Is policy adapting to its market, or vice-versa? Evaluation of policy measures on the FTTH market.

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Abstract

There currently is a large variety in the policy and regulations that are steering the developments of telecommunication networks worldwide. Specifically, in the deployment of future-based fixed broadband networks (Fiber-to-the-Home), different regions and countries are taking a different approach. For example, where the US ruled that broadband providers should not be subject to last-mile unbundling, some other countries from Europe (Portugal, Spain), as well as countries in the Asia-Pacific region (Japan, New Zealand) are regulating it with different approaches.

By comparing a selection of OECD countries on their policy approach, competition status and fixed broadband pricing, this paper aims at evaluating the impact of certain policy approaches on network development and market evolution. The paper concludes that there is no clear trend between the GDP per country and its broadband entry pricing (i.e. the lowest price for a 25Mbps download offer. Countries that have less parallel infrastructures (DSL, cable DOCSIS and/or FTTH) typically have lower broadband retail pricing. Unbundling or wholesale obligations clearly lead to a higher number of competing service providers (offering services using the same underlying infrastructure network), but does not necessarily lead to lower retail pricing. Countries with government investment in rural and/or urban areas report more service provider competition than countries without government investment. This might be a natural trend, or following from the fact that if governments invest invest in urban and rural areas, they make clear that only one fiber network is going to be sustained.

Keywords: *Fiber-to-the-Home, policy, business case*

1 Introduction and motivation

The telecommunications sector has long been in the hands of national monopolies in Europe and Asia, while a limited number of private undertakings were in charge of the market in the United States. Liberalization and regulation efforts brought a new dynamic to this market, while the introduction of broadband, and more recently Fiber-to-the-Home (FTTH), provides opportunities for new players, both on the infrastructure and service market.

On the infrastructure side, the deployment of FTTH networks is becoming more and more an economic challenge (Van der Wee et al., 2014; Domingo et al., 2014), rather than a technological one, as the deployment of this new infrastructure requires a significant upfront investment. While some countries stimulate the involvement of the government into deploying the infrastructure – like Japan or New Zealand, others are working to raise new barriers for public institutions to invest their funds into deploying new networks (US or Europe) (FCC, 2015.a, European Commission, 2014). Exceptions in both regions are rural and areas with difficult access, where public funds are allowed under certain conditions.

Currently, there is a plethora of regulatory obligations and guidelines, which strongly differ across countries. One of the more important points refers to the need for unbundling or open access on fiber infrastructure, similar to unbundling obligations on copper-based networks. Where the US ruled that broadband providers should not be subject to last-mile unbundling, some other countries from Europe (Portugal, Spain), as well as countries in the Asia-Pacific region (Japan, New Zealand) are regulating it with different approaches. Apart from clear regulatory obligations, some countries or regions also set dedicated targets for broadband coverage and uptake. The most well-known example can be found in Europe's Digital Agenda (30Mbps to all by 2020) (EC, 2010), while the FCC in the US with an Agenda of the same year (FCC, 2010) now follows with a minimum target of 25Mbps definition of broadband that updates the 2010 Agenda (FCC, 2015.b). While these targets aim at stimulating network deployment in less populated regions, they seem to be a new tool to show evidence of not needing to upgrade the network in other areas.

Although these regulatory recommendations, guidelines and targets all aim at providing high-quality, yet affordable, services to end users in a competitive market, there is little to no proof of their actual effect. Therefore, by comparing a selected number of OECD countries on their policy approach, competition status and fixed broadband pricing, this paper aims at evaluating the impact of policy on the broadband market.

The next section shortly introduces the framework, based on parameters (input) and Key Performance Indicators (output. Section 3 introduces the OECD countries and compares them on policy approaches and their impact on the identified KPIs. Finally, a summary and some dedicated recommendations conclude the paper (section 4).

2 Framework for comparison

This paper aims at comparing the broadband policy and deployment approach in different OECD countries based on a number of selected parameters (input) and Key Performance Indicators (KPIs – output). Comparing these input and output parameters allow for assessing the impact of broadband deployment approach and related policy on the broadband availability and pricing for end users. Apart from these selected parameters, the authors rely on an extended case study knowledge (Van der Wee, 2015; Domingo, 2015) for the analysis.

Five input and three output parameters were selected. On the input side, the authors evaluated both the strategic plan and the actual government and policy involvement. For each of the analyzed countries, the broadband plan was studied: is it a concrete plan with quantifiable targets (e.g. the percentage of the population that should be covered with specified data rates) or is the plan seen as a more strategic vision without specific identification of the goals? Secondly, the authors assess the involvement of the government in terms of direct or indirect investment. Does the government provide financial support for all types of areas or only for low-density regions? Is the support a direct grant or does it take the form of subsidies? The third and fourth parameter aim at assessing the policy approach in the country: is there an unbundling obligation or even a wholesale-only obligation, and if so, on what layer of the network are these obligations set (passive infrastructure (dark fiber), wavelength or bitstream)? Finally, the country's GDP is used as a representation of its investment potential.

These input parameters are compared to three KPIs: broadband pricing, infrastructure-based competition and service-based competition. Broadband pricing denotes the retail prices charged to the end user for the entry offer (given that broadband is defined as reaching a minimum download speed of 25Mbps). They were collected from OECD data and expressed in USD Purchasing Power Parity (PPP). The second and third KPI give insights in the level of competition for each country: infrastructure-based competition indicates operators that offer services running on their own network, while service-based competition is defined based on the number of telecom providers that uses the leased lines of a network operator.

3 Comparing policy approaches on KPIs

This section presents the actual comparison of selected countries and the related analysis. We will first give an overview of the selected countries and the collected parameters, after specific graphs will be distracted to allow for a more detailed comparison and analysis.

