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FTTH Unbundling: The Spanish Regulation in Retrospect

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FTTH UNBUNDLING: THE SPANISH REGULATION IN RETROSPECT

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Keywords

FTTH, New Generation Access, local loop unbundling, VULA

Abstract

This paper explores the effects of Virtual Unbundled Local Access (VULA) –or its absence- on the deployment of Fibre-To-The-Home (FTTH) networks in Spain in a retrospective way. First, we assess the impact of former wholesale broadband markets' regulation on FTTH investment and on the market structure evolution. Further on, based on coverage data from 2013, we provide an assessment of how would have NGA coverage looked like if the recently approved regulation for FTTH unbundling would have come into force in 2013 instead. We conclude that if a VULA had been available earlier, the amount of households with no access to any NGA infrastructure would have been up to 50% higher than it actually is. In return, full NGA facility-based competition would have been reinforced.

1. Introduction

Given the economics of NGA and the relevance of broadband for economy and welfare, mitigating the digital divide is more than ever a political priority. Many Administrations have settled objectives to pave the way for NGA networks to extend and high-speed broadband access have become of on the cornerstones of many (political) agendas. In Europe, the Digital Agenda established back in 2010 by the Commission set two main objectives for 2020: a) universalising access to 30 Mbps networks and b) reaching 50% penetration of services of at least 100 Mbps (European Commission, 2010).

When NGA networks emerged, scholars and practitioners questioned to what extent facility-based competition would still be economically sustainable. (Analysys Mason, 2008) conducted an analysis of deployment costs of three types of fibre-based infrastructure and technologies for next generation broadband services in the UK. Besides substantial differences in costs among the technologies under study, authors point out the relevance of take-up rates in service feasibility, since fixed costs far outweigh variable costs in any case. The authors of (WIK Consult, 2008) also conclude that NGA economics are highly dependent on national specificities and, according to their calculation a nationwide NGA roll-out would not be profitable in any of the six countries analysed¹.

Despite NGA economics, especially those of fibre-based technologies, some providers have undertaken relevant investments during the last few years. Fibre-to-the home (FTTH) technologies have attracted great attention for being future-proof for new standards, enabling more and better services, and for showing lower operational and maintenance (O&A) costs than copper-based networks. But market competitive structures and regulatory regimes have been proven to play a crucial role. (Yoo, 2014) examines broadband coverage indicators along many Member States of the EU and compares them to the US. Based on the evidence, the author concludes that those countries emphasizing facility-based competition outperform those relying on

¹ Germany, France, Sweden, Portugal, Spain and Italy.

service-based competition with regard to NGA networks and high-speed broadband, which is particular clear in countries having strong competition from cable providers.

Spain is one of the paradigmatic cases of the markets attracting great investments for FTTH technologies and also having extensive cable networks. Despite reports as (WIK Consult, 2008) pointed out that the roll-out of the incumbent's network in Spain would not go beyond 12.2% households with FTTH-PON networks, reality has fortunately been different. An investment-oriented regulatory framework has coexisted along with a fierce competition from cable networks, which, for legacy reasons had much higher market shares than the incumbent at high access speeds. Actually, FTTH household coverage has increased up to 56% in 2016 from 9% in 2012, and tripled between 2013 and 2015.

| Technology | Coverage 2012 (% pop) | Coverage 2013 (% pop) | Coverage 2014 (% pop) | Coverage 2015 (% pop) | Coverage 2016 (% pop) |
|------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| HFC | 46% | 46% | 46% | 48% | 49% |
| FTTH | 9 % | 14% | 26% | 45% | 56% |
| VDSL | 11% | 11% | 11% | 11% | 12% |

Table 1. Evolution Broadband coverage by technology in Spain. Source: (SETSI, 2016)

| | 2012 | 2013 | 2014 | 2015 | 2016 |
|------------|------|------|------|------|------|
| ≥ 2 Mbps | N.D. | N.D. | 95% | 96% | 97% |
| ≥ 10 Mbps | | 71% | 82% | 85% | 88% |
| ≥ 30 Mbps | 53% | 59% | 60% | 65% | 71% |
| ≥ 100 Mbps | 47% | 52% | 56% | 61% | 66% |

Table 2. Evolution Broadband coverage by speed in Spain. Source: (SETSI, 2016)

These figures place Spain at the top with regard to countries rolling out FTTH networks in general, but at the same time make it laggard regarding rural New Generation Access (NGA) networks since investment are not surprisingly being attracted by most urban areas. In contrast to Spain, other countries such as Germany or the United Kingdom, whose service providers are partially reusing copper infrastructure and adopting Fibre-To-The-Node (FTTN) architectures show better metrics when it deals about rural access to NGA networks². For instance, the UK rural NGA coverage doubles the same metric for the Spanish case. On the other hand, current FTTH broadband coverage in Spain largely exceeds that of the other big economies in the European Union. Even considering other technologies than FTTH, in Spain 100 Mbps coverage footprint is still almost 10% above Germany's and reaches 70% households.

² Nonetheless, the strategy adopted for NGA extension to rural areas has been tackled in a very different way in the different European countries, since legacy infrastructure and competitive structure notably differ from case to case.

