Alternative Operators Investing in NGNs: A Causal Analysis of the case in Spain

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Abstract

The telecommunications market was completely open to competition in 1998 in Spain, as in most EU countries. The model for the liberalization of the market was based on the regulated use of the incumbent operators' network, so that new entrants could initially use these resources to allow for a soft entry in the market, by climbing a "ladder of investment". However, as late as 2011, no entrant operator had gone beyond the Unbundled Local Loop deploying its own access network. This changed in Spain in 2012, when Jazztel decided it would invest in deploying Fibre-to-the-Home. Later, Orange and Vodafone announced that they have reached an agreement to share the deployment of fibre to 6 Millions of households. This phenomenon has coincided in time with the lack of regulated wholesale access on Telefónica FTTH network for speeds above 30 Mbps. In this paper, we show the

causality between both events (lack of actual regulated wholesale access to the fibre, deployment by alternative operators), by understanding competition as a process, in the Hayekian and Schumpeterian tradition.

1. Introduction

The telecommunications market was completely open to competition in 1998 in Spain, as in most EU countries. The model for the liberalization of the market was based on the regulated use of the incumbent operators' network, so that new entrants could initially use these resources to allow for a soft entry in the market.

Both interconnection and access services were (and are) offered in regulated conditions to entrant operators. The idea was that, once these operators would have achieved a certain critical mass of costumers, they would start deploying their own network, and eventually would stop relying on the incumbent network for providing their services. For this purpose, the "ladder of investment" was put in place in most EU countries, whereas several regulated access points on the incumbent network were allowed to alternative operators, with the idea of providing an easy path to climb into the deployment of their own network.

The "ladder of investment" approach was originally proposed in (Cave, 2004). The idea is to force incumbent operators to open several levels of access to their network (the "rungs" of the ladder) in such a way that alternative operators may climb up the ladder using more of his own infrastructure, and thus decreasing their reliance on the wholesale products of the incumbent operator. The final result would be the deployment of its own access network by the alternative operator, once he has captured the appropriate number of costumers to profit from the economies of scale of that investment.

However, empirical evidence has shown that no such development was taking place in any European country. Namely, no alternative operator based on wholesale services provided by the incumbent was deploying access network, even if several of them had achieved a considerable number of customers. Of course, there was some climbing on the "ladder", up to the ULL (Unbundled Local Loop) access point, but, as late as 2011, no ULL-based operator had gone beyond that point and deployed its own access network, and they did not seem to have plans for doing that in the near future.

This changed in Spain in 2012. In that year, Jazztel decided it would invest in deploying FTTH (Fibre-to-the-Home) and signed an agreement with Telefónica for sharing the costs of deployment of in-building cable, for up to 3 Millions of households[1]. Later, in 2013, Orange and Vodafone announced that they have reached an agreement to share the deployment of fibre to 6 Millions of households. At last, ULL-based operators were planning to develop their own access network.

This phenomenon has coincided in time with another one: Telefónica FTTH wholesale service is only regulated up to 30 Mbps. This means that alternative operators may not use regulated FTTH wholesale services to provide any retail service, but only retail services with speeds below 30 Mbps. This wholesale service, known as NEBA[2], complements other several regulated wholesale services, like duct sharing or ULL. In sum, Telefónica is not obliged to provide its fibre to ULL-based operators in regulated conditions, unless they use it to provide low speed services.

This temporal "coincidence" has also happened in other EU countries, such as France and Portugal. In both cases, a regime in which there is actually no regulated wholesale access to the incumbent fibre has coincided with deployment by alternative operators: Illiad/Free and SFR in France, and Vodafone and Optimus in Portugal.

In this paper, we propose to analyse if there is any causality between both events (lack of actual regulated wholesale access to the fibre, deployment by alternative operators), that could explain why no investment in access networks by alternative operators occurred when the access to the incumbent network was regulated, and why it happened precisely the moment no such regulated access existed.

In order to do so, praxeology, the methodology of the Austrian school of Economics, will be used. More specifically, we will build our explanation on the theory of competition as market discovery process, as stated by Friedrich von Hayek (Hayek, 2002).

[1] According to recent information, the agreement has been extended to 4.5 Million households.
[2] Acronym of its Spanish name : *Nuevo servicio Ethernet de Banda Ancha* (New Broadband Ethernet Service)

We will start by assessing thoroughly the evolution of both market and regulation in Spain. In section 2, we will briefly describe the evolution of access related regulation in Spain. Even if the description will focus in Spain, it must be noted that the general lines of telecommunication regulation are similar across EU countries.

In section 3, we will detail access market evolution since 1998 to 2013. We will distinguish two phases, separated by the resolution of the Comisión del Mercado de Telecomunicaciones (CMT, the Spanish NRA) on May 2009, in which it regulated FTTH wholesale services below 30 Mbps, leaving those above 30 Mbps with no price regulation.

In section 4 we will apply the view of competition as a market discovery process to explain the sequence of events that have happened in Spain during the assessed period, concluding that lack of regulation together with commercial initiatives by Telefónica, seem to have forced ULL-based operators to start deploying their own access network to be able to stay in the market.

In section 5 we will contrast if our hypothesis holds by assessing the case in other EU countries in which alternative ULL-based operators have deployed their own access network. Specifically, we will check what has happened in France, Portugal, Sweden, Germany and the Netherlands.

Section 6 concludes and closes the paper.

2. Access regulation evolution and current situation in Spain

The complete liberalization of the telecommunications sector to competition in Spain took place in December of 1998, some months later than in most EU members. One of the main features of this liberalization was the imposition of asymmetric obligations to certain agents, due to its initial position in the market power as former legal monopolists. We will focus on two basic categories of asymmetric regulation: access obligations and retail offer control.

Access obligations

Even if at the beginning asymmetric regulation was mainly focused on interconnection issues, by 2000 it was clear that one-way access regulation (i.e., regulation of the access to the local loop) was to be the most important part of asymmetric regulation, as currently is. Consequently, the focus of this section is on wholesale access services, including unbundled and indirect access both to the traditional copper network and the modern optical fibre one.

The first Unbundled Local Loop Offer (ULLO) imposed on Telefónica dates from 2000.
By that time, Telefónica had already an obligation to provide indirect access for broadband to its copper network, known as GigADSL.

After the approval of the 2002 EU Telecom package and the subsequent market analysis by the CMT, new obligations were imposed on Telefónica[3]. With regard to wholesale access, these are the more relevant.

- Not to make anticompetitive practices in the provision of retail services.
- Communicate CMT in advance the retail prices for its services: access, fixed telephone traffic and broadband services
- Publish a reference offer for Wholesale Line Rental (*AMLT*, in Spanish), the so-called "virtual loop"
- Publish a reference offer for indirect access to the local loop (OIBA, in Spanish), currently part of the ULLO, including a wholesale service of indirect access in just one point (ADSL-IP), with regulated prices.
- Communicate the quality of GigADSL services.

[3] And other operators. For a detailed review of the evolution of asymmetric regulation in Spain, see Herrera-González & Castejón-Martín (2009)

In 2009, the second round of market analysis took place, and new obligations were imposed on Telefónica with regard to wholesale access:

- Publish a reference offer for access to civil infrastructure with cost-oriented prices (MARCo).
- Provide detailed information about any fibre roll-out plans to CMT.
- Provide a NGA wholesale broadband access up to 30 Mbps (NEBA).

CMT imposed NEBA in all areas and for all technologies (ADSL2+, VDSL2, FTTH) up to 30 Mbps, with the view of replacing the existing indirect access services over time.

NEBA service was available since the July 2012, after the definition of its reference offer, process that began in November 2011. Prices were provisionally defined in a separate specific procedure, which concluded on the 19th of the same month.

From February to March 2013, CMT reviewed the price for NEBA. On May 2013, CMT notified the EC about its price proposal for NEBA. EC opened a phase II investigation in June, recommending to withdraw or amend price proposal, stating that it included "*an element of arbitrariness*" as a substantial upward adjustment from the results of the BU-LRIC+[4] cost model was considered in the methodology.

On 30th January 2014, the CNMC (*Comisión Nacional de Mercados y Compentencia*[5]) adopted a decision to maintain prices for fibre access.

Retail offer control

The other relevant piece of asymmetric regulation is retail offer control. SMP operators[6] and specifically the former monopolists are usually subject to restrictions in their retail offers, to prevent possible anticompetitive behaviour. In Spain, the main test to approve a retail offer of Telefónica is

[4] Bottom Up - Long Range Incremental Cost+
[5] As we will see later, successor of the CMT and current Spanish NRA for telecommunications and other regulated sectors. It is also the Spanish National Competition Authority (NCA)
[6] Significant Market Power operators. These are operators found by NRAS to have market power in a reference market and, in consequence, are imposed asymmetric obligations to solve identified market failures.

one of replicability, making sure that the proposed price allows competitor to offer a similar product using the regulated wholesale services of Telefónica, and leaving a certain economic margin.

The effort to assure the replicability was especially strong and continuous in the case of the Fusión product, launched by Telefónica in September 2012, which will be described later. In any case, after a long process that had started before summer, CMT approved Telefónica's offer making sure that it was replicable by third operators. Intense supervision of the Fusion products continues as of now.

Notwithstanding, after its announcement, most Telefónica rivals required the CMT to ban the commercialization of the product, alleging it was impossible to replicate using the NEBA service. CMT did not find reasons to accept these claims, so the commercialization of the product progressed.

A couple of months after Telefonica´s launch of Fusión, most operators began to market similar 4-play products, thus somehow proving that the replicability of the product was feasible[7], in spite of the initial concerns.

