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Promoting investment in fibre and nurturing competition

A CERRE Policy Paper

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Abstract

The main objective of this paper is to investigate the role of regulation in terms of mandating copper access during the transition to fibre. Based on recent studies and own findings considering the trade-off between static and dynamic efficiency, we investigate whether it is efficient to mandate access at a regulated price. Based on this, we then study the potential role of regulation during the transition to fibre. The paper's conclusions include policy recommendations relative to supporting the objective of developing high performing new generation networks and, at the same time, sustainable competition.

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1. Introduction

Information and telecommunication technologies play an essential role in our modern societies. As a driver of productivity and economic growth, broadband development is a central concern both for national and EU policy makers. Promoting the development of next generation networks[2] is paramount to making very high-speed internet available to all European citizens in the near future.

At the same time, vigorous and sustainable competition is of utmost importance to ensure fast and cheap broadband access to final customers. However, constant technological change and the on-going process of liberalisation make it difficult for regulation to achieve effective competition and to promote investment in the broadband market. Indeed, National Regulatory Authorities (NRAs) constantly have to adapt to changes in market conditions while attempting to reach their objectives of sustainable competition and development of a high-performing new generation network.

This leads us to the central question of whether mandating access to the incumbent's network in order to promote broadband competition is necessary to encourage investment in next generation networks, and if so, what the optimal degree of mandated access should be?

In the literature, two opposite points of view have developed regarding access regulation. Supporters of access regulation argue that it provides entrants with the necessary incentives to invest (cf. Ladder of investment theory, Cave (2006)). Opponents argue that access regulation reduces incentives to invest, both for the incumbent (by reducing its revenues) and for entrants (by allowing them, through access to the incumbent's network, to bypass the need for investment). Opponents to mandatory unbundling often see the development of non-DSL technologies as an alternative to access regulation to promote competition (i.e. intra-platform competition).

The paper is structured as follows: **section two** develops the different aspects of the trade-off between dynamic and static efficiency based on previous empirical studies.

[2] Fibre to the Home, Building and Cabinet (FTTH, FTTB and FTTC)

It investigates the links between mandating access and broadband penetration or investment. This allows us to make an assessment of the European regulatory framework and NRAs' past decisions in **section three**. Based on these findings, **section four** derives policy implications for regulation in the context of the current transition to fibre. Finally, **section five** concludes by providing policy recommendations in view of fostering fibre roll-out.

2. Access regulation: dynamic versus static efficiency

The objective of the liberalisation process of the telecommunications industry in Europe is to develop a competitive market, providing increasingly efficient and affordable products. The European Commission, together with national regulators, therefore pursue the double objective of **static efficiency** (lower prices) and **dynamic efficiency** (development of more efficient products). In this context, many questions arise on the appropriate role of regulation: how to promote sustainable competition while at the same time providing the right incentives to operators to invest in next generation networks?

Regarding the trade-off between static and dynamic efficiency, two important aspects of access regulation need to be taken into account: the access obligation per se and the access price.

Without any price constraints, the incumbent could choose a high **access price** to discourage alternative operators from joining the market, which in essence amounts to refusing access. This is why access prices must be set by national regulators at the level providing the optimal trade-off between static and dynamic efficiency.

On the one hand, a low access price would encourage competition in the short term but also reduce incumbents' incentives to invest. On the other hand, a high access price would provide incumbents with better incentives to invest but would discourage entry, thereby reducing competition (Laffont and Tirole, 2000).

Regarding the application of **mandatory access**, Cave (2006) develops what has become known as "the ladder of investment", specifying that temporary access regulation (at a low price) would enable an entrant to develop a sufficient customer base in order to build up its own network in the long run. This theory does not imply a

strong trade-off between static and dynamic efficiency as access regulation promotes both short-run competition and investment by new entrants in the long-run.

Since the advent of liberalization, many authors have, however, focused on the efficiency of access regulation. Most empirical studies have investigated the link between broadband access and broadband diffusion or investment. Crandall (2011) reports 12 empirical studies on unbundling and concludes the following: "The bulk of the studies surveyed did not support the proposition that mandated unbundling increases broadband penetration or deployment. Most studies find the relationship to be either negative or insignificant".