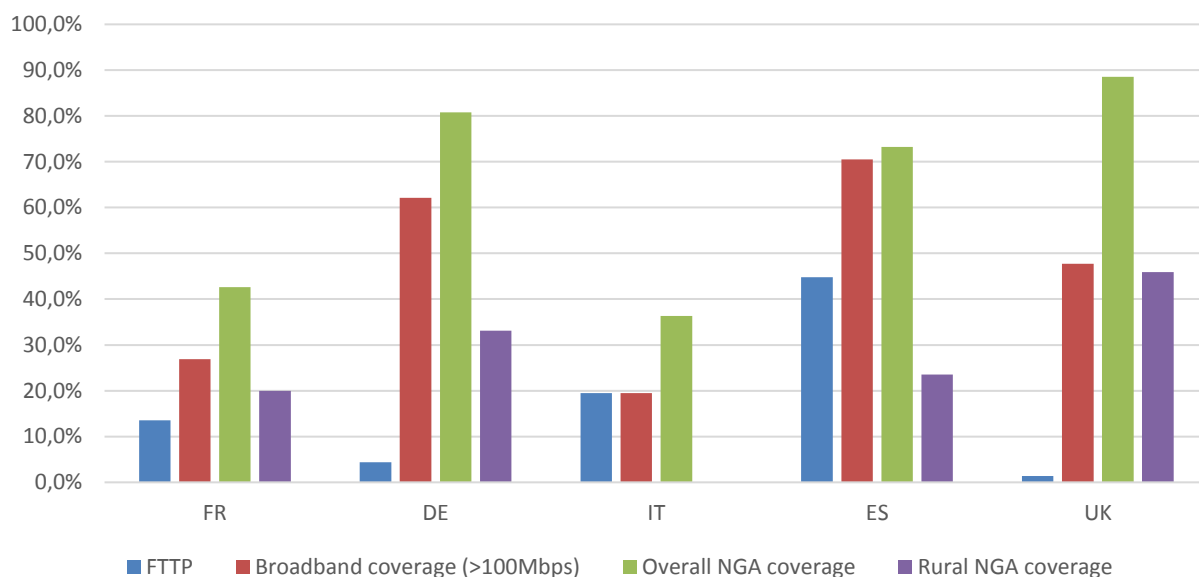


Figure 1. Household coverage as for FTTH networks, NGA networks and general 100 Mbps broadband coverage (as of 2014). Source: Authors based on (IHS & VVA Consulting, 2015)

Actually, the technology playing a relevant role in rural access to NGA have been HFC DOCSIS 3.0. Figure 2 shows FTTH and HFC coverage as of population size in Spain in 2013. Cable networks coverage footprint and wholesale broadband markets regulation have played a very relevant role in promoting FTTH investments out of the biggest cities.

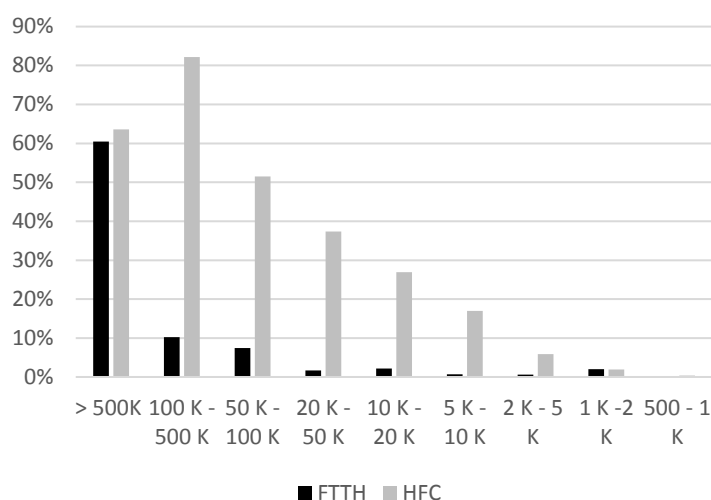


Figure 2. Population coverage of FTTH and HFC networks in Spain as of population size. Source: Authors based on (SETSI, 2013)

On the one hand, this paper aims at analysing whether and how regulation of former markets 4 (wholesale physical network infrastructure access) and 5 (wholesale broadband access) qualified the remarkable deployment of FTTH networks that have taken place in Spain over the last few years. On the other, we provide an assessment of what would have happened if the recently approved regulation for FTTH unbundling (CNMC, 2016) would have come into force in 2013, as many claimed.

The rest of the paper is structured as follows. Section 2 describes the 2009 regulation with regard to FTTH networks and an assessment of its interplay with the evolution of the Spanish telecommunications market. Section 3 describes the recently approved regulation replacing that from 2009, wherein a Virtual Unbundled

Local Access (VULA) is settled for the incumbent's FTTH infrastructure. Further on, section 4 provides some methodology remarks and section 5 shows the main results of the work, addressing the question of what would have happened if the current regulation had been adopted earlier. Finally, section 6 concludes the paper and points out to future research lines.

2. FTTH regulation and the interplay with the Spanish NGA market

The 2007 European Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation (European Commission, 2007) identified seven different markets. Among them, markets 4 (wholesale physical network infrastructure access³ at a fixed location) and 5 (wholesale broadband access⁴) were the two markets which more directly affected fixed broadband access services. Following the Commission Recommendations, the Spanish ANR analysed both markets in 2009, declared Telefónica as Significant Market Power (SMP) operator and established some remedies in form of obligations.

For market 4, obligations relative to the legacy copper network were maintained, but no additional obligations were imposed to FTTH networks, whose roll outs were still incipient. Nonetheless, other obligations were imposed with regard to essential facilities, such as ducts⁵, which were considered non replicable and thus a critical asset for an operator to deploy its own FTTH network.

For market 5, wholesale service obligations for indirect access were imposed to Telefónica in 2009, which had to offer services up to 30 Mbps on a technological neutral basis, that is, no matter fibre or copper. At the moment the remedy was settled, the existing wholesale reference offers were GigADSL and ADSL-IP. These offers had been later on reviewed to include fibre networks, which led to NEBA offer, released March 2013, which replaced GigADSL and ADSL-IP offers and made it possible for alternative operators to provide differentiated QoS services to their customers.

This 30 Mbps threshold has undoubtedly been an important element in promoting fibre-based network roll-outs, but –in author's view– this success cannot at all be attributed just to this because providing services based on indirect access is expensive compared to doing it based on wholesale physical access to infrastructure. In our view, the inexistence of a virtual unbundling obligation to fibre loops has played the major role.

Two key issues must be mentioned when trying to explain FTTH boom in Spain. On the one hand, in 2012 cable networks, which are completely updated to DOCSIS 3.0, benefited from a larger NGA broadband coverage than the incumbent provider (Telefónica). Actually, as it shown in Table 1, almost half of the population was covered by HFC networks (46%) in 2012, while FTTH coverage footprint was very incipient: only 9%. This made it extremely difficult for Telefónica to compete at ultra-fast broadband access. Actually, the biggest cable operator (ONO) beat Telefónica in NGA connections market share, despite being having an overall share of around half of the broadband services market⁶. This fact necessarily drove Telefónica to invest in ultra-fast capable technologies if it wanted to remain as the market leader in the future. And it was then or never, as fibre networks were still out of the scope of markets' 4 regulation

³ Including shared or fully unbundled access.