3. Broadband market evolution in Spain

The evolution of the provision of retail internet access in Spain has been similar to that in other countries. In the very first stages (mid-90s) public internet access was mainly based on dial-up methods. Around 2000, this access started evolving to DSL based services, supported on the incumbent copper network. At the same time, cable-based access was also available in those geographical areas in which cable-operators were present. By the end of the first decade of 2000, the commercialization of fiber based services changed the competition landscape of the market, together with the increasing generalization of fixed-mobile convergent offers.

[7] http://www.xatakaon.com/noticias-adsl-y-cable/la-cmt-archiva-las-denuncias-contra-movistar-fusion-demostrado-que-si-es-replicable

In this section, we will assess how the market has evolved, with special focus on the accesses deployed by ULL-based operators.

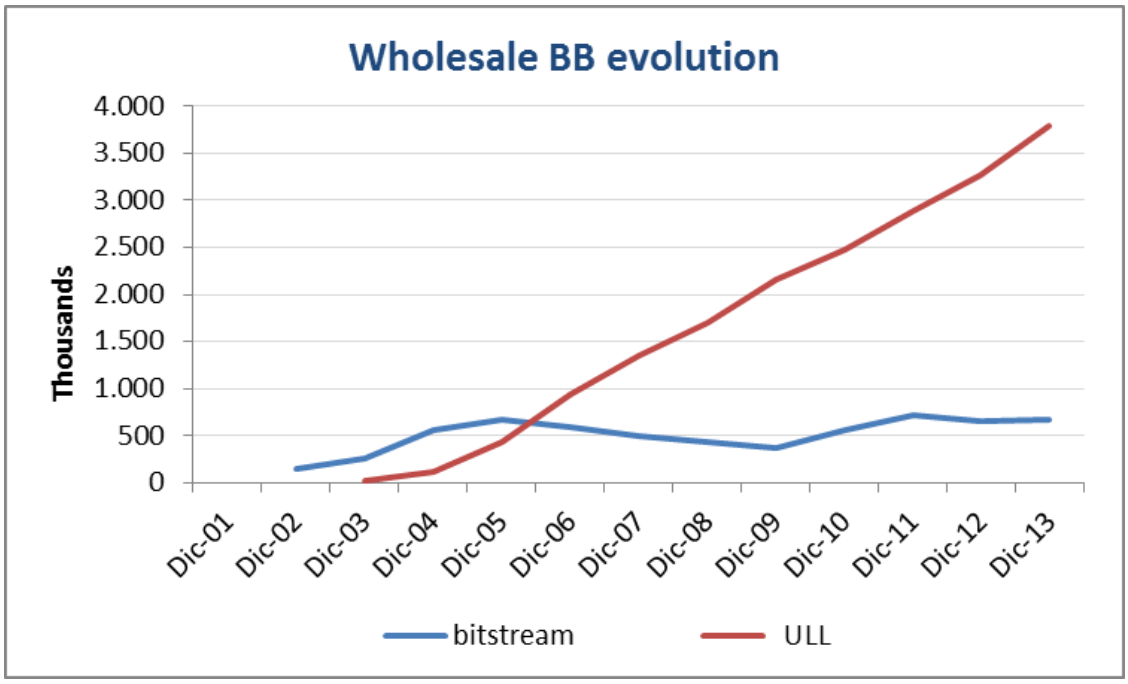
3.1 Evolution of wholesale broadband penetration 1995-2008

First commercial access to internet was based on dial-up. It was available since 1995 under the commercial product InfoVía, providing narrowband access to Internet with speeds up to 28.8 kbps. Due to problems of capacity and poor quality of service it was migrated to InfoVia Plus in 1999, increasing capacity up to 58 Kbps.

Under this model, Telefónica was the only provider of access services to the costumer. Alternative operators offered access to Internet by using Telefónica retail access together with interconnection services. There was not a wholesale market for access to Internet as such.

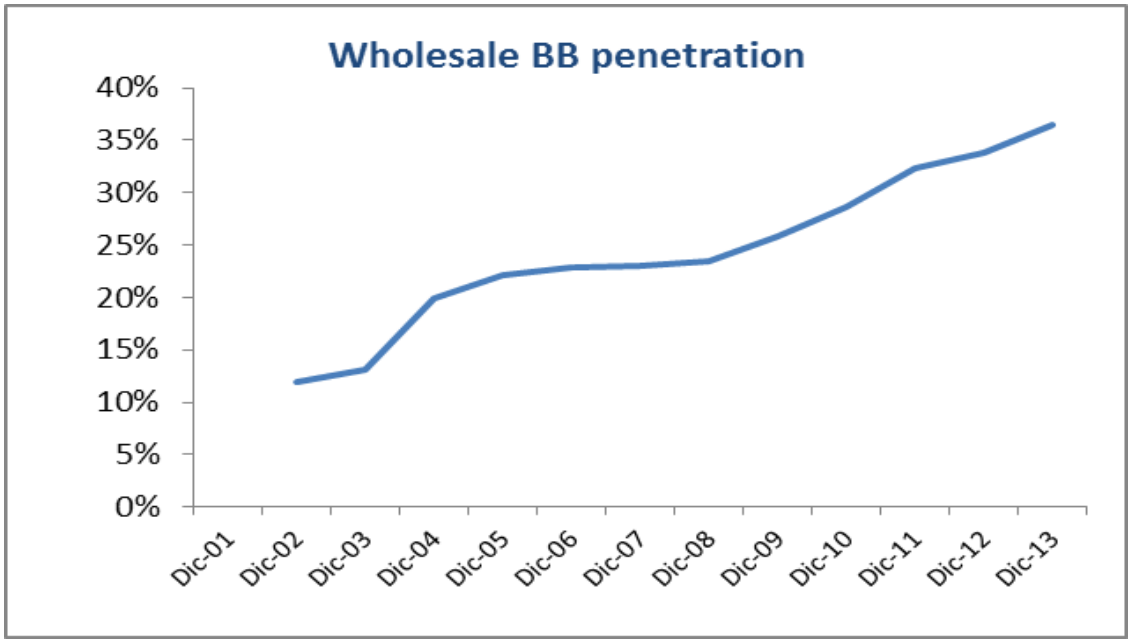
By September 1999, Telefónica launched its first DSL services with speeds from 256 kbps. However, dial-up access would be the predominant type of Internet access until 2002, when DSL services began to get traction. In 2003, DSL revenues surpassed those of dial-up, and by 2004 the number of DSL customers surpassed the number of narrowband ones.

As explained above, in 2000 CMT approved the ULLO and Telefónica was obliged to provide wholesale access products at regulated prices. First data about number of unbundled accesses was recorded by CMT in 2003, amounting to just some thousands of lines. In 2006, unbundled lines reached its first million. Indirect access was already in place in 1999, and it accounted for the majority of regulated accesses until 2005, when was surpassed by unbundled accesses. The complete evolution both of unbundled and indirect broadband access through the years is depicted in the following figure:



Source: CMT

The following graph shows the evolution of the use of wholesale services as a percentage of the total broadband accesses:



Source: CMT

However, even with this spectacular increase in both relative and absolute terms of the use of wholesale services, no progression to the last step of the ladder of investment took place. As late as 2013, no ULL-based operator had deployed any direct access to provide services, as shown in the following tables:

2007	ADSL	HFC	Others	Total
Telefónica	4.313.000	-	-	4.313.000
Ono	49.000	1.227.000	0	1.277.000
Orange	701.000	-	-	701.000
ya.com	442.000	-	-	442.000
Tele2	258.000	-	-	258.000
Jazztel	240.000	-	-	240.000
Euskaltel	5.000	159.000	4.000	168.000
R	2.000	114.000	0	117.000
Telecable	-	81.000	-	81.000
Others	34.000	-	29.000	63.000
Total	6.045.000	1.581.000	34.000	7.660.000

2013	xDSL	HFC	FTTH	Others	Total
Telefónica	5.114.002	0	597.888	429	5.712.319
Ono	70.138	1.466.363	0	0	1.536.501
Orange	1.692.543	0	0	0	1.692.543
Vodafone	954.606	0	0	0	954.606
Jazztel	1.429.393	0	428	0	1.429.821
Euskaltel	2.086	254.186	0	3.722	259.994
R	21.605	192.618	0	0	214.223
TeleCable	0	113.129	7.924	641	121.694
Others	30.359	49.218	3.078	57.482	140.137
Total	9.314.732	2.075.514	609.318	62.274	12.061.838

Ya.com was acquired by Orange and Tele2 by Vodafone
Telecable employs the Asturcon fiber network to provide NGA access in Asturias
Source: CMT Annual Reports

As can be seen, none of the main operators providing broadband access based on ULL services in 2007, i.e., Orange, ya.com (later acquired by Orange), Tele2 (later acquired by Vodafone) and Jazztel, had deployed any direct access on 2013, six years later.

3.2 Evolution of broadband access market 2008-2013: fibre deployment

First deployments of FTTH in Spain

First deployments on FTTH in Spain date from the beginning of 2000. They were carried out by regional and local authorities and supported by public funding. The most relevant example of these initiatives is Asturcon, which deployed optical fibre between 2005 and 2007 to some villages in mining areas, covering around 33.000 households[8]. The network is currently managed through a public company, (GIT - *Gestor de Infraestructuras Públicas de Telecomunicación del Principado de Asturias*), which deploys and operates the infrastructure, providing wholesale access to other telecommunications operators under conditions of no discrimination. Three retail operators are

[8] http://www.elmundo.es/navegante/2007/11/29/tecnologia/1196336487.html

known to be currently using Asturcon services, amounting to 11.700 accesses in total as of August 2013[9].