Among these, Denni and Gruber (2005) published a study covering all U.S. states for the period 1999-2004. They find that inter-platform competition has a greater influence on broadband diffusion than intra-platform competition. Moreover, intra-platform competition seems to have a positive effect in the short-run, but this effect disappears completely in the long run. The authors conclude that regulation should therefore focus on inter-platform competition, instead of access regulation.

Furthermore, covering 20 OECD countries for the period 2003-2008, Bouckaert, van Dijk and Verboven (2010)[3] analyse the effect of inter- and intra-platform (facility-based and service-based) competition on the broadband penetration rate. The main novelty of this study is that it separates service-based (induced by resale and bitstream access) and facility-based competition (induced by full Unbundled Local Loop (ULL) and shared access). They conclude that intra-platform competition has a negative (in the case of service-based competition) or null (in the case of facility-based competition) impact on the diffusion of broadband. They also determine that inter-platform competition has a positive impact on the penetration rate.

The results of these two studies are explained by the fact that new entrants seem to consider access to the incumbent's network as a substitute for own investments. Incumbents also seem to have fewer incentives to invest when they are being forced to share their network. Moreover, access involves a risk transfer from entrants to incumbents which increases the cost of capital and thus decreases incentives for the incumbent to invest.

[3] This study has been recently published in Telecommunications Policy.

A third empirical study, conducted by Grajek and Röller (2011), establishes a link between access regulation and investment of incumbents and entrants. Their data cover 70 operators of fixed lines in 20 EU countries for the period 1997-2006. The authors conclude that access regulation has a negative impact on investment by the incumbent and a positive impact on other operators' investments. Considering both effects, the authors determine that an increase in intensity of access regulation has a negative impact on total investment.

Grajek and Röller (2011) measured the impact of regulation intensity on investment, whereas Denni and Gruber (2005) and Bouckaert, van Dijk and Verboven (2010) measured the impact of intra-platform competition on broadband penetration. The latter five authors came up with the implicit conclusion that access regulation (especially service-based access in Bouckaert and al. study) had a negative impact on broadband investment. Indeed, a slower broadband take-up could be explained by a lack of investment. Moreover, it could also mean that the gains in broadband penetration generated by more (intra-platform) competition are smaller than the losses in broadband penetration generated by a lack of investment incentives.

The studies cited here above focus mainly on the impact of regulation on broadband investment and penetration. However, the retail price is also an important measure of consumer welfare but this variable seems to be omitted as dependent variable in previous empirical studies. Indeed, the latter is uneasy to estimate because of bundled offers (telephony, internet and TV) and because price has to be associated to quality (speed of transmission) which is also a difficult variable to estimate[4]. Nonetheless, as the penetration rate is included in several previous studies, one can assume some links between retail price and broadband penetration rate i.e. high prices would lead to lower consumption and thus a lower penetration rate and inversely for a low price. Hence, higher broadband penetration rates would assume lower retail prices which is a good indicator of consumer welfare.

Most empirical studies show that mandated unbundling does not encourage broadband development. Furthermore, they generally show a positive impact of inter-platform competition on the broadband penetration rate. Hence, empirically, there seems to be a strong trade-off between static and dynamic efficiency. Even though

[4] Because of significant differences in speed offered by the operators and real speed observed at consumer level.

access regulation promotes competition in the short term at the retail level, it tends to lower infrastructure investment incentives both for incumbents (who are forced to share their network) and for entrants (who use access as a substitute for own investments).

However, most empirical studies do not differentiate between service-based and facility-based competition. As mentioned above, Bouckaert, van Dijk and Verboven (2010), who introduce such a distinction, conclude that there is a null impact of facility-based competition and a negative impact of service-based competition on broadband penetration.

Based on these findings, the two graphs depicted hereunder (Fig. 1 & Fig. 2) investigate the correlation between the different access forms and broadband penetration. The data[5] cover 18[6] EU countries[7] (for the period July 2003 - July 2010 with a biannual observation frequency).

The first graph (Fig. 1) shows that there is a small negative correlation between broadband penetration and the share in broadband take-up of service-based access[8]. The second graph (Fig. 2) shows that there exists a clear positive correlation between the share of facility-based access and the penetration rate of broadband. Therefore, differentiating between the two forms of access, we can conclude that the general negative impact of access regulation on broadband penetration (evidenced in previous empirical studies) can be due only to service-based access, whereas facility-based access has a strong positive impact on broadband penetration.