3.1 Overview of selected countries

In this paper, we focus the analysis on a selected number of OECD countries: Australia, Belgium, Chile, France, Germany, Ireland, Japan, the Netherlands, New Zealand, Portugal, Spain, Sweden and the United States of America. As can be seen from Figure 1 below, the authors put a focus on Western Europe, but allow for a worldwide comparison. The tables below (Table 1 and Table 2) provide the collected input and output parameters, respectively.

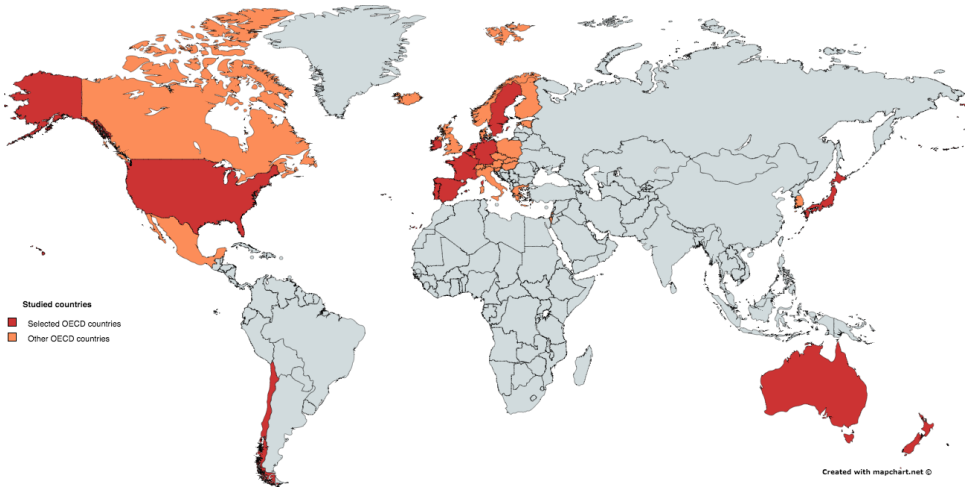


Figure 1: Overview of selected countries

Table 1: Overview of input parameters for the selected countries

Country	BB plan? (Domingo, 2015)	Government investment	unbundling obligation?	wholesale only?	GDP (USD PPP) (OECD, 2014)
Australia	yes	yes	No, because wholesale-only	Yes, for all technologies, FTTH included	44612
Belgium	yes	no	-Yes, bitstream for cable and DSL (no ULL for VDSL vectoring) -No regulation for FTTH	no	42987
Chile	yes	Investment in Wi-Fi	Only inside buildings, but no ULL obligations	no	22254
France	yes	Yes, overall investment under PPP form	ULL for copper, not for fiber	no	38858
Germany	yes	Under-covered regions (white spots)	ULL and bitstream, no ULL for VDSL vectoring	no	44788
Ireland	yes	Underserved areas under PPP investment type	European ones, Yes for DSL	no	47796
Japan	yes	yes[1]	Yes for DSL and proposal for FTTH	no	36485
The Netherlands	Yes (only in PPP schemes)	No (apart from some PPP exceptions)	Yes, bitstream and ULL for DSL	Yes, wholesale-only for Reggefiber	47635
New Zealand	yes	YES: both urban - UFB (Ultra-Fast Broadband: FTTH), and rural - RBI (Rural Broadband Initiative)	Yes (infrastructure separation mandatory)	yes	36401

[1] The case of Japan is shown as direct government involvement as the State holds more than a third of NTT shares (the incumbent operator).

Portugal	yes	Line of credit to cover the entire country	Yes xDSL	no	28317
Spain	yes	Yes: PPP on rural or underserved areas (no competition)	Yes xDSL	no	33720
Sweden	Yes	Yes: mainly for rural areas	Yes xDSL	Yes for publicly-funded regional FTTH initiatives	45113
United States of America	yes	Yes: mainly for rural areas	Yes xDSL	no	54640

Table 2: Overview of output parameters for the selected countries

Country	**BB entry prices[2] (VAT included), in USD PPP for 2014**	**competition infrastructure**	**competition service level**
Australia	35.18	Telstra, Optus (both have DSL and cable) NBNCo deploys limited FTTH	52 service providers on the NBNCo, SMP designated by area are: Telstra, Optus, iiNet and TPG Telecom.
Belgium	29.87	Proximus (DSL, FTTC) Telenet/VOO (Cable) Almost no FTTH	Very limited
Chile	61.61	Telefonica (Movistar), VTR, Entel (those compete with cable and FTTH)	Very limited
France	34.91	3 main operators Orange with DSL and FTTH, Numericable-SFR (cable, FTTH) Free-illiad with FTTH	Very limited to none.

[2] BB is over 25Mbps and including fiber (FTTC, FTTB, FTTH), except for Chile that is over 25Mbps over xDSL access

Germany	40.24	Deutsche Telekom (VDSL), local municipal FTTH initiatives (e.g. Munich, Cologne, etc) Vodafone (Cable)	Very limited
Ireland	28.14	Eircom (DSL and FTTH) UPC Ireland (Cable), Vodafone (FTTH)	Mainly on DSL through bitstream (35%) and LLU (15%)
Japan	25.81	3 main network providers: NTT East, NTT West, KDDI (FTTC and FTTH)	20 FTTH 13 xDSL
The Netherlands	41.93	KPN (DSL and FTTH through Reggefiber) UPC (cable) Local initiatives (FTTH)	Around 12 per area on Reggefiber's network
New Zealand	33.85	Local Fiber Companies (FTTH) Chorus (xDSL) Limited cable	87 SPs in total, about 10 per area
Portugal	38.11	PT(MEO) (DSL and FTTH) Cobovisao (cable)	Limited
Spain	49.07	Telefonica (DSL and FTTH) Vodafone/ONO (Cable and FTTH) Orange/Jazztel (xDSL and FTTH)	Around 6 per area
Sweden	49.07	TeliaSonera and Telenor(DSL and FTTH) Stokab (FTTH) in Stockholm and over 150 small-scale regional FTTH initiatives ComHem (cable)	regional FTTH initiatives: dark fiber + competition on top
United States of America	69.66	4 competitors on national level: ComCast (cable), ATT (DSL and limited FTTH), Verizon (cable and FTTH), TimeWarner (cable) Small players (e.g. Google Fiber)	Around 8 per area

