prices at levels which reflected the investments required for FTTH.

Figure 7-10: Double and triple play offers 2016 (Total monthly charges in € PPP)[155]



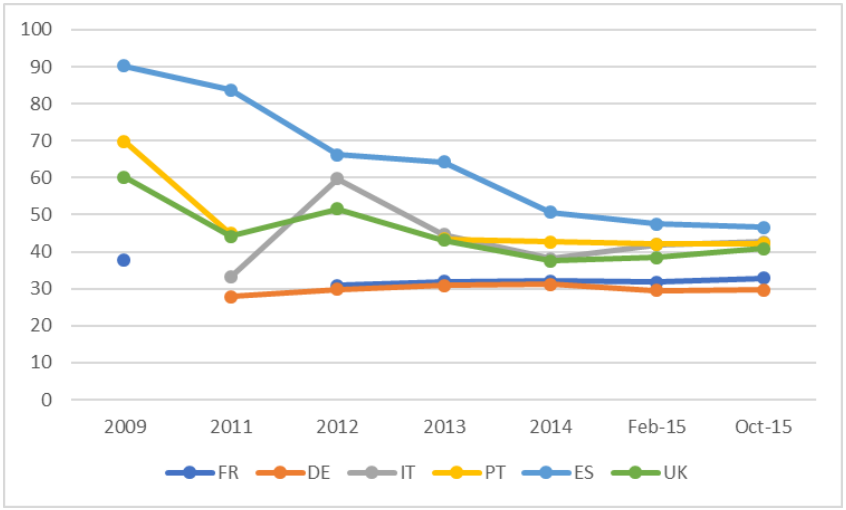
Source: Broadband Internet Access Cost study

As the figure below illustrates (and other pricing breakdowns confirm), although prices in Spain and Portugal are higher than in France, Germany and Italy, there is no evidence to suggest that prices for fast or ultrafast offers increased in these countries following the adoption of the FTTH or ultrafast specific regulatory regimes in 2009, or relative to prices in countries which pursued a more interventionist regulatory approach to ultrafast broadband. In fact, the figure below suggests that competition may have

155 Double play refers to offers including Internet and telephony. Triple play refers to offers including Internet, telephony and TV. The methodology is described in the report for the Commission Fixed Broadband Prices in Europe 2016 at https://ec.europa.eu/digital-single-market/en/news/fixed-broadband-prices-europe-2016.

driven ultrafast prices lower, while copper prices have been kept level by wholesale regulation.

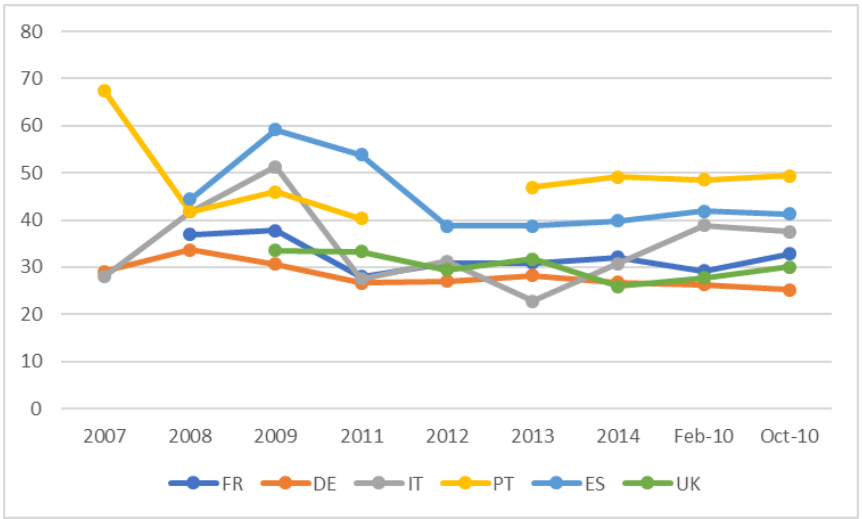
Figure 7-11: Monthly price of fixed broadband internet access offers (above 30 and up to 100 Mbps): Minimum price in euros (PPP)



Source: EU Digital Agenda Scoreboard

Rather retail prices for basic broadband seem to have been higher in these countries than in the others studied from an early stage. The reasons are not clear.