[5] The data were sourced from the "working document on broadband access in the EU: situation at 1 July 2009" for 2003 to 2009; from the "15th Progress Report on the Single European electronic Communication Market-20095" for January 2010 and from the "CoCom Broadband lines July 2010 data exercise" for July 2010.
[6] The data bases for the remaining nine countries were not fully available.
[7] These countries are Germany, Austria, Belgium, Denmark, Spain, Finland, France, Greece, Hungary, Ireland, Italy, Netherland, Poland, Portugal, Czech Republic, United Kingdom and Sweden.
[8] The relative broadband penetration was computed as follows: the actual broadband penetration rate – the average of all countries' broadband penetration rate. This calculation enables to withdraw the natural broadband penetration evolution through time from the countries broadband penetration (which may bias the correlation estimation).

Figure 1: correlation between service-based access and the broadband penetration rate.

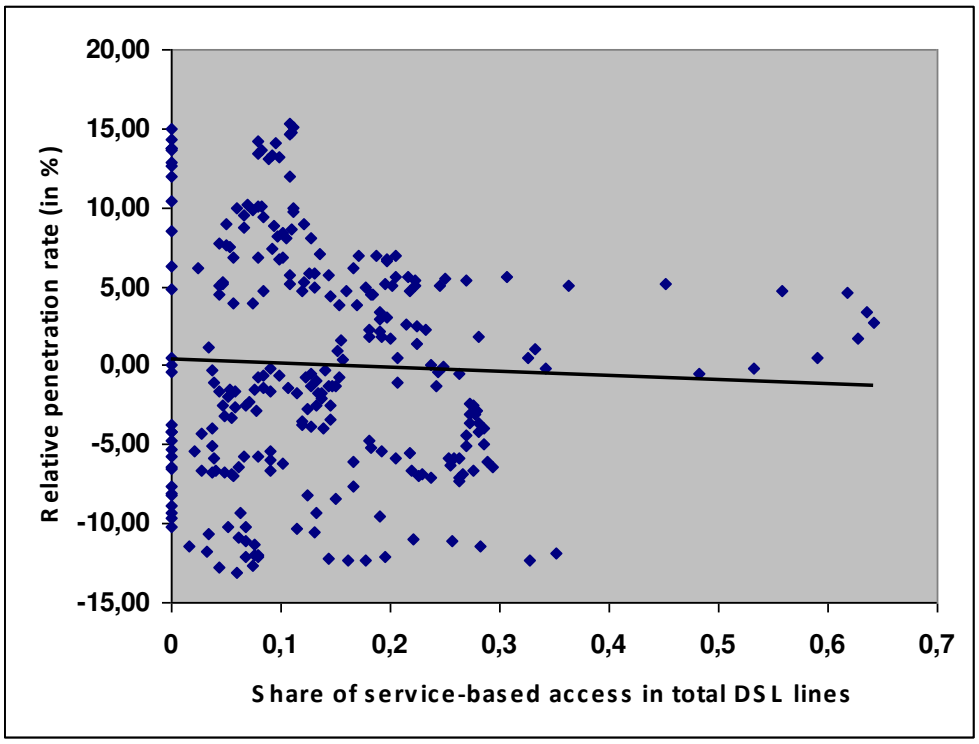
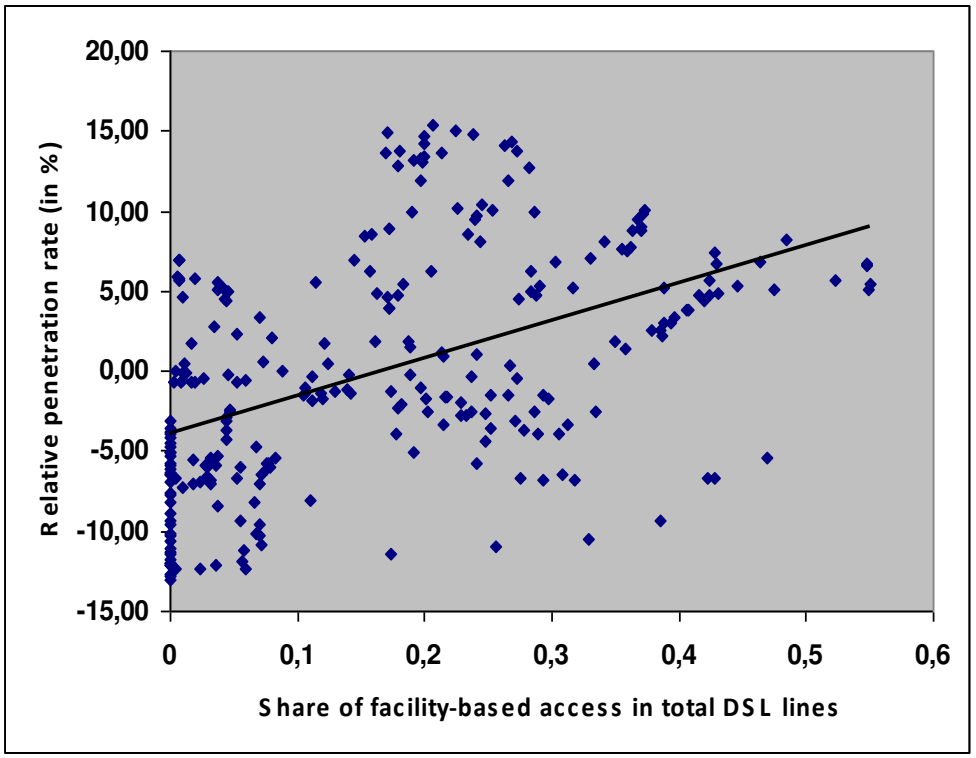


