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The need for more efficient public funding of new communications infrastructure in EU member states

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ABSTRACT

Ubiquitous coverage of new high-speed broadband networks, as foreseen by the European Commission, still appears to be a rather unrealistic objective in most European Union member states without government intervention in terms of funding network deployment in unprofitable areas. We contend, however, that the current contract practice of fixing ex ante targets for network expansion is inefficient given the uncertainty about future returns on high-speed broadband services and the public authorities' incomplete information about the costs of the network provider. This paper suggests delegating the choice of the network expansion to the typically much better informed network operator. Furthermore, we show that such contracts can be implemented based on existing accounting data and that it is not necessary to undertake any additional ex post verification of cost or demand data as is currently the case under claw-back rules.

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1. Introduction

The European Commission (EC) defines broadband deployment targets in its Europe 2020 strategy (European Commission, 2010a). The Digital Agenda Europe (DAE) inter alia 'seeks to ensure that, by 2020, (i) all Europeans have access to much higher internet speeds of above 30 Megabits per second (Mbit/s) and (ii) 50% or more of European households subscribe to internet connections above 100 Mbit/s' (European Commission, 2010b, p. 19). Whereas target (i) refers to a coverage level of 100 per cent of the population, target (ii) refers to a minimum household penetration level. As private investors are not ready to roll out new high-speed fiber-based broadband networks ('next generation network(s)', NGN) in remote and unprofitable regions but only in densely populated areas, public funding is necessary to achieve ubiquitous coverage (i) in most countries. Accordingly, the DAE encourages the use of national and European Union (EU) related funding instruments to meet the broadband coverage targets (European Commission, 2010a,b). The policy guidelines for the application and approval of public funding measures are summarized in European Commission (2013).

State-aid policy as a tool of industrial policy to promote investment and growth has become increasingly important in recent years in the EU (Börke Tunali and Fidrmuc, 2015). EU member states can foresee public funding for the provision of broadband networks as a 'service of general economic interest' (SGEI) in line with Article 106(2) TFEU (Treaty on the Functioning of the European Union). The latter refers to both provision of basic ('first generation') broadband services as well as NGN (European Commission, 2013).[1] Similar to the societal benefits of first-generation broadband infrastructure, the future importance of high-speed NGN infrastructure relates to its general-purpose technology character (Bresnahan and Trajtenberg, 1995) which promises significant

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[1] The distinction between old or 'first-generation' broadband networks and NGN is somewhat blurred. For a discussion of relevant NGN scenarios the reader is referred to the technical annex in Briglauer et al. (2015a).

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productivity improvements and economic growth across all major business sectors.

Given the economic and social desirability of broad-scale NGN[2] due to positive market externalities but insufficient private investment, we want to examine the following research question: Is the current practice of funding NGN rollouts efficient, and, if not, how can public authorities, despite their informational disadvantages, design robust contracts that provide more efficiency-based incentives for increased NGN deployment but nevertheless keep public expenditure low? Our main proposition is that the level of network expansion or of other quality criteria should not be fixed ex ante by the public authority but that this choice should be left to the NGN provider who has better knowledge of investment costs and future demand.

The remainder of this paper is organized as follows. Section 2 reviews the literature that is directly related to NGN funding as well as relevant theoretical contributions. Section 3 outlines the main economic rationales for public funding of NGN and compiles public funding plans in EU member states as well as in some selected non-EU countries. Section 4 presents a formal model with optimal linear contracts for principal/agent settings with complete and incomplete information. As this paper aims specifically to take account of the real-world characteristics of NGN, Section 5 compiles policy implications that directly follow from the main results of our model. Section 6 contains further relevant policy considerations and issues related to the practical implementation of more-efficiency based funding programs. Section 7 summarizes and contains some final remarks.

2. Literature review

A growing branch of the literature focuses on different aspects of the funding of NGN. Diverse funding instruments and cost models have been discussed and developed by industry consultants (e.g. WIK-Consult, 2008; dot.econ, 2012; European PPP Expertise Centre (2012); Ventura Team and Portland Advisers, 2012), international organizations (e.g. OECD, 2009; ITU, 2009) and in the policy-oriented work of academics (e.g. Cave and Martin, 2010; Falch and Henten, 2010). Belloc et al. (2012) are the first to examine econometrically the distinct effects of demand- and supply-side policies on the diffusion of conventional broadband technologies. They find that although both kinds of funding policies have a positive impact on broadband diffusion, their effectiveness is dependent on the respective diffusion stage.