3.2 Impact of GDP on broadband entry pricing

Figure 2 shows the different broadband entry prices (OECD, 2014) expressed in USD PPP versus the countries' GDP (OECD, 2014) expressed in USD PPP. It can be observed that there is no direct correspondence (no increasing trend as one would expect), broadband entry prices range from $25 to $50 (VAT included) in most of the analyzed countries. Exceptional cases are the ones for Chile and the USA. We assume that for Chile the geography plays a huge barrier for network operators when deploying fiber. On the other hand, the US price for broadband is higher due the price setting in triple play offers. When a price is too high (the TV price in the US leads the offer) the other services prices are offered with a higher price to not show such a big difference gap between them, (Domingo & Lehr, 2013). As many other countries also rely mainly on triple (or even quadruple) play offers (e.g. Belgium, Spain), this might not provide a sufficient reason for this higher pricing in the US.

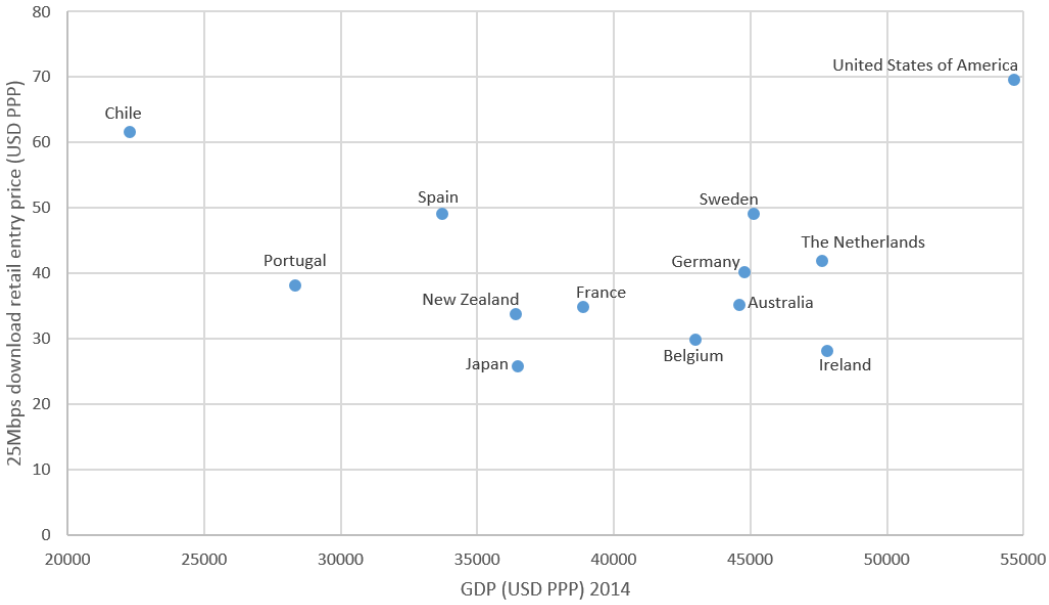


Figure 2:Broadband entry prices versus GDP per country

We have to take into account that the prices in Figure 2 are entry prices for broadband retail offers over 25Mbps. When we put this into context, by comparing how much of this broadband offers are bought, we can have the real impact of the fixed broadband market. For instance, in the case of Chile (Figure 3), it can be observed that there is no market share over 25Mbps, and the entry price is considered too high for most of the population. The US broadband share of the broadband market is also offering the perception that broadband connection was OK to access the Internet while they were focused on Content and Services. Since 2015, with the FCC ruling a new broadband definition (download speed for broadband should be 25Mbps or higher), most of the users realized that they do not have a broadband connection, and that they will need to pay attention to the data speed when buying a new telecom service bundle.