⁴ Indirect access, bitstream.

⁵ MARCO is the cost-oriented reference offer with regard to duct access.

⁶ 49% as of II Q 2013.

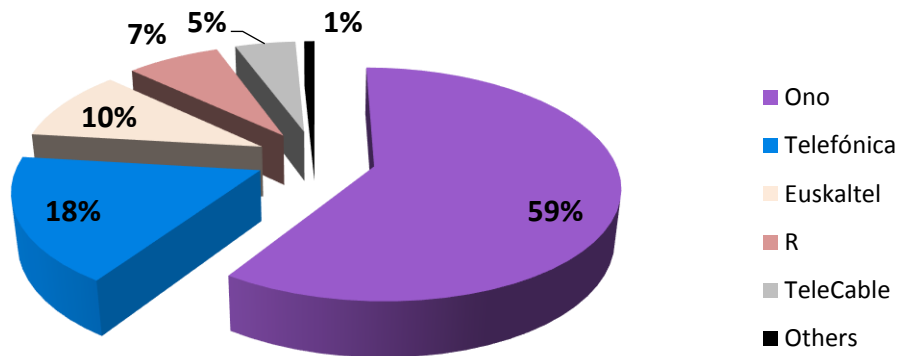


Figure 3. NGA market shares II Q 2013. Source Authors based on CNMC data.

On the other hand, ULL providers were –and still are– very relevant competitors for Telefónica not only in the biggest cities but also in medium-size towns, as it proves the data in Figure 4. They also needed a way forward, especially in the big cities like Madrid and Barcelona, where cable footprint is very weak and they are the main competitor for the incumbent.

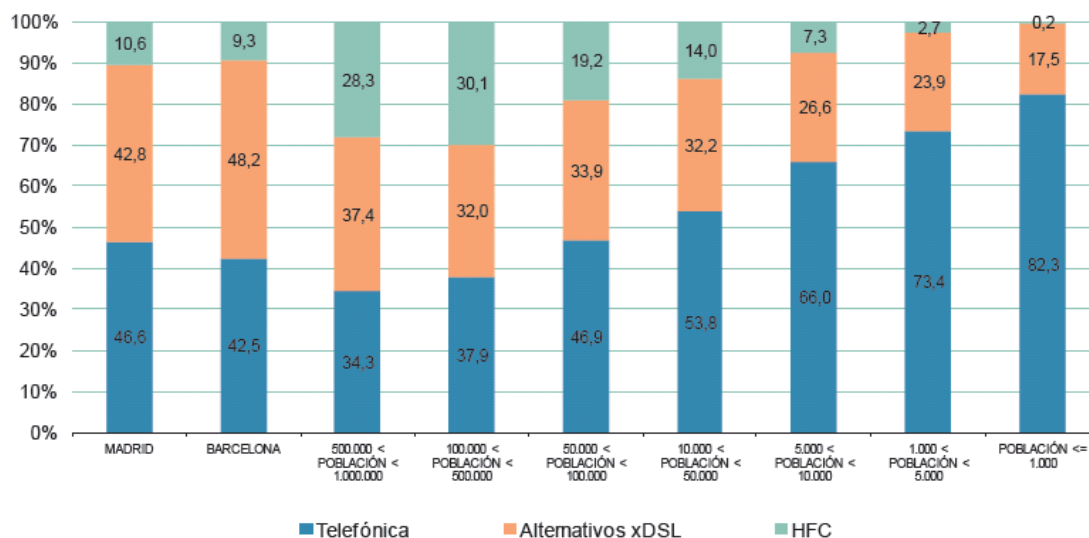


Figure 4. Market shares of Telefónica, ULL providers (alternativos xDSL) and cable providers (HFC) as of population size. Source: CNMC.

However, the fix-mobile bundled rates Telefónica started offering also in the autumn 2012 have given rise to a wave of consolidation processes in the Spanish market among providers with different levels of investment in either fix and mobile infrastructures. During the end of 2011 and the beginning 2012 Telefónica was losing market share very quickly in both fix and mobile markets, but especially in the mobile market. As a consequence it started an aggressive strategy based on exploiting its assets in both markets to launch the abovementioned new bundled rates, while increasing its investments in fibre optic networks. It might sound weird that the operator having the best customer base in both fixed and mobile services gave rise to a fierce competition with a new fare with led to a notably decrease in the ARPU of its own subscribers. But it important to note that on the one hand, Virtual Mobile Network Operator were gaining more and more market share, and on the other, cable networks were leading the fix market.

Indeed, the increase in bundled rates, especially in 4P (fixed and mobile, broadband and voice) during 2013, as it is shown in Figure 5, reveal the great success of Telefonica's bundled rates, which actually stopped the

decline in Telefónica customer base. Given this success, alternative operators in the fixed market (which are themselves major players in the mobile market) began shortly afterwards to reach sharing agreements to deploy their own fibre networks to remain competitive in the new stage.