Figure 7-12: Monthly price of fixed broadband internet access offers (above 12 and up to 30 Mbps)



Source: EU Digital Agenda Scoreboard

8 Relevance to the UK

Ofcom has outlined[156] its intention to update its approach to regulation to support investment in full fibre. Key aspects include plans to strengthen and remove limitations on the DPA remedy[157] and differentiate its approach to access regulation of wholesale active products in different parts of the country.[158]

Experience from the five markets reviewed for this study, as well as the provisions of the EU electronic communications Code provide insights that could be relevant as Ofcom implements its strategy to boost fibre investment.

8.1 Forbearance on gigabit capable networks

The UK is in some respects now at a similar stage in full fibre development as was the case when the initial NGA review took place in Spain and Portugal. There is limited current full fibre coverage, but significant commercial full fibre deployments have been announced by both alternative operators such as CityFibre in addition to Openreach and are in prospect over the course of the market review period.[159]

This is therefore a moment in which a different, more market driven, approach could be taken towards gigabit capable networks than has historically existed for copper in order for nascent investments to maintain momentum.

Experience from Spain and Portugal suggests that forbearance at least for an initial period could support investment as well as a more sustainable commercial competitive model for full fibre.

First, the widespread presence of FTTC in the UK, supports the case for adopting a distinct deregulatory approach towards gigabit capable networks. As FTTC could undermine the case for investment in full fibre (by limiting demand for upgrades), clear regulatory signals incentivising full fibre investment for both the incumbent and its challengers are needed to encourage a step up in investment and address associated risks. Experience from Spain and Portugal suggests that forbearance (i.e. no wholesale

156 Ofcom 24 July 2018 Regulatory certain to support investment in full-fibre broadband.

157 See Nov 2018 consultation on Physical Infrastructure market review https://www.ofcom.org.uk/consultations-and-statements/category-1/physical-infrastructure-market-review.

158 See Dec 2018 Consultation on approach to geographic markets https://www.ofcom.org.uk/__data/assets/pdf_file/0005/130001/Consultation-Promoting-investment-and-competition-in-fibre-networks.pdf

159 Under a £500m deal agreed with Vodafone, CityFibre has said it intends to deploy FTTH to at least 1m homes by the end of 2012. http://www.vodafone.com/content/index/media/vodafone-group-releases/2017/vodafone-and-cityfibre.html.It has since secured further funding to deploy to 5m homes in 37 cities by 2025. https://www.reuters.com/article/us-britain-broadband-cityfibre/cityfibre-to-invest-25-billion-pounds-in-full-fiber-for-uk-homes-idUSKCN1MX37N. Openreach has proposed deployment to 3m households by 2020. http://news.openreach.co.uk/pressreleases/openreach-launches-fibre-first-programme-to-make-fibre-to-the-premises-broadband-available-to-three-million-uk-homes-and-businesses-by-the-end-dot-dot-dot-2399074.

access regulation on ultrafast networks) could provide such a signal. At the same time, the presence of widespread FTTC in the UK reduces the 'consumer harm' that might result from a 'Type II' error arising from under-regulation of full fibre, as consumers already have access to superfast broadband on reasonable terms).

Secondly, the wholesaling business model prevalent in the UK supports the case for at least temporary forbearance. Unlike incumbents in Spain and Portugal, BT relies heavily on wholesale customers to maintain its wholesale market share, and is facing competition from a wholesale only provider. Forbearance could provide an opportunity for strong competition and innovation in *commercial* risk sharing and/or co-investment deals to emerge as the ultrafast wholesale providers vie for the custom of retail broadband providers.