Commercial deployments of FTTH did not begin until 2007, when Telefónica started some trials with selected customers. In November 2008, CMT allowed Telefónica to start offering retail fibre services on commercial basis.

In 2009, CMT published the first data on fibre customers, reporting around 19.000 customers and 396.000 Homes Passed (HP). From 2009 onwards, fibre deployments were included in the CMT periodical reports, as illustrated in the next chart:

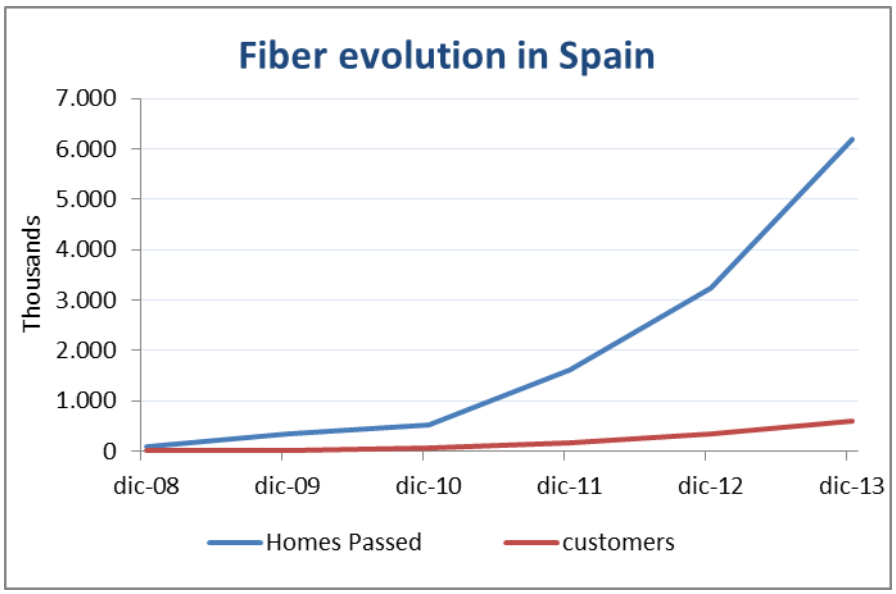
Installed accesses evolution

	2008	2009	2010	2011	2012
Copper	16.100.379	15.865.857	15.996.403	16.065.690	15.740.106
HFC	9.146.308	9.307.653	9.439.863	9.497.692	9.797.680
FTTH		396.065	524.370	1.607.108	3.250.556
FTTN	26.894	628.494	668.724	691.435	700.495
Radio	235.189	233.335	226.186	236.807	219.532
Others	20.699	25.349	20.027	14.207	19.322

Source: CMT

Although in 2010, HP by fibre increased by 50% compared to 2009, it was not until 2011 when fibre deployment started to get traction, reaching a footprint of more than 1'5 million homes. This figure was consolidated through 2012 overcoming the threshold of 3 million HP. At the end of 2013, HP nearly doubled those of 2012.

[9] http://www.socinfo.es/contenido/seminarios/1322asturias2/GITPA.pdf



Launch of Fusion by Telefónica

In September 2012, Telefónica announced the commercial launch of the first 4-play product in Spain combining fixed and mobile services, after obtaining regulatory clearance.

The product included in just one bill the following services:

- Fixed voice
- Broadband access over DSL/fibre
- Mobile voice, up to 500 minutes per month
- Mobile broadband, up to 1 Gb per month.

The monthly price for the bundle was 49'9 € / 59'9 € for DSL / fibre.

The product had a good adoption, at first within Telefónica customer base, but later also in the customer base of other operators. Three months later, by December 2012, one million customers had already subscribed to a Fusion product. Currently, nearly 52% of Telefónica customer broadband base has contracted a Fusion product, amounting to 3 million subscribers by the end of 2013.

Agreement between Telefónica and Jazztel

In October 2012, Telefónica and Jazztel[10], one of its main competitors in the broadband market, reached an agreement to jointly deploy FTTH to up to 3 million homes. According to the public details of the agreement, they would share the in-building cable in multi-home buildings, and each one would roll out half of the total agreed figure before the first quarter of 2015.

The agreement was open to third parties[11], but at the time of signature, no other operator showed interest in joining Telefónica and Jazztel on the venture.

At the beginning of 2014[12], Telefónica and Jazztel revised the scope of the agreement, to increase the total number of HP up to 4'5 million homes, splitting the deployment in halves. By the end of 2013, Telefónica had a total of 3'5 million HP, while Jazztel had rolled up over 1 million homes. There is no public information about how many of these passed homes are part of the agreement, but the figures, specifically the number of accesses deployed by Jazztel, may be indicative of the agreement being fulfilled in general terms. Another hint of this happening was that, in its 2013 yearly results, Telefónica updated its target to 7 million homes passed by the end of 2014.

Agreement between Vodafone and Orange

In March 2013, Orange and Vodafone signed an agreement[13] to deploy FTHH to 3 million homes by 2015 and 6 millions by 2017. According to the public details of the agreement, each of them would cover 3 million homes in complementary geographical areas in order to avoid duplicity of infrastructures. The estimated investment committed in the project was about €1.000 million.

[10] http://corporativo.jazztel.com/sala-de-prensa/notas-de-prensa
[11] http://www.abc.es/20121008/economia/abci-telefonica-jazztel-fibra-optica-201210081810.html
[12] http://www.expansion.com/2014/01/08/empresas/tmt/1389136285.html?a=103fd1578a879ce4879429348b43a8cf&t=1399451665
[13] http://blog.orange.es/empresas/orange-y-vodafone-acuerdo-fibra-en-espana/

Vodafone and Orange, when announcing their agreement, stated that they relied on the redefinition of a regulatory framework in the near future that would allow, among other things, "*the elimination of the bound of 30 Mbps for the NEBA in economic conditions that allow competition in the fibre retail market.*" [14]

Although in August 2013 both operators had committed to deliver 800.000 HP by March 2014, it seems that at that moment Vodafone has effectively covered only 100.000 homes, according to its CEO in Spain[15].

ONO acquisition by Vodafone

On 17th March 2014, Vodafone announced an offer for the cable company ONO, which was later accepted by ONO shareholders. The offer amounts to €7.200 million (including debt of €3.400 million).

According to most financial analysts, the implicit multiples underlying the acquisition are in line with those of the latest mergers in the sector (Kabel DT, Virgin Media, Numericable). Estimated synergies associated with the merger amount to €3.000 million, of which €2.000 million correspond to an expected reduction of operating costs, and €1.000 million to increased revenues.

[14] See the following paragraph on the text referred in the previous footnote.
"*Este acuerdo se ha alcanzado en la confianza de que en un futuro inmediato se cuente con un* ***marco regulatorio para la fibra que permita:***
1. *La plena compartición de verticales en el interior de edificios, tal y como establece la regulación, y a un precio adecuado a su coste real.*
2. *Una mayor facilidad de acceso a los ductos de Telefónica, imprescindible para facilitar el despliegue masivo y rápido de la nueva red*
3. *La eliminación del límite de 30 Mb en la oferta NEBA en condiciones económicas que permitan competir en el mercado retail de fibra*
4. *Una mayor facilidad y rapidez en la obtención de los permisos necesarios para la realización de los despliegues previstos, mediante la coordinación en la respuesta administrativa de ayuntamientos y comunidades de vecinos*"
[15] http://www.larazon.es/detalle_normal/noticias/5635673/vodafone-anuncia-que-su-red-de-fibra-llega-a-100-000-hogares

With the acquisition of the cable operator, Vodafone would have access to the largest NGN network (based on HFC) in Spain, covering 7'2 million homes and serving 1'5 million broadband customers in 13 of Spain's 17 administrative areas. The network is fully upgraded to DOCSIS 3.0 with broadband speeds of up to 200 Mbps for residential customers and up to 500 Mbps for SO-Hos, what makes this network the most advanced among those of the cable operators. ONO provides pay TV services to nearly 800.000 customers. It also provides virtual mobile services to more than 1'3 million customers[16], using Telefónica as host operator. ONO reported revenues of €1'6 million for the year 2013.

According to Vodafone, the acquisition of ONO is aligned with its corporate strategy worldwide, that consist of focusing on main markets and becoming there a real integrated operator to compete with incumbents[17].

At the moment of writing, it is not clear how this operation will affect the agreement with Orange described above. After announcing the acquisition, Vodafone showed its intention to limit the fibre deployments in the scope of that agreement to the initial commitment of 3 million HP.

Additional consolidation movements in the market

Due to the very likely acquisition of ONO by Vodafone, analysts have started to speculate with the possibility that the third biggest mobile operator in the market, Orange, could be eyeing targets such as Jazztel or Yoigo.

Different financial analysts estimate that Orange could achieve synergies between €2.000 and €3.000 million from merging with Jazztel[18]. In the meantime, Jazztel has doubled its market capitalization in just one year and as of April 2014 it stands at €2.700 million.

[16] http://corporativo.ono.es/sites/default/files/archivos-descargables/ono_q1_2014_full_results_def_0.pdf
[17] http://www.vodafone.com/content/dam/group/investors/downloads/ono/acquisition-of-ono-newsrelease.pdf
[18] http://www.expansion.com/2014/04/07/empresas/tmt/1396860856.html

On the other hand, it has been speculated with the possibility of Yoigo being other eligible target, due to the current relative expensive price of Jazztel[19]. Other minor regional cable companies, such as R, Euskaltel or Telecable, could also be of interest to Orange, even if they do not offer such attractive synergies for a nation-wide operator[20].