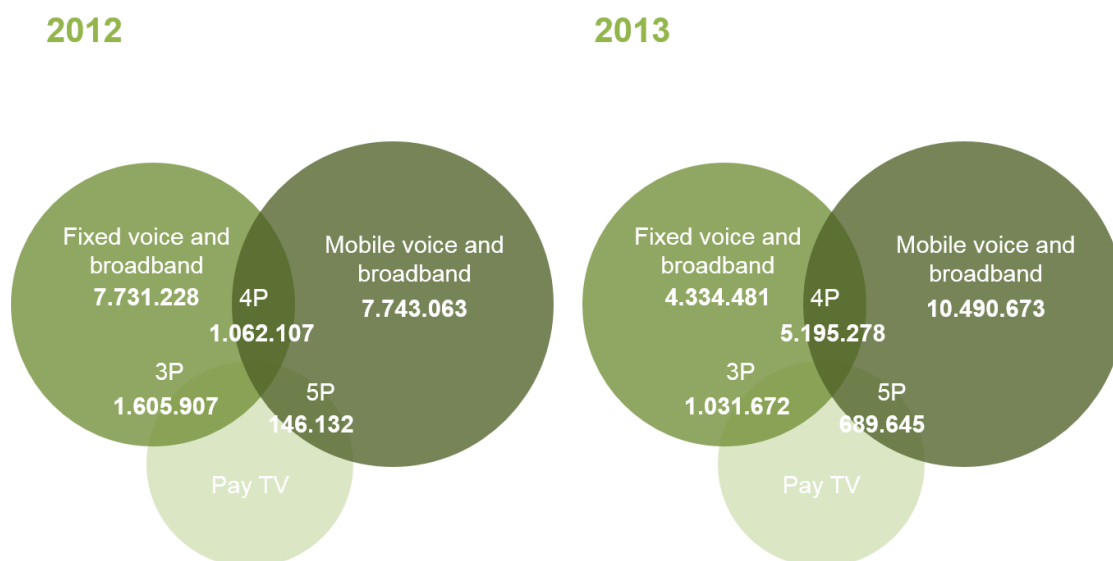


Figure 5. Adoption of bundled rates. Source: (CNMC, 2014b)

In the absence of a VULA service, alternative ULL providers started deploying their own fibre networks in 2012 based on the available products of the wholes physical access market. In addition, they could rely on additional obligations with regard to the so called 'verticals', the last stretch of the FTTH network, which usually runs within the buildings or on the façade. These obligations were symmetric, i.e. no significant power market operator was defined and thus they apply to any operator deploying fibre networks. This regulation forces all operators to reach an agreement with regard to this last stretch of the infrastructure to a competitor if the subscriber decides to switch providers⁷. No reference offer was established at the beginning, but the prices had to be negotiated by operators. After some litigation among several alternative providers and the incumbent, the regulator fixed the prices in 2014⁸.

Nonetheless, the high deployment costs led to agreements of very different kind during 2012 and 2013 among various players in the market. In October 2012, Telefónica and Jazztel, one of the most relevant ULL providers, made public their agreement to share the last stretch of their FTTH networks⁹ by which each of them would give access to the other to 1.5 million households. Shortly afterwards, a similar agreement was signed shortly afterwards between Orange and Vodafone –ULL providers in the fix market and relevant providers in the wireless-, although in this case they would build jointly a shared FTTH access network to reach 6 million households¹⁰, whose investments would reach € 1.000 million according to the companies' declarations¹¹.

However, the heavy investments being undertaken in FTTH by Telefónica have forced its competitors to look for quicker ways to consolidate its presence in ultrafast broadband access market and compete in the fix-mobile bundled market. Thus, Vodafone -whose parent firm had just sold Verizon Wireless in the US and have

⁷ The rationale of this regulation was to ensure that no operator could act as a gatekeeper, since in some buildings it might be difficult to deploy more than one vertical stretch for each household, either physically or due to reluctance of some neighbours or of the community of house owners.

⁸ <http://cnmcblog.es/2014/06/25/la-cnmc-fija-precios-definitivos-para-el-acceso-a-la-fibra-optica-en-los-edificios/>

⁹ <http://www.expansion.com/2012/10/08/empresas/tmt/1349711390.html>

¹⁰ <http://www.xatakaon.com/noticias-adsl-y-cable/jazztel-solicita-150-millones-al-banco-europeo-de-inversiones-para-su-red-de-fibra-optica>

¹¹ <http://www.elmundo.es/elmundo/2013/03/13/navegante/1363155571.html>

enough financial capacity- agreed to acquired Ono (the main cable provider) for 7,200 M€ in March 2014, operation approved by the European Union Competition Commission without conditions in July 2014 . Soon after, in September 2014, Orange made an offer for Jazztel, which the European Competition Authorities approved subject to conditions in May 2015. These conditions include selling to a new entrant a FTTH network reaching between 700,000 and 800,000 households and providing wholesale offers for Orange's mobile network.

To sum up, we could say the former regulation (2009), or rather the fact that it has not been reviewed until very recently, has proven successful at boosting fibre-based networks, in particular those undertaken by the incumbent player. With regard to former ULL providers, it has caused a concentration process, more than relevant greenfield rollouts in relevant greenfield, since they needed to minimize the time to market. Table 3 show the evolution in number of installed access for each provider in FTTH and HFC technologies.

| | 2011 | | 2012 | | 2013 | | 2014 | |
|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|
| | FTTH | HFC | FTTH | HFC | FTTH | HFC | FTTH | HFC |
| Movistar | 1.583.458 | 0 | 3.207.506 | 0 | 5.225.676 | 0 | 10.346.563 | 0 |
| Ono | 0 | 6.708.603 | 527 | 7.062.626 | 586 | 7.063.153 | 607 | 7.171.267 |
| Jazztel | 1.526 | 0 | 1.632 | 0 | 868.500 | 0 | 3.008.881 | 0 |
| Vodafone | 0 | 0 | 0 | 0 | 1.868 | 0 | 839.382 | 0 |
| Orange | 11.878 | 0 | 13.208 | 0 | 67.377 | 0 | 826.689 | 0 |
| TOTAL | 1.607.108 | | 3.250.556 | | 6.244.313 | | 15.134.930 | 10.259.309 |

Table 3. FTTH and HFC DOCSIS 3 installed Access as of providers.

3. A new regulation for FTTH infrastructures

Unbundling in next generation networks has been a topic widely discussed among scholars and policy-makers, not only for its technical constraints but also with regard to the implications for competition in future telecom infrastructures. (Cave, 2010) addresses the issue of unbundling in a next generation world and refers to a reconfiguration of the ladder of investment, wherein some products would disappear and would be replaced by others, such as 'active line accesses'. Most FTTH providers have rolled out GPON architectures, where a single fibre is shared by up to 64 users, which makes it impossible to physically unbundle the fibre local loop.