Thirdly, forbearance, even if temporary, would avoid the need for Ofcom to have to predict the shape of the market in years to come. The degree to which infrastructure competition in ultrafast broadband will develop is uncertain. This was recognised at the outset of deployments in Spain and Portugal and has been acknowledged in Ofcom's position.[160] If Ofcom pre-judges the outcomes, this may distort buy build incentives and limit competitive deployment..

Indeed, the EU electronic communications Code envisages that NRAs should, when considering mandating access "examine whether the *sole* imposition of DPA obligations would be a proportionate means to promote competition and the interests of the end-user".[161] Regulators are also required to consider the impact of commercial agreements, including co-investment agreements on competitive dynamics in the context of mandating SMP obligations under the Code.[162] The wholesale model being developed by CityFibre as well as its co-investment with Vodafone, should – amongst other things - be considered relevant factors affecting competitive dynamics going forwards. Rather than being pre-empted by ex ante regulatory access rules, the Code also signals that Openreach should be given the opportunity to propose commercial co-investment and/or long term wholesaling agreements – which might negate the need for ex ante regulatory intervention.

Ofcom would retain the right to intervene to apply SMP regulation if it transpired that market solutions did not secure an adequate competitive outcome.

160 See paragraph 4.3 of the Ofcom July 2018 policy statement.
161 Article 73 – EU electronic communications Code.
162 Article 68 idem.

8.2 Impact of competitive fibre build and DPA on business access regulation

The approach taken towards business access regulation as well as backhaul in France, Spain and Portugal offers a number of lessons which may be relevant to the UK, as it proceeds with a more co-ordinated approach towards analysing fixed access markets.

- Experience from France, Spain, Portugal suggests that taking steps to promote competition in fibre deployment through DPA, is likely to increase competition in the provision of high quality business access, by lowering barriers for the deployment of dedicated business fibre. For example, data suggests that as much as one third of DPA use in France is for business-specific purposes. The competitive deployment of mass-market full fibre via DPA is also likely to create a potential substitute for dedicated point to point fibre lines – at least for some businesses and applications.
- In some areas and/or bandwidths, the competitive effect of WLA remedies such as DPA[163] on the HQA market, could justify an extension of the deregulated zone for fibre-based leased lines.
- For areas that may remain subject to regulation, it should be considered whether cost-based charge controls are still needed, as these charge controls could disincentivise potential investment and/or the development of FTTH as a substitute offering for the business market. Alternatives used in the countries investigated include retail minus and non-excessive pricing.
- Experience in France, Spain and Portugal suggests that a policy of promoting infrastructure competition in FTTH coupled with the investment requirements of 5G may lead the market towards larger converged operators, which are active in both fixed and mobile networks and services. The UK is also seeing entrants in fibre provision such as CityFibre, which intend to focus their business around wholesale provision. It is worth considering in that context, whether backhaul for fixed and mobile broadband is likely to be self-supplied or bought and sold on a commercial basis across significant portions of the UK. If so, it may be appropriate to consider deregulation (at least in parts of the UK). Research by WIK on regulatory approaches to backhaul for mobile access, show that it is considered by many NRAs to be competitively supplied,[164] and this is especially true in countries which have benefited from extensive deployment and infrastructure competition in FTTH or have widespread wholesale only

163 DPA could affect business access competition through facilitating deployment of dedicated leased lines as well as by supporting the deployment of FTTH, which could substitute for some dedicated leased lines.

164 There is no regulatory obligation for incumbents to supply dark fibre for mobile backhaul in Sweden, the Netherlands, Germany, Spain, Portugal or Italy. Dark fibre for use for mobile backhaul has been mandated in Austria (under market 4) and use of fixed dark fibre backhaul for mobile has recently been authorised in France. However, these obligations should be seen in the context of limited FTTH deployment in Austria and a generally interventionist policy towards dark fibre regulation in France.

infrastructure. In such circumstances, regulating access to dark fibre for mobile backhaul could have the effect of deterring mobile operators from investing in FTTH as a core element of their business plan.