Fibre migration offered by Telefónica to its DSL customers

On April 2014, Telefónica announced that it will upgrade its Movistar Fusion ADSL customers to fibre access in those areas where it has rolled out its FTTH network. The offer includes the low-end TV package of Telefónica.

Apart from the inclusion for free of this TV package, conditions, specifically speed and price, will be maintained after the migration. Those customers who choose to migrate have to stay with Telefónica for a certain time.

On May 2014, Orange has filed a complaint with CNMC, denouncing the impossibility to replicate Telefonica offer by means of NEBA without incurring in margin squeeze.

Summary

Commercial fibre deployments in Spain have been led by Telefónica since 2007 when it began its first trials. By the end of 2013, Telefónica had more than 3'5 million HP with 600.000 customers. It has announced a target of 7 million HP at the end of 2014.

Jazztel signed an agreement with Telefonica in 2012, so that both parts would deploy 1'5 million HP, for a total of 3 million of shared accesses, to be achieved by the first quarter of 2015. The original

[19] http://www.eleconomista.es/interstitial/volver/selfabr14/empresas-finanzas/noticias/5723172/04/14/Vodafone-admite-su-interes-por-Yoigo-si-Bruselas-actua-en-favor-de-la-consolidacion-.html#.Kku8EGsp7IfqFUV

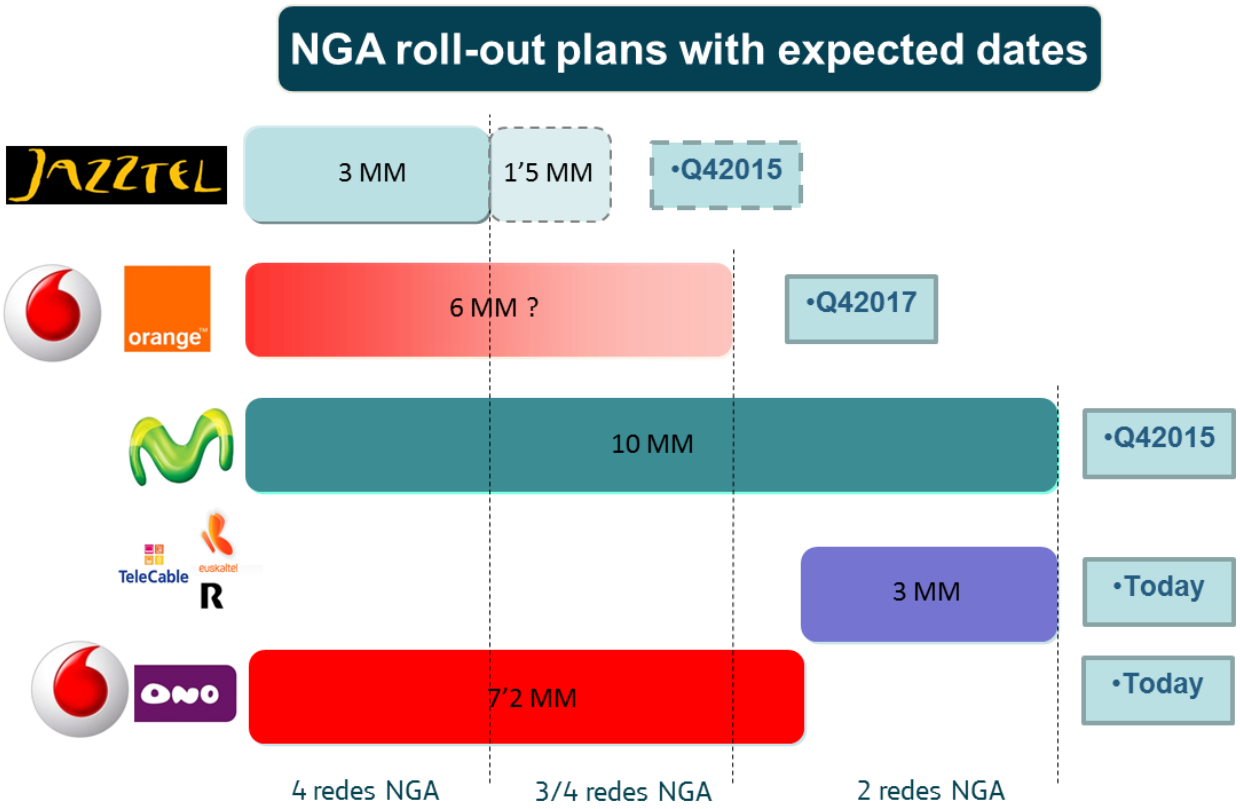
[20] http://www.eleconomista.es/publicidad/aciertoabril/tecnologia/noticias/5688264/04/14/Euskaltel-Telecable-y-R-se-preparan-para-ofrecerse-a-Orange-o-buscar-una-fusion.html

agreement has been recently updated to a shared deployment of 4'5 million HP, increasing in 1'5 million the initial figure.

The fibre roll-out initiated by Vodafone and Orange, in spite of the milestones agreed in 2013, seems to be delayed. It is very likely that the buyout of ONO by Vodafone is affecting the agreement.

Adoption of fibre by Telefónica costumers can be described as a success. Part of this success may have been caused by the 4-play product Fusión, launched by Telefónica in September 2012. At the end of 2013, this product had 3 million of subscribers, accounting for 52% of Telefónica customer broadband base. Telefónica has just launched an offer to migrate DSL customers to fibre.

The following figure summarizes current deployment and roll-out plans publicly announced by operators for Spain.



4. Theoretical explanation

4.1 Competition as a discovery market process

The traditional static approach for competition does not provide much light in order to explain the phenomena depicted above. According to the traditional approach, markets are in equilibrium. The equilibrium may change as a consequence of exogenous events (for example, the advent of a new technology, or the implementation of investments), which change the supply curve or the demand curve. As a consequence, the market somehow moves to a new equilibrium. No explanations are provided on why investments were made or on how the agents interact to reach the new equilibrium; however, this is precisely what we would like to understand when the market evolution is analyzed.

In this sense, our view is that the interpretation of competition as a process, and more concretely as a discovery market process, provides a much richer framework of analysis. This theoretical framework focuses on the process that drive markets in one or other direction, instead of focusing on a hypothetical (and normally unreachable) final state. Moreover, being of a dynamic nature, this framework integrates phenomena that are considered exogenous in the traditional approach, such as investment or innovation.

The understanding of market competition as a process starts from the fact that information about customer preferences is dispersed among individuals, and has to be discovered in order to be satisfied. Based on this fact, the market is understood as a dynamic process of discovery generated by entrepreneurs (Hayek, 2002).

Entrepreneurs are constantly looking for new opportunities for profits, that is, gaps between current and expected prices of resources. This is done by market calculation, which allows them to make estimates to guide their ex ante decisions. Prices act as signs for entrepreneurial activity in this context.

Detecting a profit opportunity is akin to detecting a more valuable use for a commodity. The entrepreneur who decides to act has to acquire the supposedly undervalued resource, and mix it with other resources in the productive process (always consuming time). Then he needs to sell the product at a price allowing him to recover the whole investment, and the interest rate for the passing of time (time-preference rate). If, after the whole process, there remains a profit, it means his anticipation was right and the commodity is more valuable in the new use than it was in the former one. On the contrary, a loss would signal a wrong use for the resource, issuing a clear warning that the commodity should be returned to its original use.

If there is a profit, more amount of the commodity should be directed for the new use. This will be accomplished by entrepreneurs attracted by profits. The process goes on up to the moment in which the profit is exhausted, due to an increase in available stock for the commodity or to an increase in the prices of resources. This increase will in turn act as a signal for profits in downstream markets, unleashing another competitive process there.

Profit opportunities depend on the gaps between current prices of resources and expected prices of them. Changing in prices may thus prompt profit opportunities: a raise in a price signals an increase in the relative scarcity of the commodity, be it due to an increase in its value for individuals (for example, due to a new use), or to a decrease in the available stock. A reduction in a price signals the opposite: an increase in the relative abundance of the commodities, because of the dual reasons.

The Austrian economics view of the market may be then summarized around four key concepts (Kirzner, 1985, p.629-633).

- Competition: understood as rivalrous activities of market players in search for new pieces of information on how better satisfy customer needs.
- Knowledge and discovery: the competitive process does not only mobilize existing knowledge, but also generate awareness of opportunities whose very existence was known to no one at all.

- Profit and incentives: Profits are not understood as the mere subtraction of known costs from known revenues, but as the incentives to locate gaps between costs and revenues. In other word, profits are a sign that resources are more valuable in other uses than in the current ones.
- Market prices: in each moment, they are the exchange ratios worked out between market participants; they provide information to entrepreneurs on the current valuation of commodities, and, thus, on the opportunities of profits.

4.2 Effects of regulation

So far, the workings of the discovery market process have been described assuming that there is no regulation affecting the acts of entrepreneurs. However, the competition process usually has to coexist with regulation. This intervention affects the working of the discovery market process. Specifically, the telecommunications market is subject to considerable intervention, both symmetric (imposed on all agents in the market) and asymmetric (imposed on only some of the agents in the market, for example, those considered as having SMP).

Regulation alters opportunities for entrepreneurial gain, and influences the prices emerging from entrepreneurial competition. Kirzner (1985) identifies four categories for impacts of regulation on the discovery process.