For this reason, many European regulators have created a Virtual Unbundled Local Access (usually named as VULA) as a means to unbundling in FTTH networks. For instance, the UK approved VULA products for fibre-based technologies (FTTH, FTTB, FTTC) in 2010, Italy in 2011 or Sweden in 2012. On the contrary, in Spain wholesale markets have not been reviewed since 2009 until now.

With the new European Commission Recommendation on relevant markets of October 2014 (European Commission, 2014), the Spanish regulator, CNMC, has carried out a new market analysis and a review of obligations according to the new Recommendation. Former markets 4 and 5 have turned to new markets 3a (wholesale local access provided at a fixed location) and 3b (wholesale central access provided at a fixed location for mass-market products), and a new market 4 (wholesale high-quality access provided at a fixed location) have appeared on the stage, which is basically aimed at enterprise customers. The new Spanish regulation, first proposed in December 2014 (CNMC, 2014a) and finally approved in February 2016 (CNMC, 2016) creates a VULA for FTTH infrastructures and emphasizes on competition differences among geographical areas.

The main rationale for imposing a VULA is grounded on the substitutability of FTTH and copper networks in the retail market with regard to the demand-side, especially for the following reasons:

- The analysis CNMC conducted on the retail market for broadband access shows that there is no cutting-edge, i.e. as of speed access, which allows clearly separate broadband services provided on NGA networks from those provided on legacy networks. In fact, the incumbent commonly provides copper-like services in terms of speed and features on top of FTTH infrastructure.
- Telefónica is increasingly shutting down copper exchanges, since fibre-based networks show lower O&M costs. In this regard, CNMC states that *“a large part the demand of NGA networks services is driven by internal migration from a provider’s copper network to the same provider’s NGA network”*

Consequently, VULA access would belong to the same market as the unbundled access to the local loop in copper networks.

In the retail market, CNMC identifies two areas with varying level of competition, labelled as zone 1 and zone 2. After assessing different quantitative criteria to define these two zones, copper exchanges are classified in either zone in the following way:

- Zone 1: if at the exchange there are at least to two other providers different from Telefónica at with a market share of 10%¹² each and Telefónicas’ market share is below 50%
- Zone 2: otherwise

This way, zone 1 would comprise 703 exchanges¹³ while the other over 8.000 would belong to zone 2.

Based on the analysis at copper interconnection exchange points, the results are widen with an analysis on the competition level with regard to NGA infrastructure, as services provided on NGA networks are assumed to belong to same market than services provided over other kind of infrastructure. This way an exchange is labelled as *‘NGA competitive’* if there are at least three NGA networks with a minimum coverage of 20 % each.

Two upstream wholesale markets are identified (market 3a and 3b) from the retail market. The way they are regulated in the new rule is described next.

Market 3a

With regard to market 3a (access to physical infrastructure), obligations remain for copper network and ducts, but a new VULA is created. However, on a geographical basis, since facility-based competition greatly differ among areas. When defining *‘non-competitive’* areas where the VULA will be in force, CNMC considers that taking copper exchanges as the geographical unit for segmentation would not take into account the future level of competition in the prospective way required. This is mainly for two reasons: i) telecom operators are still undertaking NGA roll outs, and ii) their investment plans are neither certain nor show the minimum required level of geographical breakdown as to rely on that data.

Consequently, CNMC selects municipalities as a better unit for geographical market segmentation, as they argue current NGA coverage indicates future competitive areas for NGA networks. Thus, any municipality having an exchange labelled as *‘competitive’* would be left out of any obligations in market 3a with regard to VULA. In other words, having anywhere in a municipality with three different NGA competing is considered enough to take the municipality as a whole as competitive area where it is expected to have several NGA networks competing within the temporary scope of the regulation.

¹² For this 10% Vodafone-ONO and Orange-Jazztel are taken into account as main alternative (entrant) providers.

¹³ Accounting for around 60% of copper pairs of Telefónica.

In the 66 municipalities under this circumstances, the regulation proposes only direct physical access obligations on copper infrastructure (in addition to wholesale access to ducts and verticals) to remain. In the rest of the territory, Telefónica must offer a virtual unbundled local access. This is in line with the Commission Recommendation on regulated access to NGA networks¹⁴, where the Commission recommends NRA mandating unbundled access to the fibre loop “where the SMP operator deploys FTTH, with the exceptions of geographical areas where the presence of several alternative infrastructures [...] in combination with competitive access offers is likely to result in effective competition to the downstream level.” Obligations imposed to Telefónica include non-discrimination, transparency and price control.

| | 2009 regulation | 2016 regulation |
|----------------------------|---|--|
| Significant Power | Telefónica | Telefónica |
| Geographical market | National | National, but obligations are split into high competitive and low competitive areas |
| Cooper network | Obligations of unbundling access to the local loop and sub-loop (OBA) | Obligations of unbundling access to the local loop and sub-loop (OBA) |
| FTTH network | <ul style="list-style-type: none"> - Access obligations to ducts and passive infrastructure (MARCO offer) - Access to the last stretch of fibre optic network (vertical) on a symmetric basis - No additional obligations on access to fibre optic network | <ul style="list-style-type: none"> - Access obligations to ducts and passive infrastructure (MARCO offer). - In addition to general symmetric obligations on the verticals, a specific regulation is added when vertical belong to Telefónica. - In the high competitive area (66 municipalities): no additional access obligations - In the low competitive area (the rest): virtual unbundled local access |
| Exchange shutdown | <ul style="list-style-type: none"> - If there are co-located operators: a minimum warranty period of 5 years from the closing communication central - If there are no co-located operators: one year warranty period. - Telefónica is not allowed to proceed to cooper interconnection exchange shutdown until at least 25% interconnection exchange subscribers have migrated to fibre. | <p>Periods of one year and five-year guarantee remain, depending on co-location of operators</p> <p>Requirements on the threshold 25% subscriber having moved to fibre network is eliminated.</p> |

Table 4. Summary of most relevant differences between former and regulations for market 3a (former market 4) in Spain.