Figure 2: correlation between facility-based access and the broadband penetration rate.



On one hand, unlike facility-based access, service-based access seems to be harmful to broadband diffusion and deployment considering both the graphs and previous empirical studies. Therefore, mandated unbundling for resale and bitstream access is best not used by regulators trying to promote static and dynamic efficiency. Indeed, in addition to deterring investment incentives, the latter tends to bring very little in terms of price competition (and no quality competition), making it an inefficient tool to promote competition as well.

On the other hand, the positive effect on broadband penetration of the share in broadband take-up of facility-based access can be explained by the fact that full ULL and shared access lead to competition over price and quality as entrants are able to invest in network upgrade. This evidence points to the desirability of mandating facility-based access.

Another efficiency gain from mandating full ULL and shared access can be explained by an extension of the ladder of investment theory set out in Cave (2006). As entrants have to invest in own equipment and facilities in these forms of access, they may be driven to invest later in a fibre network or other platforms (i.e. to climb the ladder of investment). Facility-based access can thus be seen as a stepping stone for further investment in new networks.

3. Assessment of the European framework and NRAs' decisions

Considering the European Commission's Framework Directive (Directive 2002/21/EC)[9], access regulation can be imposed on markets where one or more undertakings have significant market power in accordance with the concept of dominant undertakings (defined by the Court of Justice). Later, in 2007, additional recommendations[10] were published by the European Commission which defined three criteria to identify the product and service markets in which ex-ante regulation may be warranted:

1. Static criterion: the presence of high and non-transitory barriers to entry.

[9] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:108:0033:0033:EN:PDF
[10] "Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services". http://ec.europa.eu/information_society/policy/ecomm/doc/library/proposals/rec_markets_en.pdf

2. Dynamic criterion: the market structure does not tend towards effective competition within the relevant time horizon.
3. Criterion for adequate competition law remedies: regulation must be applied on markets where competition policy is not sufficient to address market failures.

On the basis of these three criteria, the Commission established a list of seven telecommunication markets open to ex-ante regulation. Two of these markets refer to broadband, namely, Market 4 for wholesale (physical) network infrastructure access at a fixed location (full ULL and shared access) and Market 5 for wholesale broadband access (resale and bitstream access).

However, this list does not bind national regulators in the sense that they may define additional markets to regulate, or, on the opposite, decide not to regulate these markets. However, NRAs must then justify their choice to the European Commission who has a veto. This burden of proof provides NRAs with incentives not to deviate from the EC recommendation. One can observe this fact with the low number of NRAs who don't impose remedies[11] (or impose only partial regulation) on Markets 4 and 5. Indeed, regarding Market 5, only 4 countries (Austria, Poland, Portugal and the UK) decided to impose partial ex-ante regulation and only 2 countries (Malta and Romania) decided not to regulate this market at all. Considering Market 4, none of the European countries decided to deviate from the recommendations.