1) *The undiscovered discovery process:* Regulators may not correctly address which would have been the market course in the absence of regulation.
2) *The un-simulated discovery process:* The regulation process cannot simulate the market process, because regulators have no incentives for conventional profit seeking. In consequence, it is very unlikely that they are able to discover opportunities that the market process has not already discovered.
3) *The stifled discovery process:* Regulation may inhibit, discourage or hamper the discovery processes which the market might have generated, activities not yet foreseen by anyone. For

example, price ceilings may not only restrict supply from known sources, but also inhibit the discovery of wholly unknown sources.

4) *The wholly superfluous discovery process:* Regulation may create opportunities for new market discovery processes which would not be relevant in an unregulated market. Regulation constraints introduce profit opportunities that otherwise would have been absent. Such consequences may be wholly undesired by authorities.

In brief, "*the competitive-entrepreneurial process, being a process of discovery of the as yet unknown, can hardly be predicted in any but the broadest terms. The imposition of regulatory constraints necessarily results in a pattern of consequences different from (...) what would have occurred in the unregulated market.*"

4.3 Analysis

As has been shown, until 2012 there was no alternative access deployment by ULL-based operators. Even if in 2007 these operators already had near 1'8 millions of clients, by the end of 2012 they have NOT one client served by their own infrastructure, out of nearly 4 millions of customers.

Herrera-González & Castejón-Martín (2011) show that this lack of investment into own infrastructure could be due precisely to the "ladder-of-investment" regulatory approach. They base their reasoning on the following points:

1) Impossibility of establishing relevant points of access outside the market process, causing rungs defined by regulation to be arbitrary. Even if they are reasonable from a technical point of view, this does not imply that there is a need for them in the market.
2) Impossibility of establishing a meaningful price outside the market process; prices set by the government will distort the investment decisions of entrepreneurs, causing them to direct resources to wrong places.
3) As the decision to progress between rungs depends on the incremental profit (instead of on the absolute level of the same), it is more difficult for an operator already present in the ladder of investment to deploy its own access network, than it is for a whole new entrant. However,

> regulation at that time was driving prospective alternative operators to the ULL rung, making it very unlikely that they would be interested in deploying their own access network.

Herrera-González & Castejón-Martín (2011, p. 92) consider that the ladder of investment gives rise to instances of the un-simulated market process, the stifled market process and the wholly superfluous market process, following the classification of Kirzner (1985).

As the production model is defined a priori by the regulator, "*entrepreneurs will see that relying on the incumbent network and replicating its architecture is a better alternative than looking for other solutions to serve the market. So, the regulatory defined production model will tend to stay and so will the rungs of the ladder of investment. Innovation will be driven from the search for alternative network solutions, to the search for new uses of the incumbent network.*"

On the other hand, prices below market level for wholesale services "*will produce lower profits and thus will repel entrepreneurs willing to enter the wholesale market (i.e. develop alternative infrastructures). This will probably lead to stifled innovation due to a lack of incentives.*"

So, the lack of investment in own infrastructures by ULL-based operators until 2012 could be explained based on the stifling of the market process by the regulatory approach. In other words, the availability of a regulated wholesale service froze innovation in the production process of broadband services and caused operators to opt for the regulated production process.

The regulatory situation slightly changed in 2009, as has been told before. From that moment onwards, there is no wholesale regulated access for services above 30 Mbps. However, this per se is not enough to trigger an investment process. As has been explained above, entrepreneurs have to be aware of the opportunity for the investment process to start.

It has been shown that Telefónica was deploying FTTH since 2007, but that this deployment did not have a great impact in the competitive dynamics of the market, arguably due to the premium to be

paid in comparison with DSL bundled products, and to the lack of demand of high speed connections. In fact, the FTTH deployment did not get momentum until 2011, when 1'5 million of homes were passed, figure that was duplicated to 3 million in 2012.

Recall that in September 2012 Telefónica launched Fusion, the first 4-play product in the market, including voice and data, for both fixed and mobile access. As an entrepreneurial effort, success is not guaranteed. However, it has been also shown that the product may be considered a success in terms of number of clients.

As expected, this success attracted the attention of its competitors, and in a very short timeframe, all main operators in Spain had their own 4-play offer in competition with Fusión. This was easy and quickly accomplished by alternative operators in part due to the replicability requirements on Telefónica's commercial offers. As has been shown, before Telefónica could launch its offer, it was subject to a long and inquisitive procedure by CMT to make sure it would be replicable by other operators. To be sure, this procedure still goes on today for each new product or promotion launched by Telefónica under the Fusión brand.

Thus, we find a clear instance of the trial and error, innovative and imitative process of competition, with the usual steps:

1) Telefónica spots a business opportunity (4-play products packaging fixed and mobile, voice and data services) and tries to profit from it
2) After launching the Fusion product, the high take up is interpreted (mistakenly or not only time will tell) both by Telefónica and its rivals as a success.
3) In consequence:
    a. Telefónica increases the pace of its fibre deployments,
    b. The rest of operators launch their own 4-play package.

The competitive process is distorted because the regulator has made sure that the offer of Telefónica is replicable by the rest of operators. This explains why it takes so little time for other operators to

react and also why they just mimic Telefónica's offer. In fact, this is what has happened in the past with all successful offers launched by Telefónica: as the regulator is assuring replicability of Telefónica products, there are no essential difficulties for imitating them, and no need for other operators to innovate or invest in their own network.

This time, however, there was a feature in Telefónica's offer that could not be replicated with the regulated wholesale offer. As explained, NEBA is only regulated for the provision of services up to 30 Mbps. Thus, any Fusion bundle that includes the provision of broadband services over that threshold cannot be replicated by alternative operators using regulated services.

This situation forced operators to look for alternative ways to imitate the offer of Telefónica. On the one hand, cable operators sped up its mobile strategy, adding mobile virtual services[21] within its product portfolio and bundling them with high speed products based on its DOCSIS 3.0 network.
The main problem was, of course, for those operators based on ULL-services, which lacked any fixed access network to provide services and had historically relied on Telefónica's network.

In the previous section it has been shown how Jazztel, Vodafone and Orange reacted to the situation. Now we are able to explain those reactions in economic terms.

Absent any regulated wholesale service allowing for the imitation of Telefónica's offer for speeds above 30 Mbps, Jazztel opted for deploying their own FTTH. To achieve this, it reached an agreement with Telefónica for sharing the deployment to 3 million of households. Jazztel has already started offering broadband services of 200 Mbps over its own network[22], a differentiated offer which would not have been possible under a regulated regime.

[21] It should be noted that the main mobile operators in Spain are obliged to provide wholesale mobile access to their networks. However, access conditions are not regulated and left to commercial negotiations. In consequence, the degree of distortion introduced in the competitive process by this obligations is of a considerable lesser degree than that introduced by the wholesale broadband access regulation.

[22] http://www.eleconomista.es/interstitial/volver/selfmay14/tecnologia/noticias/5510466/02/14/Jazztel-lanza-su-fibra-optica-de-200-megas-con-un-pack-para-atacar-a-Movistar-Fusion.html#.Kku8VTTSadcDVOm

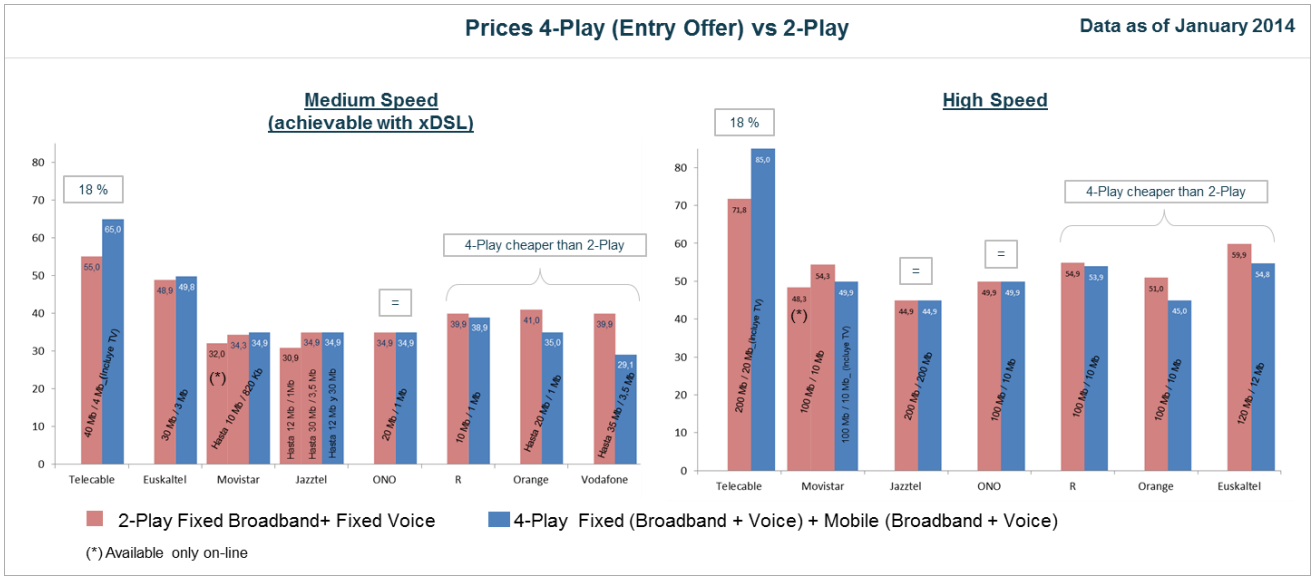
The other main ULL-based operators were Vodafone and Orange. Both of them own and operate mobile networks, contrary to Jazztel and the cable operators. They initially opted for a strategy of "wait-and-see", possibly assuming that the CMT would eliminate the 30 Mbps bound for regulated access to FTTH in the short term.