In a theoretical model Jullien et al. (2010) analyze the interaction between regulators, incumbents and local governments with regard to investment in new network infrastructure. They find that government intervention can be welfare reducing in the case of asymmetric information or regional externalities. There is also a growing literature on public-private partnerships (PPPs) where both types of partners contribute with certain comparative advantages. For an overview the reader is referred to Engel et al. (2013) and the academic literature cited therein as well as the policy-oriented contributions of the European PPP Expertise Centre on various thematic papers on PPPs.[3] A primary focus of this literature is on the allocation of risks between the public authority and private provider. Engel et al. (2001) derive the optimal length of concessionaire contracts under uncertain demand. Engel et al. (2013) investigate the optimal choice between financing through user revenue and public subsidies under demand uncertainty. Martimort and Pouyet (2008) and Iossa and Martimort (2008) study the optimal bundling of tasks (e.g. network construction and its operation) in a moral hazard model. Hart (2003) develops a model for PPP on the basis of privatisation and incomplete contracting theories of the firm to analyse the costs and benefits associated with PPPs. Finally, Evenhuis and Vickerman (2010) discuss social marginal cost pricing within PPPs with regard to pricing in the transport sector. The latter exhibits some structural similarities but differs from NGN PPPs which are subject to substantial demand, regulatory and technological uncertainties.

To the best of our knowledge, there has been no systematic attempt at combining these branches of the literature for evaluating real-world NGN funding in light of information asymmetries and efficiency considerations. Our paper aims to fill this gap and shed light on the inefficiencies involved in the previous practice of NGN funding in EU member states.

3. The economic rationale for subsidizing NGN

The main economic rationales refer to market failure and equity concerns. The latter mainly refer to the avoidance of the so-called 'digital divide'. Market failure arises if markets do not manage to supply the efficient outcome for society. As regards broadband infrastructure, the main source of market failure refers to positive externalities (e.g. increasing efficiency and decreasing costs in other business sectors arising from NGN).[4]

NGN deployment is highly investment-intensive. In particular, civil works for digging, in-house wiring and laying down optical cables account for 60% to 80% of the NGN's total costs (FTTH Council Europe, 2012) and are literally sunk. Since access networks branch out in a tree-like structure, renewing access infrastructure involves fewer customers the closer one gets to the final consumer. This means that rollout costs will be distributed among fewer customers and hence average cost per customer will be higher ('economies of density', European Commission, 2013, para (38)). Moreover, high investment requirements come along with high risks of NGN deployment related to the high share of sunk costs, long amortization periods (20–25 years) of network infrastructure and substantial uncertainties regarding future demand for high-speed broadband services (Briglauer and Gugler, 2013; dot.econ, 2012). Finally, NGN investors are confronted with regulatory risks because the extent of NGN specific ex ante regulations is still an open issue in many countries.[5] Potential investors may fear moral hazard on the part of the regulators. For example, they will take away realized profits if business turns out better than initially expected. Of course, this creates another source of uncertainty, especially for operators who most likely will be deemed as dominant and therefore subjected to sector-specific regulation in future decisions.[6]

[2] Czernich et al. (2011) estimate the impact of broadband networks on economic growth and Gruber et al. (2014) assess the economic benefits of implementing the DAE targets. FTTH Council Europe (2012) provides an estimation of total NGN deployment costs.

[3] The individual reports are available at: http://www.eib.org/epec/library/index.htm (last accessed: 17 November 2015).

[4] OECD (2009) calculates that slight spillover effects that accrue in major sectors of the economy such as health, transport or energy are sufficient for justifying NGN subsidies. See also Gruber et al. (2014).

[5] For information on the implemented NGN regimes in the EU the reader is referred to WIK-Consult (2012) and notifications submitted by EU member states under Articles 7 and 7a of the Electronic Communications Framework Directive (2002/21/EC), available at https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp (last accessed: 17 November 2015).

[6] Moreover, according to the academic literature regulation actually diminishes total investment incentives. Alesina et al. (2005) assess the role of product market regulation in several nonmanufacturing sectors. The authors find tight product market regulation had a negative effect on investment. The majority of the broadband related empirical literature also points to a negative impact of regulation on investment (see e.g. Cambini and Jiang (2009) who review the literature related to old broadband networks and Briglauer et al. (2015b) who review the NGN-related empirical literature.

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