Market 3b

With regard to wholesale broadband access services for residential customers, the new market 3b, the regulation considers its scope is below national scale, and defines two sub-national markets according to the competition level identified in the retail market analysis (zones 1 and 2): markets 3b_1 and 3b_2.

In its analysis, CNMC concludes that the traditional barriers to entry the market of wholesale broadband access are obviously lower in market 3b_1 than in market 3b_2, given cable networks deployed. Actually, the very existence of ULL providers have worsen these differences since ULL providers are also mainly located in market 3b_1.

¹⁴ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010H0572&from=EN>

The deployment of different FTTH networks, framed in co-investment agreements confirm the existence of areas where a higher competition level can be prospectively assumed (zone 1), while this should not be expected in other areas where facility-based competition is lower and thus there are fewer alternatives to Telefónica's network. In this regard, wholesale broadband services in market 3b_1 will be driven by market forces, as it has been happening with co-investments agreements.

In short, market 3b_1 comprises 758 interconnection exchanges where there are no obligations with regard to wholesale broadband access: those from zone 1 (identified at retail level analysis) plus some of zone 2, which must be excluded from any obligations so as to make it consistent with regulation of market 3a. The rest of the exchanges belong to market 3b_2 where there is a mandated bitstream solution provided by Telefónica without limits of speed, as it used to be in former regulation of 2009.

| | 2009 regulation | 2016 regulation |
|----------------------------|---|--|
| Significant Power | Telefónica | Telefónica |
| Geographical market | National | Two geographical markets: high competitive and low competitive areas |
| Cooper network | Wholesale indirect access obligations up to 30 Mbps | - High competitive area: no wholesale obligations - Low competitive area: wholesale obligations remain |
| FTTH network | Wholesale indirect access obligations up to 30 Mbps | - High Competitive area: no wholesale obligations - Low competitive area: wholesale obligation, but the 30 Mbps limit would be eliminated |

Table 5. Summary of most relevant differences between former and new regulations for market 3b (former market 5) in Spain.

4. Methodology remarks

This article aims at analysing the Spanish regulation on fibre loop unbundling in retrospect and thus assessing the consequences of having created a VULA in a review of the electronic communications markets in 2013 instead of in 2016. At that moment (2013) several European countries had already implemented this kind of service as a remedy to ensure effective competition in the wholesale physical network infrastructure access market (former market 4).

In order to assess the potential implications on competition of this hypothetical market review in 2013, we need to determine in the first place which would have been the result of the market analysis with a similar approach to the above described regulation of 2016. In this regard, we need to assess how would have a possible geographical segmentation looked like. To do so, we have processed data from 2013 with regard to FTTH and HFC coverage for each municipality in Spain. Based on different criteria we have classified municipalities as competitive or non-competitive in the prospective way it would have been done three years ago, as we explain next.

Regulatory market analysis must be necessarily prospective, as they are intended to be valid within the time horizon the regulation is expected to be in force. This fact, probably unavoidable, introduces a certain degree of uncertainty in the process. The selection of certain criteria to prospectively identify whether there are different geographical markets or if dissimilar remedies must be imposed to different areas –according to their *likely* level of competition- is one of the most difficult tasks in this type of regulatory approaches. Not surprisingly, different criteria will probably lead to different results when prospectively assessing this

competition level. This in turn might condition infrastructure deployment with a certain degree of arbitrariness.

These criteria for identifying competitive and non-competitive areas with regard to VULA are related to the level of facility-based competition between fibre and cable networks (i.e. criteria 1 or 2) or ‘objective’ profitability according to the population of each municipality (i.e. criteria 3 and 4). For this work, we propose the following criteria.

- **Criterion 1**

Competitive areas are those in which **both** FTTH and HFC networks had been deployed. These areas comprise the whole municipality with any presence of this competing infrastructure, since, municipalities are a better prospective geographical unit than copper exchanges (CNMC, 2016). In this regard, the presence of some coverage of these networks is assumed as an indicator of future competition and the municipality is classified into the competitive area.

- **Criterion 2**

Since in Spain cable networks had more extensive coverage than FTTH networks in 2003 and given that cable network have never had unbundling obligations, the regulator could have considered that the prospectively competitive area would be all the places where **either** of the two networks had been deployed. This could have made sense since: i) FTTH networks footprint will follow those of cable networks as their providers are market leaders at high-speed broadband and ii) the incumbents’ FTTH network were constrained to the biggest cities, so it could be expected that ULL providers would develop their own fibre networks anyway in those areas.

Another possible way to prospectively evaluate whether there will be facility-based competition within a certain area in the future would be using some metrics related to ‘objective’ profitability. However, this profitability is influenced by many variables which are difficult to estimate precisely and to determine whether the area will be profitable within the time horizon considered or not. Nonetheless, we can simplify this approach as of size of the municipality, as long as the biggest towns, with few exceptions, are also the most profitable, as empirical evidence has proven.

- **Criterion 3**

In this criterion the population size is taken as the main variable to discern between theoretically competitive and non-competitive areas. In this case, competitive areas comprise **all municipalities bigger than 100,000 inhabitants**, while the rest belong to non-competitive areas.

- **Criterion 4**

This last criterion is the same as n. 3, but the threshold to classify areas as competitive and non-competitive is a population size of **50,000 inhabitants**.

Based on each of the criteria above we define competitive and non-competitive areas and calculate the percentage of population, households and premises that would be within each of the two areas for each case. The results are shown in the next section and the implications of having had these hypothetical regulations developed are further discussed.

5. Results and discussion

The need or not of a geographical segmentation in NGA network remedies has been a major discussion topic in academic literature (Bourreau, Doğan, & Manant, 2010; Cave, 2014) and how to determine them has also been an important issue during the public consultations carried out by the Spanish regulator. Some of the proposed thresholds to distinguish competitive from non-competitive areas relate to the current facility-based competition level, the future facility-based competition level or other indicators more related to theoretical profitability.