This did not happen, and in March 2013 they announced an agreement to share the deployment of FTTH to 3 million homes by 2015. As has been described, both operators seemed to condition this deployment to a redefinition of the regulatory framework and specifically to the elimination of the 30 Mbps threshold for NEBA. Because of this fact and the lack of actual deployment deriving from this agreement, it is not clear what the real purpose of the announced agreement was. What is clear is that it put a lot of pressure on the CMT to increase regulation on Telefónica's FTTH network.

At that moment, the Spanish regulator was also going through fundamental changes of its own. In fact, the process initiated by the Spanish government in early 2012 to consolidate regulatory authorities from different markets into one agency was about to mature. CMT was to integrate into the recently created CNMC. This of course caused unavoidable disturbances in the functioning of the former regulator, making very difficult the approval of such an important measure during the soon-to-end term of the Council.

With independence of the causes, there was no revision of the scope of the wholesale access service to FTTH and the 30 Mbps bound remained. And it remains up until now, in spite of the common belief that the CNMC will remove it in the next market revision.

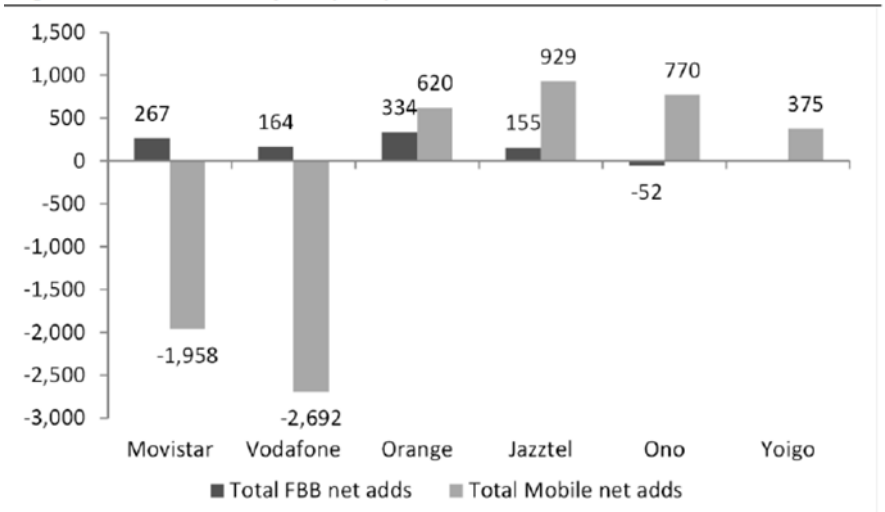
In the meanwhile, Orange and Vodafone were suffering increasingly the effects of not matching their unregulated competition. More specifically, the generalized launch of 4-play products has the unexpected effect of reducing the value of the mobile network, and the willingness of customers to pay for mobile services. As can be seen in the following figure, as of January 2014, there was no significant difference of prices between the fixed 2-Play offer and the entry 4-Play offer for most operators in the Spanish market. In fact, in some operators 4-Play prices are below 2-Play prices.



What this figure shows is basically that mobile network seems to lose its value when bundled with fixed broadband. Obviously, the agents most affected by this trend will be Vodafone and Orange, because they have mobile network but lack fixed access network. Telefónica, on its side, can protect the value of its mobile network to a certain extent by bundling it with its FTTH network. But this is out of the scope of Orange and Vodafone, in the absence of regulated access to Telefónica's network.

Vodafone seems to be the main sufferer of this trend, as the graphic below depicts:

Figure 5. Net Adds in Spain ('000) since *Movistar Fusion's* Launch, Oct12 – Dec13



Source: "*ONO, Sensible deal*". Banco Santander (March, 2014)

For example, more than 60% of new subscribers of Jazztel were contracting convergent products. Vodafone, however, stood at just 17%. These results forced Vodafone to change its strategy regarding the fixed network, what could explain the acquisition of ONO.

Orange, for its part, did not have the same urges, as the results depicted above show. This could explain why they have not moved yet on this regard and seem to keep the "wait-and-see" and regulator lobbying strategy.

4.4 Summary

Since 1998 to 2012, no ULL-based operator deployed access infrastructure in Spain. During that period, operators could access Telefónica's network basically in the same way Telefónica could, by means of regulated wholesale services.

In 2009, the CMT decided not impose a regulated wholesale access services to Telefónica FTTH network for speeds above 30 Mbps. This regulatory situation has remained since then, due to various reasons, among them the structural changes suffered by the regulator which could have delayed the market analysis.

This delay has caused alternative operators to, one by one, abandon their strategy of "wait-and-see" hoping that CMT would force Telefónica to offer regulated wholesale services above 30 Mbps. They have been compelled to do so in part for the successful launch by Telefónica of 4-play products. Absent the possibility of imitating this product by using regulated services (specifically, for bundles with FTTH), they have started to look for alternatives to serve the costumer. This has sparked a dynamic competitive process of discovery that had been absent from the Spanish telecommunications market for most part of its history.

Jazztel was the first alternative operator to react, and it did so by starting to deploy its own FTTH network for around 3 million households in cooperation with Telefónica. Vodafone and Orange initially reacted by signing a similar agreement, using it to put pressure on the regulator to impose the above referred wholesale obligation on Telefónica. The expected results from the agreement have not been achieved so far, contrary to what has happened with the agreement between Jazztel and Telefónica.

This may have driven Vodafone to the acquisition of ONO as a mean to bundle its mobile services with fixed services of similar speeds as those of Telefónica FTTH network, and thus protect the value of its mobile network.

Summing up, it have been shown that there is causal relationship between the lack of regulation on access to Telefónica FTTH network above 30 Mbps, and the consequent investment of up to this moment ULL-based operators (namely, Jazztel and Vodafone) on their own access network. This deployment has not been necessary until now, because, thanks to regulation, entrant operators could completely rely on Telefónica network to imitate the entrepreneurial process of this operator. That regulation seems to have stifled the discovery market process, process which is now operating with very good prospects for the social welfare.

5. Hypothesis contrast: situation in other European countries

Having shown in the previous section that there seems to exist a causal relation in Spain between the lack of a regulated NGN wholesale service, and the deployment of NGN by alternative operators, we propose now to briefly check this hypothesis in a sample of EU countries. Our approach for this check is twofold:

1) If there is a regulated NGN wholesale service, there should be no deployment of NGN by ULL-based operators.

2) If there is NGN deployment by ULL-based operators, there should be no regulated NGN wholesale service.

We propose to review the following countries, as especially relevant for our purpose: Germany, Sweden, Portugal, France and the Netherlands.

5.1 Germany

Regulation[23]

Since March 2011, Deutsche Telekom (DT), the former monopolist, is obliged to provide fibre unbundling to other operators. The decision does not specify how the unbundling is to work in practice on a passive optical network (PON). BNetzA, the German NRA, imposed wavelength multiplexing, with details to be defined in a future reference offer.

Price of unbundled fibre is not regulated ex ante, but it is subject to ex-post control in the form of price-squeeze test.

There is also obligation to provide wholesale unbundled access to copper from cabinets (SLU), the actual usage of this obligation is very limited and restricted to rural areas. Currently, only 2'5% have been equipped by alternative operators to use SLU.

DT is also obliged to provide wholesale services on its FTTC/VDSL network. Price is subject to ex-post control in the same way as the unbundled fibre price. Currently, both Vodafone[24] and O2[25] have a commercial agreement with DT for the provision of this kind of service.

[23] Cullen Research, Feb 2014

[24] http://www.telegeography.com/products/commsupdate/articles/2013/05/16/vodafone-inks-vdsl-network-deal-with-dt/

[25] http://www.multinationalsolutions.telefonica.com/media/64007/network%20cooperation%20may%202013.pdf

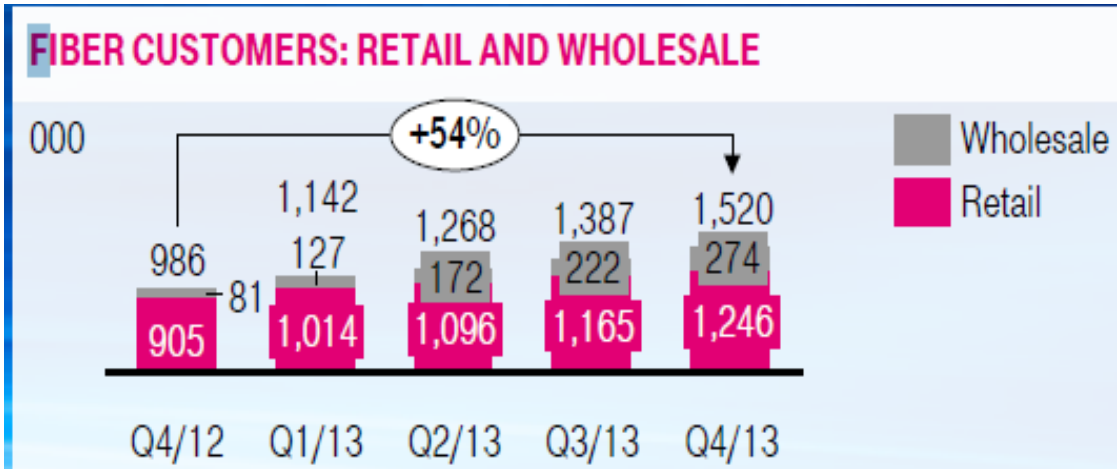
In order to allow for competition in those areas in which vectoring is used, and due to its technological limitations, the operator that first decides to offer retail services by this mean in a cabinet is obliged to provide wholesale broadband access to the rest. Price are subject to ex-post control in the same way as those seen above.