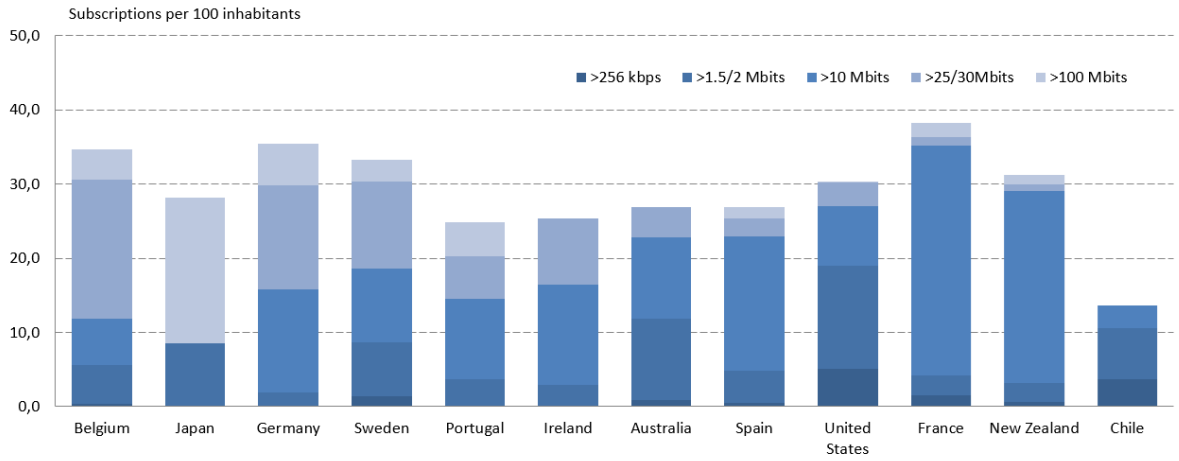


Figure 3: Download speed for broadband subscriptions per country

Although we have used the USP PPP for both BB pricing and GDP, the absolute numbers do not show a clear trend. However, as the GDP can be seen as a measure of economic prosperity in a country, it can represent the investment capacity in a certain country. As Figure 4 shows, Chile still is the outlier, with a very high entry price for fixed broadband (over 25 Mbps). Apart from the mountainous geography leading to a higher deployment cost (and hence price), another reason is that the Chilean government and regulatory efforts are focusing on the wireless coverage, and even their Digital Agenda is planned over wireless enhancement as it can have a higher impact on the short run. But what does explain the broadband price differences in the other countries? We will continue our investigation by comparing broadband pricing on the other considered parameters.

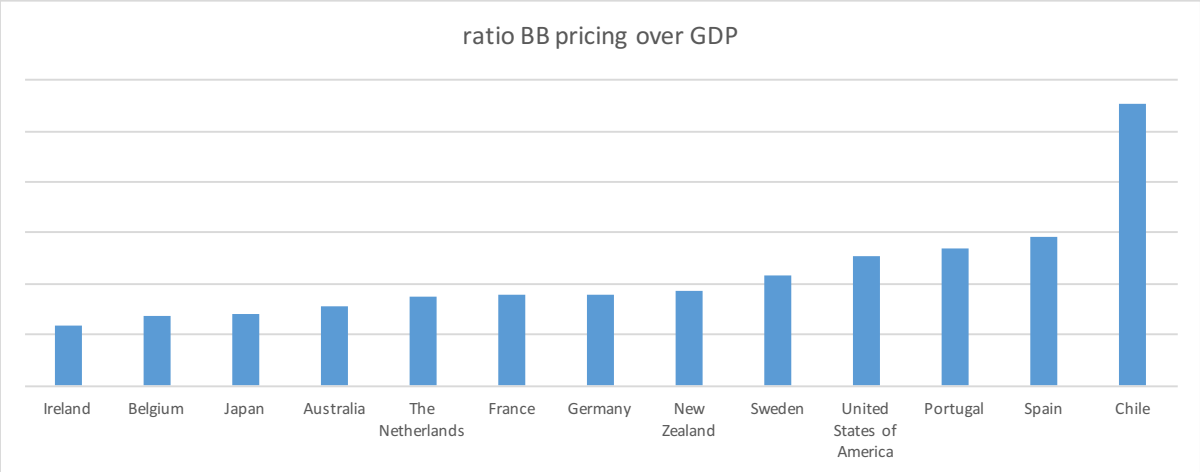


Figure 4: Ranking of compared countries according to the BB pricing/GDP ratio (both expressed in USD PPP)

3.3 Impact of infrastructure coverage on broadband pricing

The infrastructure competition column in Table 2 provides a good indication of the number of competing physical operators (i.e. operators that are relying on their own network) that are on the market in each country. As these operators are however not always targeting the same area, it is not fair to use this number to indicate the level of infrastructure-based competition in each country.

We hence propose a different parameter for analysis: infrastructure coverage, which we define as the number of parallel infrastructures being deployed and operated. As we consider only fixed broadband infrastructures (copper, cable, fiber), this number lies between 0 and 3,

and is based on the actual copper and cable coverage (OECD, 2009) and a FTTH ranking coverage (0-1, in steps of 0.25) based on the literature review performed.

Figure 5 visualizes the broadband entry pricing in comparison to this infrastructure coverage parameter and clearly shows a positive correlation. This observation confirms that deploying full parallel infrastructures (infrastructure-based competition) may increase competition, but does not necessarily decrease prices for the end customers (on the contrary).