Because ex-ante regulation of Market 5 seems to harm broadband deployment and penetration, it might prove efficient to deregulate this market. Regarding Market 4, the European framework seems to be efficient as it gives incentives for NRAs to regulate this form of access (facility-based).

4. Policy implications

Since broadband access has been mandated in Europe, many questions arise regarding the role of regulators. Several studies have analysed the impact of past regulation empirically and most of them came up with the conclusion that access has been regulated too "aggressively" in Europe. Some of them even conclude that

[11] http://ec.europa.eu/information_society/policy/ecomm/implementation_enforcement/eu_consultation_procedures/index_en.htm (see the Excel file: status of market overview)

maximum efficiency could be reached with fully unregulated access. The question raised in this section is therefore **how to regulate copper access during the transition to fibre, taking into account lessons from the past? Should access be regulated "aggressively", "lightly" or not at all?**

In the previous sections, we came to the conclusion that ex-ante regulation of Market 4 may be the right option. Nonetheless, one should keep in mind that efficiency of regulation is a "U-shaped" phenomenon. Indeed, low regulatory intensity (resulting in a low access level) brings insignificant competition on the one hand and higher incumbents' revenue that may be invested in network upgrade on the other hand. High regulatory intensity discourages incumbents' investment but brings competition. Hence, the optimal degree of regulation needs to be determined so as not to discourage investment by incumbents while promoting price and quality competition. In order to reach the optimal level of access, access price may prove to be a useful instrument.

Moreover, in order to reach a maximum level of both static and dynamic efficiency in the broadband market, it is essential for policy makers to implement incentive policies which foster the deployment of non-DSL technologies such as wireless and cable. This will promote inter-platform competition which is a fundamental element for broadband take-up (see section 2). In parallel, it is also important to give the right additional incentives to copper incumbents to invest in fibre.

4.1. Access regulation

On one hand, to promote investment in fibre roll-out, two arguments have to be considered: firstly, competition drives investment; secondly, as incumbents will play an important role in fibre roll-out, they need the right incentives to invest. On the other hand, considering general consumer welfare, one should also take into account the main broadband outputs which are quality, price and broadband take-up. These outputs are all driven by competition (long term and short term).

In view of these arguments, it would be efficient to promote competition in two ways. Firstly, as most authors will agree, it is essential to promote inter-platform competition as it is a driver of broadband penetration. Such policies will also bring long term competition which will in turn promote investment. Secondly, to encourage medium-term or short term competition, it also seems important to promote intra-platform

competition. But such policies have to be implemented very carefully so as not to harm incumbents' investment in fibre roll-out.

In order to reach the right degree of access (increasing the level of efficient competition, while not discouraging incumbents' investment), one option could be to reduce the level of service-based access (bitstream and resale), while increasing the level of facility-based access (full ULL and shared access). This policy is also in line with the ladder of investment theory (Cave, 2006) in the sense it will provoke the transfer of entrants from a "rung" needing a very low investment level to a form of access that needs more investment. In this perspective, the access price will become a determining factor in next generation network roll-out.

Indeed, an increase in wholesale prices of resale and bitstream access will reduce the level of service-based access and a decrease in wholesale prices of full ULL and shared access will increase the level of facility-based access [12].

This policy should not be much harmful to incumbents and new entrants while it increases overall efficiency. On one hand, such a policy should lead to similar levels of market share and revenue from access for incumbents, while, on the other hand, still providing entrants access rights at a reasonable price.

However, the wholesale price of the remaining form of access (facility-based) has to be set carefully in order to: (1) avoid access prices which are so low as to encourage inefficient entry and lead to low retail prices that will deter fibre investment and (2) avoid access prices which are so high that they deter competition.

This access regulation policy thus aims at keeping a right balance between giving incentives for incumbents to invest in fibre while nurturing efficient competition on the broadband market.

4.2. Parallel policies

Mandating efficient access is a necessary but not sufficient condition to reach the best outcome or in other words, the best compromise between effective competition and "adequate" incentives to invest in fibre roll out.

[12] Nonetheless, an increase in wholesale prices of service-based access may be sufficient in the sense it can provoke a shift of entrants from the latter access to the facility-based access.

