

TELECOMMUNICATIONS

Elements of successful fiber to the home policies

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In the economic crisis, investments in fiber-based infrastructures are an important stimulus. We discuss international fiber to the home policies and the trade-offs to be solved in their implementation.

New applications and greater internet use have recently increased demand for broadband connections and will do so even more in the coming years. Hence, throughout the world many investment projects are planned or already completed that replace the existing copper-based infrastructure in the local loop by fiber and thus bringing more (two-way) bandwidth to private customers and businesses. Many countries have started public fiber to the home (FTTH) policies. These policies pursue various objectives: wide network coverage to reach as many potential customers as possible; avoiding inefficient network duplication; efficient provision of services through competition among service providers; and economic stimulus in time of crisis.

Given the importance of infrastructures for the entire economy, such policies might play an important part in stimulating economic activity while promoting wide network deployment and competition. Investments are mainly local, and improve the existing infrastructures substantially. Importantly, the new infrastructures in place will reduce transaction costs and are likely to stimulate new, internet-based services.

Distinction of Network Layers

In the local loop it is useful to distinguish three basic network layers: two infrastructure layers and a service layer (see Figure 1). The first layer includes all passive infrastructures, such as fiber optic cables, ducts, buildings and in-house wiring. Layer two includes active infrastructures, that is, technical installations at the end of the fibers that send, receive and manage the optical signals. The third layer consists of the services that consumers buy from telecommunication operators.

While the investments needed and the lifespan of installations are highest in layer 1, these are lowest in layer three. On the other hand, the largest technological progress and hence the biggest potential for innovation can be expected for the layers two and three.

The different characteristics of the three layers have implications on potential regulations. Some layers may be fully competitive while others constitute persistent monopolistic bottlenecks. The starting point of this disaggregate approach to regulation (Knieps, 2000) is the differentiation between those network layers or segments in which workable (actual and potential) competition is warranted and those in which there is stable market power. The latter is expected in those layers or segments which are characterized by a subadditive cost function in combination with irreversible costs and the absence of close substitutes.

This implies that various network layers can and should be analyzed and regulated separately – notwithstanding the strong connections among the layers (Knieps, 2000, and Jaag and Trinkner, 2010). Traditionally, monopolistic bottlenecks have been located on layer 1 in the local loop in the telecommunication industry due to considerable sunk costs. With new and converging technologies, the bottleneck might lose its stability. However, as fiber-bandwidths are much higher than bandwidths provided

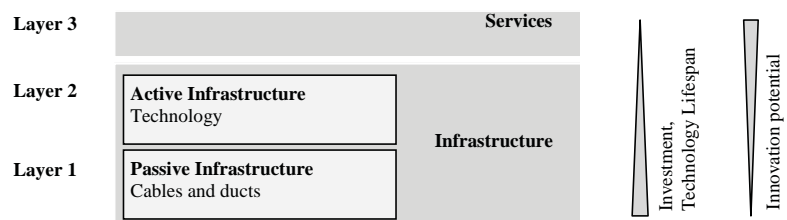


Figure 1 | Layers in network industries (Jaag *et al.* 2009)

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with copper-based, wireless or mobile alternatives, the latter will become obsolete and the former's bottleneck characteristic might be reinforced. Hence, the question is not whether the traditional copper based networks constitute a bottleneck, but rather whether new and future fiber-networks will be bottlenecks.

and how it interacts with investment incentives. This involves a fundamental trade-off: Low access prices allow for competition on the services layer, however, they reduce incentives to build infrastructures as investments are more difficult to redeem (Jaag *et al.*, 2009). On the other hand, high access prices would reduce competition but increase the incentive to invest.

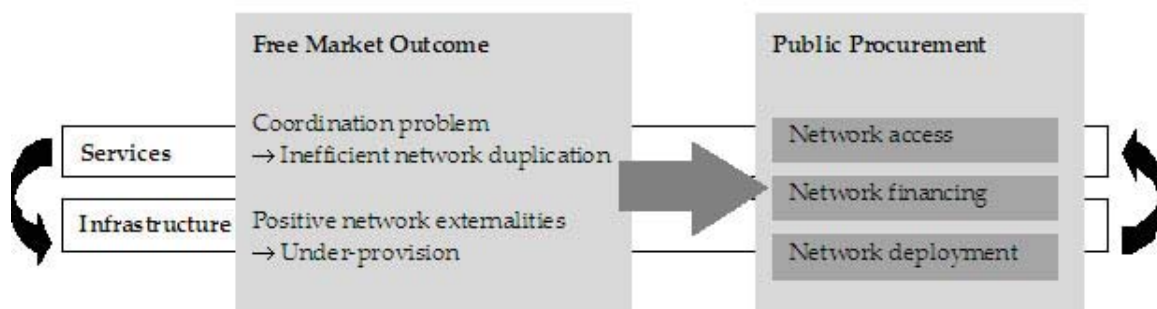


Figure 2 | Market failures and approaches to public procurement (Jaag *et al.* 2009)

Multiple Dimensions of fiber to the home policies needed

Of course, different layers are not independent of each other; network investment is usually carried out by integrated telecommunications operators. Moreover, the evolution of competition and demand on the service level very much affects the incentive to invest in infrastructure and thus interacts with control of network deployment. Hence, multiple dimensions of FTTH policies have to be considered to attain an efficient fiber-optical access network with wide coverage. These are: the control of network deployment (building infrastructures); the control of network financing (financing infrastructures); the regulation of network access (sharing infrastructures).