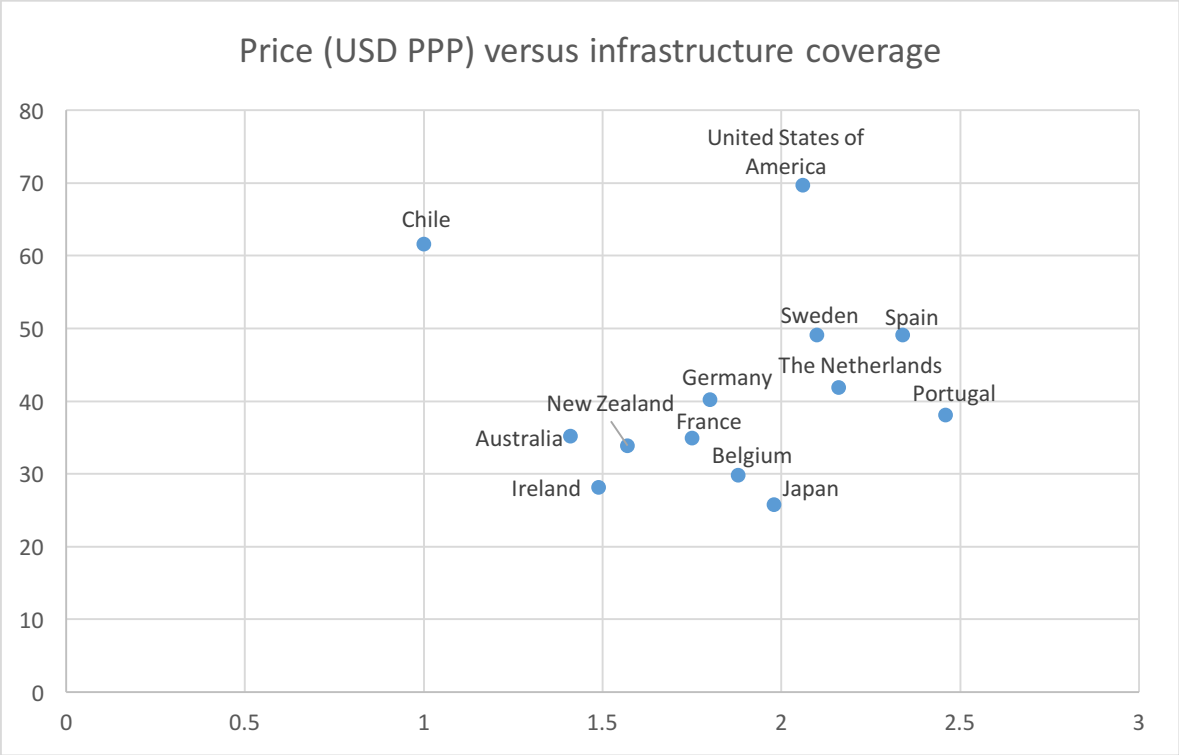


Figure 5: Broadband price versus infrastructure coverage

In comparison to the results above, we have to note that some countries (e.g. Lithuania, Portugal) have implemented an alternative to this infrastructure coverage based on separate technologies. The policy in those countries allows for sharing ducts amongst operators, which leads to a duplication of infrastructure coverage without having to incur the main part of actual network deployment cost (trenching) (Felten, 2016). Since these practices have only emerged recently, they are not taken up in our analysis.

3.4 The effect of service-based competition

The above described approach of sharing ducts offers the opportunity of infrastructure-based competition, and although this might be a good way to maximize the use of trenched ducts, it is not the only way to make optimal use of deployed infrastructure. Existing networks can also be shared by leasing out fibers, wavelengths or bit streams (virtual capacity) to other operators (see Figure 6). As this leasing/sharing is not the direct preference for existing operators (they allow competitors to enter the market without having to incur the full network deployment investment). There are two options for sharing the infrastructure: through unbundling or through wholesale (open access).

Unbundling refers to the case in which a single actor is exploiting both a particular layer and the layer on top of that, while still allowing the co-existence of other actors on top of its own

passive infrastructure/network (e.g. PIP – Physical Infrastructure Provider – also acts as NP – Network Provider, in competition with alternative NPs).

A wholesale obligation, on the other hand, refers to the situation in which the lower layer is provisioned in a nondiscriminatory way to different actors on the layer above (PIP is only allowed the role of PIP). The main difference with unbundling is that the actor responsible for the lower layer is not allowed to act in the layers above.

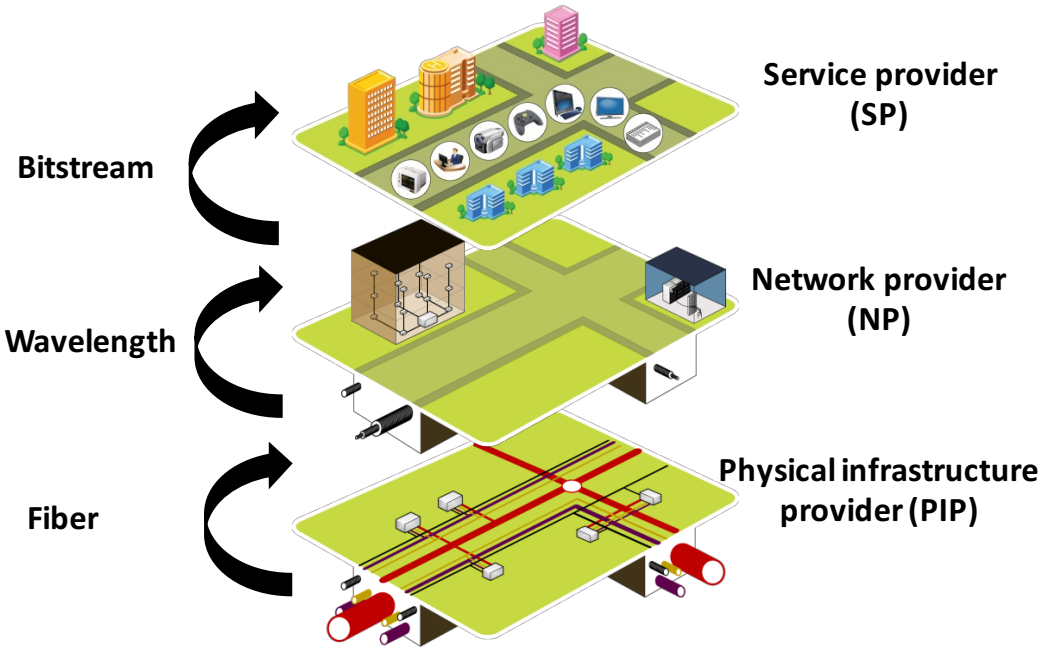


Figure 6: Unbundling and wholesale options

As there is no (single) source available that provides comparable, quantitative estimates for the unbundling, wholesale and service provider numbers, we rely on country-specific information and a more qualitative comparison. Figure 7 compares the countries on the number of service providers per area (relative size of the bubbles) and the level of unbundling or wholesale obligation (position on the Y and X-axis, respectively). This graph clearly indicates that increasing levels of unbundling and wholesale also lead to more service-based competition, and that the in the case of wholesale-only offers, the number of competitors is higher. This observation surely is the case in New Zealand and the Netherlands, where the FTTH network deployed is a full open access network. In the case of New Zealand, a Public-Private Partnership was set up between the government and four Local Fiber Companies. These companies were selected based on a tender procedure; each of them has the monopoly on deploying FTTH in their respective areas. On top of these Local Fiber Companies, many (up to 87 country-wide) service providers contract end users. A similar structure led to the founding of Reggefiber in the Netherlands, who, although now subsidiary of the incumbent KPN, only offers dark fiber to the telecom operators.