Market

No ULL-based operator is deploying NGN access in Germany or has published plans to do so. In spite of that, Vodafone cquired Kabel DT in 2013.

At this moment, fibre deployment is led by DT with the form of Fibre-To-The-Cabinet (FTTC) plus VDSL. As of December 2013, it covered around 13'5 million homes (34% of the total in Germany) with its VDSL network, a considerable increase when compared to the 3 million deployed by the end of 2012. The company´s target is to cover 65% of the total households of the country with FTTC/VDSL by 2016.

The total number of NGA customers in the VDSL network reached 1'5 million in December 2013.



Source: DT Quarterly Results Q4 13

DT has also some minor deployment of FTTH, amounting to 884.000 HP as of December 2013[26], slightly increasing the 825.000 ones at the beginning of that year. The number of costumers stood at 265.000[27], being most of them (200.000) business users.

The cable-operator Kabel DT was acquired by Vodafone in 2013 for €7.700 million. Kabel DT has a broadband coverage of 31% of households in Germany and serves 2'2 million broadband subscribers. The other cable-operator present in Germany is UPC-Unitymedia; it has similar coverage and serves 2'5 million broadband customers. Both operators were the result of a demerging from DT, former monopolist also in cable services.

Summary

Facts presented for Germany seem to be coherent what has happened in Spain, according to check 1 above. As shown, there is a regulated wholesale offer to the NGN network of DT, based on FTTC/VDSL. Main ULL-based operators are using this offer to provide retail internet access, and they are not deploying their own access network. Thus, in Germany the discovery market process seems stifled by NGN access regulation: no fixed alternative networks have been or are being deployed.

Note that cable networks in Germany were developed under legal monopoly by DT, so they do not constitute a counterfactual to the tested hypothesis.

5.2 Sweden

Regulation[28]

The main feature of broadband regulation in Sweden is the functional separation of Telia Sonera since 2008. The undertakings accepted by the Swedish NRA resulted in the creation of an access

[26] http://www.golem.de/news/ftth-telekom-nennt-keine-ziele-mehr-zum-glasfaserausbau-1401-103562-2.html
[27] BNetzA, Jahresbericht 2013
[28] Cullen Research, Feb 2014.

services division – Skanova – to provide services to all communications providers on an Equivalence-Of-Input basis.

Skanova is obliged to provide unbundled access to the fibre at cost-oriented prices. There is no obligation to provide indirect access to the fibre or access to ducts.

Market

NGA coverage in Sweden stood at 72% of total households at the end of 2013, with accesses allowing speeds over 100 Mbps amounting to 57%[29]. The Swedish fibre market is dominated by so called City Networks, available in 200 of 290 municipalities. FTTH is available in Sweden to around 65% of households[30] (vs. 46% in 2012E[31]) while digital cable networks cover around 38%. With regard to broadband customers, 45% receive services based on DSL, 35% on fibre and 19% on cable by the end of 2013.

FTTH accesses have been deployed by Telia Sonera and by municipalities. In fact, the relatively high degree of FTTH coverage in Sweden may be due to the fact that around 200 municipalities have been rolling out local fibre infrastructure since 1990. These local networks belong to public entities and provide wholesale access to operators on administrative conditions.

In sum, in Sweden there is no fibre deployment by ULL-based alternative operators. There are NGN accesses not deployed by the former monopolist, but they have been deployed by local authorities, and are publicly funded.

Summary

[29] http://www.pts.se/en-GB/News/Press-releases/2014/Sweden-well-on-its-way-to-achieving-the-EU-broadband-targets/
[30] NGA deployments by operator; Cullen report, Feb 2014.
[31] http://ec.europa.eu/digital-agenda/en/news/study-broadband-coverage-2012

Situation in Sweden seems also to be consistent with our findings for Spain, according again to the first of the checks shown above. Here, heavy intervention by means of functional separation for the former monopolist network has hindered any possible investment by alternative operators. To be sure, there are FTTH operators different from the Telia Sonera, but they are owned and funded by local authorities, and provide services in administrative conditions. Once again, the regulation of wholesale access seems to stifle the discovery market process by alternative operators, who prefer to rely on the regulated infrastructures.

5.3 Portugal

Regulation[32]

Portugal Telecom, the former monopolist, is obliged to provide a regulated wholesale access product for its accesses independent of the technology, in those geographic areas in which it has SMP. However, in those areas where there is cable presence, the Portuguese NRA considered that PT has no SMP, so the obligation to provide fibre access does not apply there. These areas account for 80% of total households in Portugal, including the 17 main municipalities.

In sum, there is no regulated wholesale service for fibre in Portugal in practice.

Market

PT provides FTTH access to more than 40% of households in Portugal.

Regarding alternative operators, as of March 2014[33], Vodafone had passed more than 250.000 homes with FTTH. These should be added to the half million homes obtained thanks to a 2010 agreement with the mobile operator Optimus (now merged with cable-operator ZON), for sharing

[32] Cullen Research, Feb 2014
[33] http://www.vodafone.com/content/dam/group/investors/downloads/ono/acquisition-of-ono-presentation.pdf

NGA infrastructure in the two main cities of the country (Lisbon and Porto). This makes a total of nearly 750.000 HP, representing 18% of coverage.

There are also two cable operators. ZON the main one, originated from a demerging of PT, and thus was developed under its condition of legal monopoly. ZON has reported 100 Mbps broadband coverage in around 80% of households. Cabovisao is the other cable operator, covering over 20% of households[34]. During 2013, ZON and Optimus, the third mobile operator, have merged, creating an integrated operator.

Summary

In Portugal, there is no effective wholesale access regulation to the NGN network of PT. So, according to the second check proposed above, there should by NGN deployment by ULL-based operators. And it has been shown that the proposition holds, as Vodafone has invested in deploying its own FTTH network, both by itself and also through an agreement with Optimus. Also, this later operator, together with this agreement, has merged with cable operator ZON. Absent effective regulation, Vodafone and Optimus had to start looking for new ways to compete in the market, and the discovery market process was unleashed.

5.4 France

Regulation[35]

The former monopolist, Orange, has not been found with SMP in the fibre services market. However, it has obligation to provide access to civil infrastructure such as poles and ducts under regulated conditions and with cost oriented prices.

[34] There is no public information about overlapping of coverages.
[35] Cullen Research, Feb 2014

All operators are obliged to provide access to their fibre deployments and share the in-building cabling (what is called "*mutualization*"). In sparsely populated areas, the sharing obligation extends to the distribution network. Price for this access is not regulated and agreements between operators are private.

Market

40% of French households are under an NGA coverage area, be it cable or fibre[36]. NGN market in France is led by the cable operator Numericable, with more than 8'5 million HP (31% of the total), although only 5'2 million of those have NGN capabilities (19%)[37]. Fibre coverage amounted to nearly 3 million homes (11%) by the end of 2013. Orange reported to have 2'6 million HP by the end of 2013 while SFR published to have around 1 million.

NGA customers totaled 2 million by the end of 2013, of which half corresponds to Numericable broadband customers, while Orange fibre customers stood at 320.000[38]. Numericable provides wholesale cable access to Bouygues, reporting around 360.000 white label customers.

A great part of FTTH development is being carried out by means of commercial agreements among operators, in reaction to the lack of regulated wholesale service. For example:

- Agreement Orange-Bouygues, by which Orange provides access to 1'7 million homes in densely populated areas to Bouygues.
- Agreement Orange-SFR to deploy access to 11 million households in sparsely populated areas
- Agreement Orange-Illiad to share a maximum of 5 HP until 2020.

[36] http://www.arcep.fr/index.php?id=10295&L=1
[37] http://www.numericable.com/images/investors/financial/Full_results_2013/PR-FY-2013-Results.pdf
[38] http://www.orange.com/en/finance/nbsp2/investors-and-analysts/latest-consolidated-results

Summary

France provides another instance of the check 2. No wholesale regulated access to NGN is imposed, and there are several alternative operators deploying their own NGNA networks: SFR, Numericable and Bouygues. Operators seem to be focusing on different geographic areas, which could be interpreted as a distortion caused by the obligation of "mutualisation" depicted above. In any case, once again the facts seem coherent with the hypothesis under scrutiny.

5.5 The Netherlands

Regulation[39]

KPN, the former monopolist, is obliged to facilitate third parties fibre access to its FTTH network. This network was developed in a Joint-Venture with Reggefiber. Access terms and conditions are defined in a reference offer which is publicly available[40]. Access has to be provided in transparent conditions and at cost oriented prices, including a reasonable rate of return estimated from a project-specific risk premium. Obligation does not extend to other fibre access such as FTTC.

There is a regulated indirect access service, but only applies to business users with high quality requirements.

Market

No ULL-based operator have deployed network in the Netherlands.

As said above, FTTH services are provided by KPN-Reggefiber JV, covering 1'7 million households (22% of total households in the Netherlands) and providing services to 550.000 customers as of December 2013.

[39] Cullen Research, Feb 2014
[40] http://extranet.reggefiber.nl/odf-portal.html

Reggefiber was set up in 2005 by a public works company, focusing on the large-scale roll-out and operation of an open fibre network. Later, on May 2008, it signed a joint venture with KPN for the rolling out of a national FTTH network. Given the SMP condition of KPN, the Dutch NRA imposed access obligation to the network and a reference offer for the provision of fibre to other operators as a condition for authorising the joint venture. Current shareholders are KPN (51%)[41] and Reggefiber (49%).

Together with KPN, there is a relevant presence of cable operators in the Dutch market. Two companies, UPC and Ziggo, jointly cover more than 95% of the households of the country, amounting for nearly 50% of the broadband market.