If the approach of the recently approved regulation had been adopted for previous market reviews, as many claimed, the market structure evolution described in section 2 would have probably been very different. Beyond the impact on merger and acquisition processes, we assess next how would now probably look like the FTTH network map if a VULA would have been imposed to Telefónica in 2009 as an operator having significant market power.

To discuss this, we have defined competitive and non-competitive areas according to the different criteria described above in section 4 and calculated the population, households and premises which would fall within either area. We have obtained the results shown in Table 6.

In the first place, the first two columns of Table 6 show how the competitive and non-competitive areas look like according to the regulation proposed in December 2014, before the public consultation, and to the final decision, respectively. In both cases the same criteria were used (described in section 3). However, for the final remedy most current data were used, which better reflected the increased deployment of FTTH networks undertaken by alternative providers.

Thus, the number of municipalities in which there will be no VULA available goes from 9 to 33. This means that the households in competitive areas increase from 17% to 27%, approximately. Since, the incumbent current fibre network exceeds this value (55%), around 28% of Spanish households will benefit from fibre service-based competition as a consequence of VULA. In return, the incumbent will not increase its current fibre coverage.

In contrast, if a regulatory remedy with a similar approach had been approved in 2013, considering fibre and cable competition at that time, the competitive area, would have comprised 40% of the households. However, in this case we might consider that the incumbent would have gone on investing in fibre network until it reached the cable networks footprint. If we assume that in that case fibre networks would have extended to any municipality where cable networks were present, FTTH networks would have anyway extended up to 66% of the households, which leads to the same result as the data following the second criterion. In this case, 66% households would have benefited from having access to a cable network and to the incumbents' fibre network. Out of the competitive area we should not have expected any kind of NGA service-based competition.

If, on the contrary, the prospective analysis for a VULA in 2013 would not have been based on the competition level of that moment (as an indicator of future competition) but rather on 'theoretical' attractiveness of the municipalities according to their population size, the definition of the competitive area would have relied on the threshold selected. If municipalities above 100,000 inhabitants would have been assumed to be attractive enough to have NGA facility-based competition (criterion 3), the competitive area would have comprised 40% of the households. If a threshold of 50,000 inhabitants would have been used, the competitive area would have extended up to 53% of the households. In both cases, the likely consequence would have been that NGA coverage (either cable or fibre) would not have extended to any households placed in the non-competitive area.

| | | CNMC PROPOSAL DEC 2014 | CNMC REGULATION FEB 2016 | HYPOTHETICAL REGULATION 2013 Criterion 1 | HYPOTHETICAL REGULATION 2013 Criterion 2 | HYPOTHETICAL REGULATION 2013 Criterion 3 | HYPOTHETICAL REGULATION 2013 Criterion 4 |
|-----------------------------|------------------|---------------------------|--------------------------------|--|--|--|--|
| COMPETITIVE AREA | # municipalities | 9 | 33 | 96 | 610 | 62 | 145 |
| | Population | 7.530.171 | 11.982.814 | 18.221.603 | 30.570.076 | 18.499.125 | 24.467.154 |
| | % Pop | 16,1% | 25,6% | 39,0% | 65,4% | 39,6% | 52,3% |
| | Main households | 3.072.479 | 4.804.835 | 7.224.200 | 11.897.284 | 7.378.296 | 9.596.145 |
| | % households | 17,0% | 26,6% | 40,0% | 65,8% | 40,8% | 53,1% |
| | Premises | 3.853.851 | 6.093.930 | 9.328.075 | 16.000.267 | 9.550.650 | 12.762.511 |
| | % premises | 14,6% | 23,1% | 35,4% | 60,7% | 36,2% | 48,4% |
| NON- COMPETITIVE AREA | # municipalities | 8.104 | 8.080 | 8.017 | 7.503 | 8.051 | 7.968 |
| | Population | 39.228.473 | 34.775.830 | 28.537.041 | 16.188.568 | 28.259.519 | 22.291.490 |
| | % Pop | 83,9% | 74,4% | 61,0% | 34,6% | 60,4% | 47,7% |
| | Main households | 15.009.193 | 13.276.837 | 10.857.472 | 6.184.388 | 10.703.376 | 8.485.527 |
| | % households | 83,0% | 73,4% | 60,0% | 34,2% | 59,2% | 46,9% |
| | Premises | 22.527.506 | 20.287.427 | 17.053.282 | 10.381.090 | 16.830.707 | 13.618.846 |
| | % premises | 85,4% | 76,9% | 64,6% | 39,4% | 63,8% | 51,6% |

Table 6. Competitive and non-competitive areas under different criteria of a hypothetical geographical segmentation.

| | CNMC REGULATION FEB 2016 | Criterion 1 | Criterion 2 | Criterion 3 | Criterion 4 |
|--|--------------------------------|-------------|-------------|-------------|-------------|
| NGA full facility-based competition (% households) | 25 % | 40 % | 66 % | 40 % | 46 % |
| NGA service-based competition (% households) | 28 % | - | - | | - |
| Others (NGA infrastructure different form incumbent) | 14 % | 6 % | - | 6 % | 7 % |
| NO NGA available (% households) | 33 % | 54 % | 34 % | 54 % | 47 % |

Table 7 shows the likely scenarios of NGA competition as of the different criteria the regulator could have selected for geographical segmentation for a VULA.

| | CNMC REGULATION FEB 2016 | BASED ON NGA INFRASTRUCTURE COMPETITION LEVEL | | BASED ON POPULATION SIZE | |
|--|--------------------------------|--|-------------|--------------------------|-------------|
| | | Criterion 1 | Criterion 2 | Criterion 3 | Criterion 4 |
| NGA full facility-based competition (% households) | 25 % | 40 % | 66 % | 40 % | 46 % |
| NGA service-based competition (% households) | 28 % | - | - | | - |
| Others (NGA infrastructure different form incumbent) | 14 % | 6 % | - | 6 % | 7 % |
| NO NGA available (% households) | 33 % | 54 % | 34 % | 54 % | 47 % |

Table 7. Likely current scenarios (2016) of NGA competition as of the criteria for VULA and the moment it would have been approved.