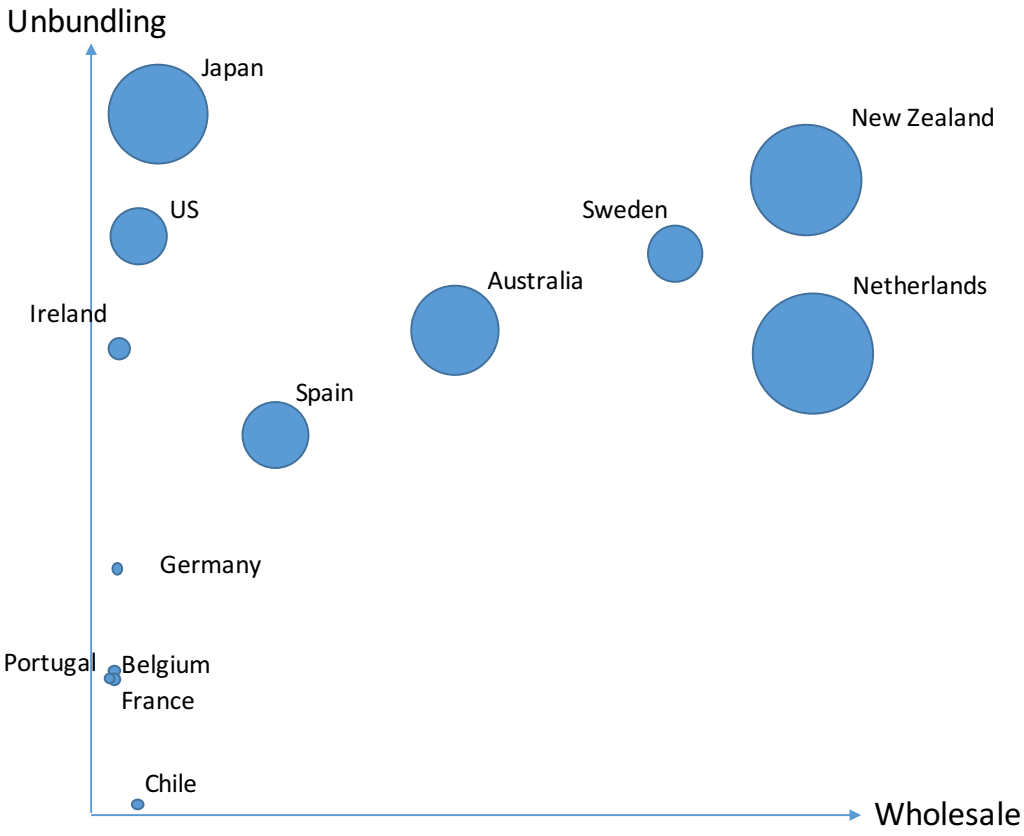
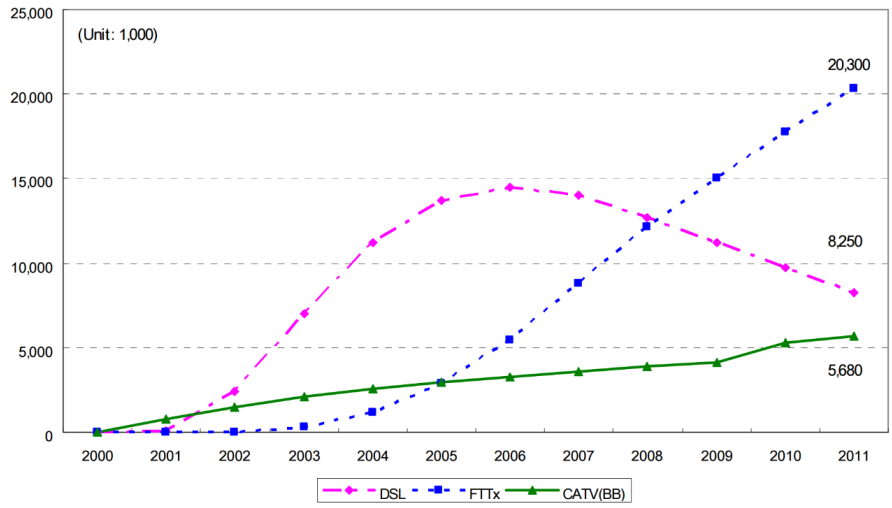


Figure 7: Qualitative comparison of the impact of wholesale and unbundling obligations on service-based competition (the size of the bubbles shows the relative amount of service providers active in the country)

The case of Japan is a specific one. Competition was first promoted in the sense of copper unbundling. In 2004 NTT decided to roll-out fiber, and when the government saw that NTT was nearly reaching its payback of the effort done by deploying the country's fiber network, decreased the unbundling fiber price (bitstream option) below the one of copper. That way, service providers were forced to move to the fiber network. This is a nice example of the government using its regulatory power to introduce competition with the use of unbundling pricing, without the need for a wholesale-only regulation.

A similar effect can be observed in the case of Spain. Initially (in 2009), the CMT (now inside the supra-regulator CNMC) set this threshold for unbundling regulation at 30Mbps, i.e. lines offering a higher download speed would not have to be unbundled. This regulation had a direct effect on fiber deployment, as it ramped-up to the copper levels. It furthermore also triggered investments in rural areas as this non-obligation led to a more secure business case for the deploying operator. Now fiber deployment is more mature, Spain is to regulate the fiber unbundling as a bitstream option (CNMC 2016.a). Figure 8 shows a similar graph for the Japanese and Spanish fixed market, be it with a timing difference.