8.3 Copper switch-off rules

Appropriate copper switch-off policies are essential in supporting the business case for full fibre. In the UK, the complexity and cost of running parallel networks is likely to be greater by a significant margin than in France, Spain and Portugal because in addition to LLU, there is widespread FTTC (VDSL) in the UK. This also magnifies the migration challenge.

A study of the approaches taken and results in France, Spain and Portugal, show that even where it might be desirable from a commercial or an economic efficiency and welfare perspective (because it avoids the cost of running of parallel networks), switch-off is likely to be a very gradual process, unless regulation is adapted to enable it. Ofcom could consider a range of potential measures to foster switch-off and migration:

- Clear rules stating under which conditions exchanges can be switched off. Such rules could for example include fibre coverage, and satisfactory technical and economic access conditions allowing altnets to continue to provide broadly equivalent services (but not necessarily identical) to those available today on copper.
- A plan allowing for service to analogue equipment to be discontinued (subject to adequate notice), so as not to unduly delay the benefits of ultrafast broadband.
- Consideration of raising the price of legacy technology (and certainly not artificially constraining it) – in circumstances where switch-off is planned, in order to incentivize more rapid migration and avoid inefficiencies and increased costs associated with maintaining parallel networks.

8.4 Implications for wholesaling and competition

An examination of market dynamics and competitive developments in France, Spain and Portugal following the introduction of policies aimed at supporting the deployment of fibre reveals a number of potential insights for the UK.

- Applied together with duct and pole access, forbearance on fibre access regulation in Spain and Portugal appears to have contributed to the development of commercial co-investment deals between the incumbent and investing alternative operators, reciprocal access agreements as well as risk sharing deals between the incumbent and access seekers. While it cannot be excluded that such deals might have emerged if access regulation had been maintained, the

incentive to seek riskless access after the investment takes place may have been greater than the incentive to share risk. Alternative operators could have relied on non-discriminatory access rather than co-investment to maintain their market position in ultrafast broadband. Meanwhile, if faced with an automatic expectation of regulation, incumbent operators would not have had incentives to propose commercial arrangements (inter alia to demonstrate that regulation was not necessary). It is notable in this context that the agreement on access swaps between Vodafone and PT in 2014, followed the decision by ANACOM not to proceed with its 2012 proposal to regulate access to fibre in certain areas. Likewise Vodafone's 2017 swap agreement with NOS followed ANACOM's regulatory decision to maintain its strategy of forbearance on FTTH access in Portugal.

- There is also evidence in both Spain and Portugal, that in the absence of regulatory obligations, incumbents have engaged in voluntary wholesaling.[165]

8.5 Implications for consumers

Analysis of the outcomes suggests that Spain and Portugal have achieved positive results for consumers, in terms of availability and take-up of ultrafast broadband. The consolidation of the market associated with ultrafast broadband investments, has also supported the popularisation of converged offers which incorporate a range of fixed and mobile services within a single package.

It is true that prices for ultrafast broadband in Spain and Portugal are higher than in the other countries studied. However, this seems to be a historic feature – also applying to basic broadband. The largely falling prices in the period when forbearance was applied, suggests that market players did not take advantage of the lack of access regulation on ultrafast broadband to apply excessive prices.

Although they are not conclusive, and other factors besides regulation are likely to have contributed to outcomes,[166] these findings suggest that forbearance in regulation of ultrafast broadband need not result in consumer detriment. Rather, it seems to have been possible, at least in Spain and Portugal to achieve a much more widespread availability of full fibre than in France, Italy or Germany, alongside a more sustainable form of competition, without resorting to detailed regulation up-front.

165 While in Spain, Telefonica's commercial FTTH wholesale offer in unregulated zones has been taken up by rivals, this was not the case in Portugal.

166 Other factors are those affecting costs including housing density, labour costs, and the quality of ducts – or those affecting revenues including retail prices and take-up, which is affected by willingness to pay, or simply factors which affect the practicality of deploying FTTC as an alternative to FTTH.