This retrospective analysis shows highly relevant results. We can state that, in general, an earlier regulation on fibre loop unbundling (2013) would have caused a larger proportion of households (or premises, in general) benefiting from full NGA facility-based competition than in the case of a later regulation (2016). In return, if a VULA regulation had been passed in 2013, the percentage of households with no access to NGA infrastructures would have been much higher, around 50% higher. Only for criterion 2 (or in the event that the incumbent provider, despite VULA regulation, would have decided to go on investing in FTTH networks until reaching cable footprint in criterion 1) the final picture would have been similar to the real situation today. The differences between this hypothetical cases and the real situation after the regulation of February 2016 are basically two:

- i) The level of facility-based competition. In the case of the hypothetical regulation of 2013, 66% of the households would have had two NGA providers available, fully competing on own

infrastructure (cable network and incumbent's fibre network), while in the final remedy approved the availability of providers would be greater: in the short term, 25% will have access to three suppliers with own infrastructure, 28% would have access to the same amount of suppliers, but some of them will compete on services, and 14% will have access to a single NGA provider.

- ii) The role of regulation. While the case of the CNMC regulation 2016 is by definition real, the best case scenario which the hypothetical regulation in 2013 based on criterion 1 have resulted in assumes that, even if the incumbent provider will have an obligation to supply VULA to competitors, it will roll out FTTH networks out of the competitive area so as to compete with the cable provider.

6. Conclusions

According to some studies, as (Crandall, Eisenach, & Ingraham, 2013), there is no real relationship between unbundling and the increase on broadband penetration nor even with network investment in general terms. But when we look at particular cases, we can identify some short-run effects. With regard to Spain and the absence of fibre unbundling, there have been two main consequences: first, relevant investments in FTTH have been undertaken by the incumbent operator in an attempt to compete with the high market shares of the cable provider at very high access speeds; and, second, it has unleashed several M&A processes, which have given rise to four fix-mobile integrated players in the electronic communications market.

The recently approved VULA regulation have faced strong critiques from different stakeholders, inter alia, obviously, the incumbent. Telefónica's intention of covering 20 million premises by 2018 vanished short after the regulator's proposal in December 2014. Actually, investments flows have declined since then. On the other hand, not having reviewed the market analysis from 2009 until 2016 has also been heavily criticised among other players, as the ULL providers.

In this paper we have assessed what would have happened and how would have NGA networks footprint looked like if a VULA regulation had been passed in 2013. For this purpose we have defined competitive and non-competitive areas according to different criteria and we have assessed how this would have –in our view- conditioned FTTH investments.

Processing the data of FTTH and HFC coverage we have found out that most hypothetical regulations which could have been adopted based on a 2013 market analysis, leads to a larger proportion of households out of any NGA infrastructure footprint than we actually have. In contrast, the areas benefiting from full NGA facility-based competition would have also been larger, as investments would have focused mainly on competitive areas. Whether either case is more desirable for society is –in our view- a policy option.

In any case, this retrospect reveals an outstanding implication of geographical segmentation in fibre unbundling when some players are still undertaking investments at a significant pace. This is a lesson that might be useful towards prospective approaches, which are always complex and uncertain.

It is important to note that this work doesn't deal with other consequences on the electronic communication market, as the impact on retail prices nor considers VDSL technologies, as they are playing a minor role in the Spanish market.

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References

- Analysys Mason. (2008). *The costs of deploying fibre-based next-generation broadband infrastructure*. (No. Final report for the Broadband Stakeholder Group).
- Bourreau, M., Doğan, P., & Manant, M. (2010). A critical review of the “ladder of investment” approach. *Telecommunications Policy*, 34(11), 683-696. doi:<http://dx.doi.org/10.1016/j.telpol.2010.09.002>
- Cave, M. (2010). Snakes and ladders: Unbundling in a next generation world. *Telecommunications Policy*, 34(1), 80-85.
- Cave, M. (2014). The ladder of investment in Europe, in retrospect and prospect. *Telecommunications Policy*, 38(8–9), 674-683. doi:<http://dx.doi.org/10.1016/j.telpol.2014.04.012>
- CNMC. (2014a). *Consulta pública sobre los mercados 3a, 3b y 4* [Consulta pública sobre la propuesta de definición y análisis del mercado de acceso local al por mayor 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]
- CNMC. (2014b). Informe económico de las telecomunicaciones y del sector audiovisual 2014.
- CNMC. (2016). Resolución de los mercados 3 y 4. [Resolución por la cual se aprueba la definición y análisis del mercado de acceso local al por mayor facilitando 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 Organismo de Reguladores Europeos de Comunicaciones Electrónicas (ORECE)]
- Crandall, R. W., Eisenach, J. A., & Ingraham, A. T. (2013). The long-run effects of copper-loop unbundling and the implications for fiber. *Telecommunications Policy*, 37(4), 262-281.
- European Commission. (2007). Commission recommendation of 17 December 2007 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with directive 200/21/EC.2007/879/EC
- European Commission. (2010). *A digital agenda for Europe. Communication from the commission to the European parliament, the council, the European economic and social Committee and the committee of the regions*. [Available from: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52010DC0245&from=EN>] (COM(2010)245 final ed.)
- European Commission. (2014). Commission recommendation of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with directive 2002/21/EC.2014/710/EU
- IHS, & VVA Consulting. (2015). Broadband coverage in Europe 2014. [Mapping progress towards the coverage objectives of the Digital Agenda. A study prepared for the European Commission DG Communications Networks, Content and Technology]
- SETSI. (2013). *Informe de cobertura de banda ancha en España en el primer semestre de 2013*. Secretaría de Estado de Telecomunicaciones y para la Sociedad de la Información.
- SETSI. (2016). *Informe de cobertura de banda ancha en España en el primer semestre de 2016*. Secretaría de Estado de Telecomunicaciones y para la Sociedad de la Información.
- WIK Consult. (2008). *The economics of next generation access*. (Final Report).

Yoo, C. S. (2014). US vs. European broadband deployment: What do the data say? *U of Penn, Inst for Law & Econ Research Paper*, (14-35)