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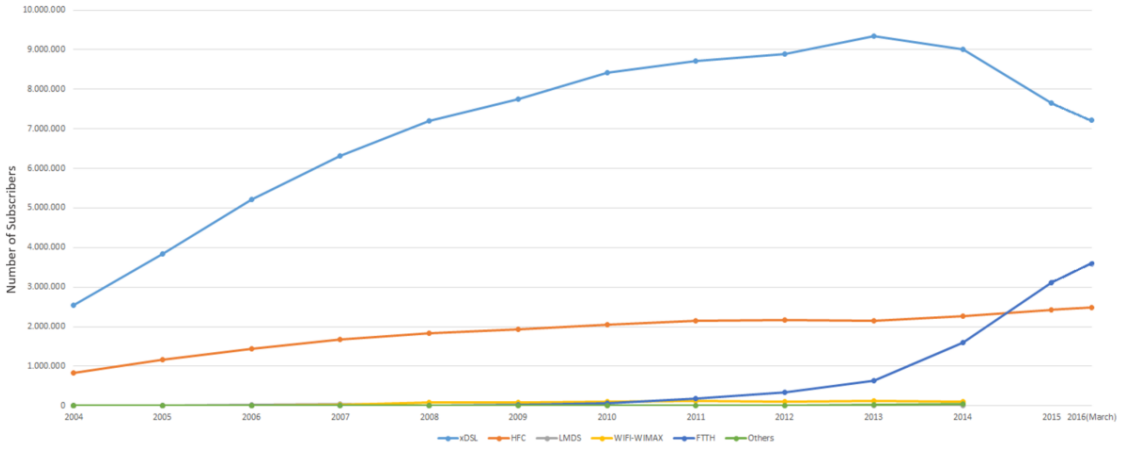

(b)

Figure 8: (a) Japanese fixed-access technology take-up rate evolution. Vertical Axis shows the number of subscribers in thousands (Image source: Akematsu et al. 2012), (b) Spanish fixed-access technology take-up rate evolution. (Data source: CNMC 2016.b).

If we however compare the countries' entry pricing with the level of service-based competition, we see no general trend… We can hence conclude that a higher level of service-based competition does increase the choice for the end customer (a higher diversification in offers, more variation in data rates, download volume, and triple/quadruple play options to choose from), but not necessarily reduce the retail pricing.

3.5 Impact of government investment

When comparing the countries in Table 1, it seems that most of the public money goes to closing the gap with rural areas. For instance, in Spain there is a PPP formula if you bring broadband over 100Mbps offer to a rural area, which is launched every year as part of the Digital Plan (until 2020). This approach follows the European user-centered policy that supports operators that want to deploy infrastructure to uncovered (white) areas (Europe, 2014). In the United States, however, there no such clear support to deploy new networks.

When comparing the government investment and service competition level, we can observe in Figure 9 that an government investment in rural and/or urban areas clearly increases the number of service providers users can chose from.

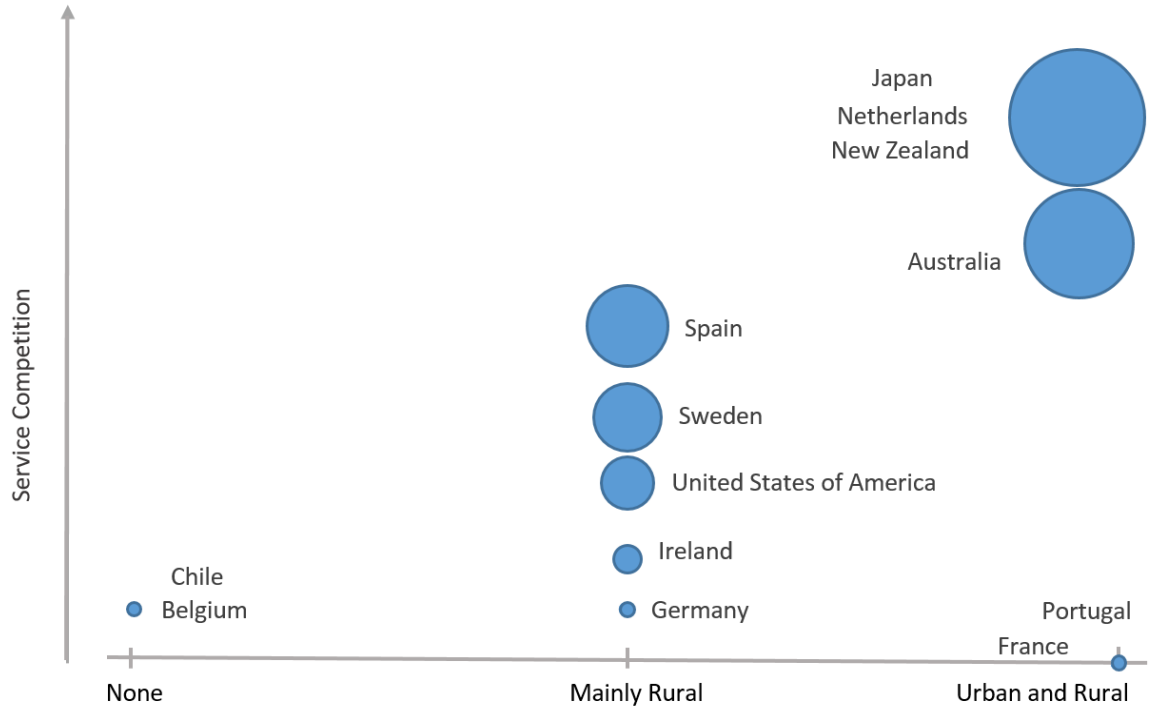

Figure 9: Government investment in fixed networks: comparison of none, mainly rural areas, or urban and rural with the number of Service Providers (the size of the bubbles shows the relative amount of service providers active in the country)

Figure 9 shows that the number of SPs is bigger in countries that invest money to catalyze some of the non-sustainable projects with only private capital investment. It should be noted that in the case of the Netherlands, the main government involvement was done in initializing the FTTH deployment (e.g. the project in Amsterdam, where the local government participated as a market investor (FTTH Council Europe, 2010)). On the other hand, Portugal and France have just started investing in deploying the fiber network, while it might take some time to get the expected SP competition on top of their fiber network.