Firstly, as mentioned above, it is essential that regulators encourage as much as possible the development of wireless technologies and also cable technologies. Indeed, the more inter-platform competition, the more the incumbents will have incentives to invest in fibre since it will make them able to compete on quality with other technologies.

Secondly, there are many other additional incentive policies to promote fibre investment, most of them are already investigated and planned for at national and community levels. For example, the "Connecting Europe Facility[13]" foresees almost €9.2 billion to support investment in fast and very fast broadband networks and pan-European digital services. Part of this amount will be allocated to grants. At a national scale, in UK for example, the government announced last November "£100m to create up to ten 'super-connected cities' across the UK, with 80-100 megabits per second broadband and city-wide high speed mobile connectivity[14]". This plan aims, among others, at promoting broadband private investment.

5. Conclusions and policy recommendations

The main objective of this paper is to investigate whether it is efficient to mandate broadband access at a regulated price.

Most empirical studies lead to the conclusion that access regulation (at least for resale and bitstream access) does not encourage long run broadband diffusion, pointing to a strong trade-off between static and dynamic efficiency. Furthermore, there is a strong positive impact of inter-platform competition on the broadband penetration rate.

Considering these empirical results, it seems that access is being regulated too aggressively in Europe. But does this imply that access does not need to be regulated at all? Indeed, one major issue has not been addressed by most authors, namely that different forms of access may have different impacts on broadband diffusion and investment. Considering distinctive access forms leads us to the

[13] A plan for a 50 billion boost to Europe's transport, energy and digital networks. http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/11/709&format=HTML&aged=0&language=EN&guiLanguage=en

[14] http://www.culture.gov.uk/news/news_stories/8658.aspx

conclusion that it may be beneficial to regulate access but (1) not in any form, (2) not too aggressively and (3) by implementing other policies in parallel.

1. Two access forms have to be differentiated: service-based access (bitstream and resale), which requires little investment by entrants and facility-based access (full ULL and shared access) which requires more investment in equipment from entrants. Since service-based access does not contribute much to broadband diffusion, it is best left unregulated. However, facility-based access, which requires more investment, generates more competition on price and quality, and fosters fibre roll-out. Therefore, ex ante regulation focusing on this form of access seems to be the most desirable.

2. The optimal degree of regulation needs to be implemented for this form of access so as not to discourage investment in next generation networks by incumbents, while at the same time promoting price and quality competition. In order to reach this optimal level of facility-based access, setting the right access price is of paramount importance.

3. In parallel with regulation of facility-based access, it is necessary to encourage the development of wireless and cable networks to improve inter-platform competition. It is also important for policy makers to give additional incentives to operators for fibre investment.

We have shown that it is possible to foster the deployment of fibre by finding the right trade-off between static and dynamic market efficiency. Following these conclusions, policy recommendations can be made. These should ideally be implemented taking into account national (or regional) specificities (e.g. current level and prices of access). However, general recommendations can be made as all EU countries at least display some degree of service-based access except for Malta and Romania (which do not impose ex-ante regulation on Market 5). Moreover, some countries currently have a high level of service-based access[15]. These policy recommendations are even more relevant for these countries.

Our main recommendations can be summarised as follows:

[15]E.g. the shares (out of total access) of service-based forms of access were 85% in Hungary, 88% in Belgium, 90% in Ireland in July 2010.

1. To reach effective broadband competition, policy makers should facilitate the transfer from service-based access to facility-based access. To do so, access price should be used as a tool to reach an efficient degree of access in addition to the cost recovery objective.

2. To phase out resale and bitstream access, policy makers should increase the wholesale prices of these forms of access.

3. Regarding full ULL and shared access, which are the only forms of access that have to remain, their wholesale price depends on each country case. Nevertheless, the wholesale price has to be set carefully in order to: (1) avoid access prices which are so low as to encourage inefficient entry and lead to low retail prices that will deter fibre investment and (2) avoid access prices which are so high that they deter competition.

4. To complement the above recommendations, policy makers should also focus on additional incentive policies. These were not investigated in depth in this study, but we should not forget that complementary incentives will be required to reach satisfactory levels of investment in fibre. Policy makers should thus also focus on incentive policies that will (1) foster the development of cable and wireless since more inter-platform competition will encourage operators to invest in fibre and (2) provide additional monetary incentives to invest in fibre, such as subsidies, or regulatory incentives with the same effect, such as predictability in future access policies.

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