Summary

In the Netherlands, access to KPN-Reggefiber FTHH network is regulated. As happened in Germany and Sweden, this regulation seems to have stifled the discovery market process, and no alternative networks have been deployed by ULL-based operators. This is consistent with our conclusions for Spain, according to check 1 of those above.

5.6 Summary

The following tables summarise the survey above, including the data referred to Spain from section 3. The first one shows the NGN coverage achieved by the former monopolist, by the ULL-based operators and by cable operators as of December 2013, with an indication about existence of effective regulation of wholesale access to fibre. The second table details the wholesale obligations related to fibre in each of the countries analysed, classifying them according to the relevant market in which they have been imposed: market 4 (Wholesale physical network infrastructure access at a fixed location) and market 5 (Wholesale broadband access).

[41] At the beginning of 2014 KPN has called an option to increase its share up to 60%.

	NGN Deployment by former monopolist	NGN Deployment by ULL-based operators	NGN Deployment by Cable operators	Effective regulation of wholesale access to fibre
DE	34%		62%	yes
SE	65% (jointly with municipalities)		38%	yes
PT	40%	18%	80%	No
FR	7%	3-13%	18%	No
NL	22%		95%	yes
ES	22%	8%	54%	No

	Market 4				Market 5	
	Unbundling obligation	Reference Offer	Pricing	Used	WBA mandated	Pricing rule
DE	yes	No	Ex Post	No	yes	PST
SE	yes	yes	cost oriented	yes	yes, but withdraw proposed	Cost oriented
PT	No	N.A.	N.A.	N.A.	No	N.A.
FR	Yes	Yes	Undecided	yes	No	N.A.
NL	Yes	Yes	reasonable return	yes	yes, only for Business	Cost oriented (FAC)
ES	No	N.A.	N.A.	No	Yes	Cost oriented (BU-LRIC+)

It is clear that, in those countries in which there is effective regulation for accessing the fibre of the former monopolist, no ULL-based operator has deployed their own access. It is the case of Germany, Sweden and the Netherlands. However, in those countries where no such regulation exists or is not effective, as Portugal and France, ULL-based operators are deploying their own access network.

In sum, it seems that the insight obtained by analysing the case of Spain, holds when other European countries are analysed, at least in first sight.

6. Conclusion

The purpose of this paper was to show that there was a causal relationship between the lack of actual regulated wholesale access to Telefónica FTTH network and the deployment of NGN access by ULL-

based operators in Spain. This has been satisfactorily proven, using the paradigm of competition as a discovery market process.

This process may be summarised in three stages:

1) Entrepreneurs look for business opportunities (i.e. prospective re-valuation of goods) and implement those for which the market calculation is positive, innovating in this way in the market.
2) Once implemented, entrepreneurs may observe if the action was or not successful.
3) If the action is dimmed to have succeeded, other entrepreneurs will try to imitate the pioneer

And so on.

Until 2009, regulatory remedies guaranteed that any innovation in the telco market, be it by the incumbent or by any entrant operator, could be easily imitated by mere replication. This was achieved by the interplay between wholesale access obligations and control of Telefónica retail offers. This possibility stifled the discovery market process, as entrant operators did not need to look for alternative and innovative ways to provide services.

From 2009 onwards, wholesale access to Telefónica FTTH above 30 Mbps was not regulated. This, per se, did not spark investment in NGN by ULL-based operators. Investment in FTTH by Telefónica did not do the trick either. What was needed was a successful product involving FTTH, and this seemed to happen with the launch of Fusión by Telefónica, the first 4-play product in the Spanish market.

Rivals of Telefónica thought that Fusión was a success and the imitation phase of the process was triggered. As the CMT had made sure that the product was replicable in the copper network of Telefónica, this imitation was mainly carried out by using regulated wholesale services. But this imitative process by replication was not possible for Fusión involving FTTH products above 30 Mbps. In consequence, competitors had to start to look for alternative ways of providing services if they were to stay in the market.

This is possibly the reason why Jazztel decided to start investing in its own FTTH network, and why Vodafone and Orange made an agreement to share the deployment of other FTTH network, and why finally Vodafone decided to acquire ONO as a quick alternative to its own deployment. As shown, lack of regulated access to Telefónica FTTH allowed the discovery market process to run its course unstifled, for the increase in welfare of Spanish costumers, who in brief will have the possibility to choose among 3 or 4 different NGN networks.

Evidence in other EU countries seem to be coherent with the causality identified, even if the concrete development in each country will for sure have specificities that we are not able to detail here. We have shown that in those countries where access to NGN is not regulated, or not effectively regulated, entrant ULL-based operators have started deploying their own NGN network.

We are aware that economic phenomena are complex and obey to numerous causes. We are not pretending that the lack of regulated wholesale access to NGN is the only cause behind the deployment of NGN access by entrant operators: of course it is not, and we have shown that other events need to concur in order for that process to start. In other words, the absence of a regulated wholesale service to NGN does not guarantee the deployment of NGN either by the former monopolist or by the entrant operators.

But, at least, we have a powerful counterfactual: The presence of such regulated access was accompanied by the complete lack of access network investment by ULL-based operators since 1998 to 2011, not only in Spain but in most EU countries. It is clear that such regulation stifled the discovery market process. Once this process was let free, it forced Telefónica competitors to react in innovative ways, for the welfare enhancement of costumers and more generally Spanish society.

In view of all this, our policy recommendation is certainly simple: let the discovery market process run its way; avoid regulating NGN investment by former monopolists or any other operator.

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Appendix: Brief description of main telecommunication operator in Spain

Telefónica Spain

Former fixed telephony monopolist.

Provides fixed and mobile services as well as pay TV services. It manages and operates a nation-wide copper network. Since 2007, have been rolling out a FTTH network, covering 3'5 million households by the end of 2013 and forecasting 7 million by the end of 2014. It provides mobile services (2G/3G/4G) through its own nation-wide mobile network.

- #1 broadband operator with 46'8% of market share (5'9 million broadband customers[42]).
- #1 mobile operator with 33'2% of market share (19 million customers)
- In 2013, Telefonica Spain reported revenues of €13.000 million, an EBITDA of €6.300 million and €1.500 million Capital Expenditures (CapEx) [43].

Vodafone Spain

Spanish subsidiary of Vodafone Group Plc.

Provides mobile services through its own mobile network (2G/3G/4G) and fixed services (voice, broadband) using regulated wholesale facilities. In March 2013, signed an agreement with Orange in order to cover 3 million households with FTTH by 2015.

- #2 mobile operator with 24'6% of market share.
- #6 fixed broadband operator with around 1 million customers.
- For the fiscal year 2013, reported revenues of £3.518 million, EBITDA of £787 million and CapEx of £511 million[44].

Orange Spain

Spanish subsidiary of Orange Group.

In 2005, Orange Group bought Amena (3rd mobile operator) integrating the operation within the French Group. Manages and operates a mobile network with nation-wide coverage (2G/3G/4G). Fixed services are provided using regulated wholesale facilities.

- #2 broadband operator with 1'7 million customers (14% of market share).
- #3 mobile operator with 12'7 million customers (22'9% of market share).
- In 2013, revenues stood at €4.052 million, EBITDA at €1.038 million and CapEx at €562 million[45].

[42] CMT December 2013 market data
[43] Telefónica Group 2013 FY results
[44] Vodafone H1 13/14 quarterly results
[45] Orange 2013 FY results

ONO

Leading cable operator in Spain, with an HFC network fully upgraded to DOCSIS 3.0. The current cable operator resulted from the merger of regional cable operators in the first decade of 2000.

ONO manages the largest next-generation network in Spain (HFC) with approximately 7'2 million HP and serving 1'5 million broadband customers in 13 of Spain's 17 administrative areas. The other 4 regions (Asturias, Galicia, País Vasco and Extremadura) not covered by ONO are served by regional cable companies. Mobile services are provided through an MVNO contract with Telefónica, serving 1'3 million customers.

- #3 broadband operator with 1'5 million customers (12'3% of market share).
- MVNO with 1'3 million mobile customers (less than 3% market share).
- In 2013[46], ONO reported revenues of €1.598 million, EBITDA of €680 million and CapEx of €422 million.

Jazztel

Independent operator publicly owned and listed in Spain Stock Exchange. Provides fixed services (voice, BB, Pay TV) through Telefonica´s copper network using regulated wholesale facilities. It also provides mobile services through a MVNO contract. In September 2012, it signed a fibre deployment agreement with Telefónica, with the objective to jointly cover 3 million households with FTTH.
It ended up 2013 with an estimated fibre coverage over 1 million HP. As of April 2014, FTTH coverage stood at 1.6 million[47] HP with 25 thousand fibre customers.

- #4 broadband operator, with 1'4 million customers (11'9% of market share)[48].
- MVNO with 1'2 million mobile customers.
- In 2013, reported €1.044 million in revenues while the EBITDA stood at €184 million. CapEx rose to €294 million due to the beginning of FTTH roll-out.

[46] ONO 2013 FY results
[47] Jazztel Q1 2014 results
[48] Jazztel 2013 FY results

Yoigo

Spanish subsidiary of the Swedish operator, TeliaSonera.

Provides mobile services, by operating its own mobile network (3G/4G) and completing its coverage through a MVNO agreement with Telefónica. Since Q3 2013, Yoigo has begun to resell retail fibre products from Telefónica bundled with its own mobile offer.

- #4 mobile operator with 6'6% of market share (3'9 million customers).
- Revenues of SEK9.467 million and EBITDA of SEK690 million[49].

[49] TeliaSonera 2013 FY results