On the other hand, the higher service provider competition might be a consequence of the government's requirement to only deploy one infrastructure network (as is the case in Japan, Australia and New Zealand). If competitors want to enter that specific markets, they have no other choice than to lease fiber or connectivity from the existing operator.

Chile is a country devoted to increase broadband coverage, and their first approach seems correct: a faster and more sustainable solution is reached with wireless technologies. Hence, again Chile is an outlier: there is significant government investment, but not in fixed telecom infrastructure.

If on the other hand, we compare government investment with retail pricing, we do not observe a clear trend. Figure 10 only points slightly to the information that investing in both rural and urban areas, would decrease the retail market price. On the other hand, Figure 4 set clear that retail pricing is quite set in accordance of GDP.

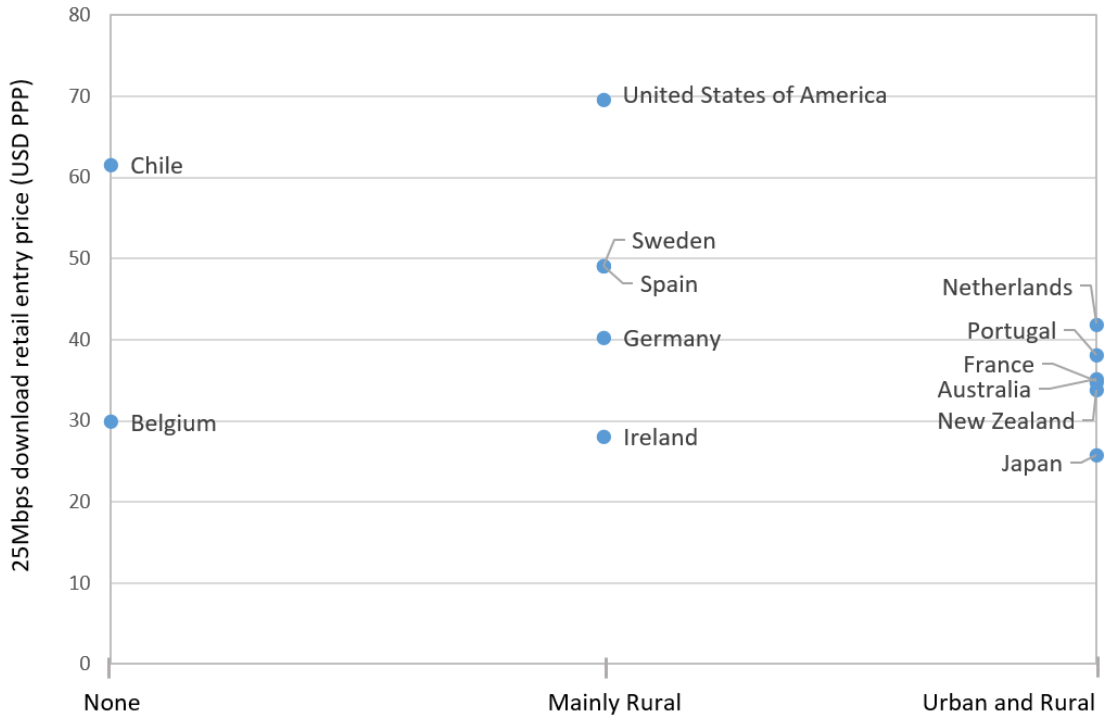

Figure 10: Government investment in fixed networks: comparison of none, mainly rural areas, or urban and rural with the retail broadband entry price

4 Summary and recommendations

Broadband is becoming more and more recognized as a basic need for people, especially after the policy guidelines set out by for example the European Union in its Digital Agenda. More and more countries have hence invested time and effort in drafting a strategy and plan for bringing broadband to all of their citizens. There are however significant differences in the policy approaches taken by different regions and countries, and it is not clear what the best approach is.

Therefore, this paper selected a number of countries (OECD worldwide, with a focus on Western Europe) to compare policy approaches and their effect on the market outcome. A number of input and output parameters (KPIs) was selected. On the input side, the parameters are: the availability of a broadband plan, financial involvement of the government, unbundling or wholesale obligations and GDP as a measure of the investment capacity of each country. The output parameters or KPIs are the broadband pricing and level of competition (both infrastructure and service-based).

The paper draws a number of main conclusions related to both level of competition and retail pricing. There is no clear trend between the GDP per country and its broadband entry pricing (i.e. the lowest price for a 25Mbps download offer), although it needs to be noted that broadband entry pricing is much higher in some countries because there is no market (yet) for this level of broadband.

Countries that have less parallel infrastructures (DSL, cable DOCSIS and/or FTTH) typically have lower broadband retail pricing. This confirms that there is no business case for deploying multiple infrastructure networks in parallel.

Competition on the other hand is necessary to ensure consumer choice and keep pricing down. Unbundling or wholesale obligations clearly lead to a higher number of competing service providers (offering services using the same underlying infrastructure network), but does not necessarily lead to lower retail pricing. Countries with government investment in rural and/or urban areas report more service provider competition than countries without government investment. This might be a natural trend, or following from the fact that if governments invest invest in urban and rural areas, they make clear that only one fiber network is going to be sustained (as is the case in Japan, Australia and New Zealand).

Chile is a constant outlier in all graphics shown in this paper, likely because of two main facts: their Digital Agenda points to a quick wireless coverage and nobody is buying a fixed connection at 25Mbps, as it is considered out of their current speed market.

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