In the absence of an active network policy there are two major challenges in the market for fiber-based telecommunications (Figure 2). First, there is a coordination problem, which may result in an inefficient duplication of infrastructures or delays in deployment due to coordination problems among different operators. Due to positive network externalities and spillovers, infrastructures or services may also be under-provided in an unregulated market environment. Hence, elements of successful policies need to take into account the close links between controlling network deployment, its financing and the rules of its sharing.

In the process of liberalization, competition will first set in on the service layer if access to the infrastructure layers is available at competitive terms. The question arises whether regulation of access on infrastructure is necessary

The two countries with the highest fiber penetration rates are South Korea and Japan. It is therefore interesting to observe how they have solved this trade-off.

South Korea: Regulatory Holidays

According to the Organization for Economic Cooperation and Development (OECD 2008), South Korea is the country with the second largest fiber network penetration rate worldwide (44 percent of all broadband subscriptions). The development of the Korean fiber optic network can be divided in two periods and can be summarized as 'directed infrastructure competition'.

The first period, starting in 2004, included the extension of the fiber network without focusing on the direct connection of households to the new network. The development in this period was driven firstly by an obligation of incumbent operator Korea Telecom to deploy fibers, secondly by public funding, and finally by a change in the access regime. For fiber optics deployed after 2004, regulatory holidays were introduced for all operators including Korea Telecom: There is no regulation of access to these infrastructures. For any local loop connection built before 2004, Korea introduced an 'open access' regime, that is, all local loop operators were unbundled including cable operators. The regime resulted in fierce competition among service providers with declining margins. At the same time, many operators started to roll out their own fiber optic networks. By 2007, a large number of households were connected to the fiber network.

The Internet Protocol Television (IPTV) Act of 2007

marked the beginning of the second period. Essentially, the act raises the incentives for upgrading the existing connections by allowing telecom operators to offer real-time broadcasting services. Given the new opportunities to commercialize fiber networks, the policy has resulted in a rapid increase in connections.

Besides regulatory holidays and the IPTV act, there have been measures to encourage the usage and to promote diffusion of the new technology. The aim was to reduce the risks regarding future demand faced by network providers and thereby to encourage larger infrastructure investments. About 47% of Koreans live in apartment complexes. This allowed for low deployment costs and facilitated investments.

Japan: Layers oriented, technology neutral access

According to the OECD (2008), Japan has the largest FTTH penetration worldwide (48% of all broadband subscribers). A milestone in the success story of commercializing the fiber optic network was reached in 2005 when the fiber network exceeded cable modem connections. In March 2008 the Ministry of Internal Affairs and Communications estimated a coverage rate of 83.4% (fraction of households connected by FTTH). The Japanese regime could for long be characterized as a 'technology neutral access regime' to the state-dominated incumbent operator Nippon Telegraph and Telephone Corporation (NTT).

Encouraged by the public majority shareholder, the incumbent NTT invested ¥2340 billion for fiber local loops between 2001 and 2008. They are owned by NTT Holding Company which belongs for more than 50% to the state.

Given the dominance of NTT and with the aim to promote services competition, Japan introduced an asymmetric access regulation; alternative operators were allowed access NTT infrastructures unilaterally. Access was established layers oriented and technologically neutral and thus new fiber connections were automatically included in the access regime.

To set incentives for the operators to invest in own fiber optics and to close the 'digital divide' between dense and non-dense regions, different instruments of financial subsidies were introduced. First of all, the government offered tax reductions on a national basis and allowed local authorities to reduce tax rates themselves. The latter were reimbursed for their lower tax income. Similarly, local governments that decided to build their own infrastructure where financially supported. Last but not least, the gov-

ernment offered favorable loans for operators investing in fiber to the home.

In October 2007 the Ministry announced new measures to promote facilities-based competition and established guidelines for access to utility companies' ducts. This measure aims at decreasing the costs of deploying fiber optic infrastructures and therefore increasing the incentives for new operators to deploy their own network.

Conclusions

If households continue to demand ever higher bandwidths, traditional copper-based access-networks will not be able to provide the necessary capacities. Throughout the world, important large scale FTTH investment projects are on their way. They replace existing copper-based infrastructures in the local loop by fiber and provide much larger bandwidths to households and businesses.

This paper has presented select approaches to fiber to the home regulation. There are important trade-offs to be solved: First, incentives for service competition through access regulation may defer infrastructure investments. Second, cost-effective network structures (i.e. the deployment of one single physical network) constrain the potential for future competition on all network layers. Therefore, active fiber to the home policies should be carefully designed encompassing a combination of policies directed towards network deployment, network financing, and service competition enabled by network access.

The quite different and successful cases of South Korea and Japan show that there are very different ways to achieve the same objective. However, both countries combined measures of network deployment, financing and access in a consistent way. The different choices reflect initial differences in the development of the telecommunications market in these countries. ★

References

- Jaag, C., Lutzenberger, M., and Trinkner, U. (2009), 'Elements of Successful FTTH-Policies: An International Comparison', Paper presented at the Second Annual Conference on Competition and Regulation in Network Industries.
- Jaag, C. and Trinkner, U. (2010), 'A General Framework for Regulation and Liberalization in Network Industries' in R. Künneke, M. Finger International Handbook on the Liberalisation of Infrastructures (Cheltenham: Edward Elgar).
- Knieps, G. (2000), 'Access to networks and interconnection: A disaggregated approach' in C.-D. Ehlermann, L. Gosling European Competition Law Annual 1998: Regulating Communications Markets (Oxford: Hart Publishing), 151-170.
- OECD (2008), Percentage of fibre connections in total broadband subscriptions (Paris, OECD).