Race to the top: Does competition in the DSL market matter for fibre penetration?

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**Abstract**

High speed broadband creates potential productivity gains and has a positive impact on economic growth. Achieving Europe's broadband access objectives will require large scale investment in next generation broadband networks, and it is imperative that an appropriate investment climate is created to encourage fibre network rollout. This study considers whether and how competition in the DSL market affects the incentives of operators to invest in the deployment of high-end fibre optic networks. Most earlier research on the drivers of investment in broadband technology has focused on the effect of mandatory access policies, such as local loop unbundling, or competing infrastructures. We posit that competition in the DSL sector may also influence fibre penetration, possibly to a considerable extent. We find that the relationship between service-based competition and fibre penetration is non-linear: a lack of or severe DSL competition is correlated with a negative effect on fibre penetration, but if a moderate degree of competition is already present in the market, more service-based competition may positively influence fibre penetration. The scale of these effects however varies with the openness of the DSL market: operators' incentives to invest in fibre appear to be more sensitive to changes in DSL competition if there is extensive local loop unbundling.

1. Introduction

The Digital Agenda for Europe has as one of its objectives to “ensure that by 2020, (i) all Europeans have access to much higher internet speeds of above 30 Mbps and (ii) 50 percent or more of European households subscribe to internet connections above 100 Mbps” (European Commission, 2010). Creating the right investment environment and conditions for penetration of high-end networks to meet these goals is a matter of debate, and so far, empirical evidence suggests that existing market conditions have been insufficient to ensure the desired outcomes (Briglauer, 2015; Briglauer, Cambini, & Grajek, 2015).

The broadband investment environment and the level of penetration are, inter alia, a function of competition in the telecommunications market and the regulatory policies that are in place. While the effect of regulation on investment in broadband has been the focus of much research (see for example Bauer, 2010; Boukaert, van Dijk, & Verboven, 2010; Briglauer, 2015; Briglauer, Ecker, & Gugler, 2013; Kongaut & Bohlin, 2014), the relationship between market concentration and investment is not equally well understood. Existing empirical research (discussed more elaborately in a later section of this paper) reveals that the relationship between

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competition and investment has many facets and that assessing the impact of competition poses many challenges. Our paper aims at contributing to the understanding of this impact.

A better understanding of the competitive characteristics that determine network operators’ incentives to invest, which in turn provide preconditions for fibre penetration, should inform competition authorities’ merger evaluations and help regulatory authorities design effective policies. From this perspective, we examine the relationship between market concentration in the Digital Subscriber Lines (DSL) market and fibre penetration. To the extent that penetration may serve as a proxy for investment in high-speed networks, such an analysis also sheds light on the relationship between concentration and investments. Aghion et al. (2010) also consider penetration, and motivate their paper in terms of the relationship between regulation and investment (in particular investment incentives and the ladder of investment hypothesis). Similar for Kongaut and Bohlin (2014), who discuss their findings based on penetration data in relation to investment in infrastructure and investment incentives. Penetration has the advantage of being an output-related variable and therefore more closely related to consumer welfare (Briglauer, Gugler, & Hashimusa, 2016). For fibre rollout in particular, one may expect that there is a relationship between penetration and rollout. The reason is that fiber projects often get initiated after having the commitment to subscribe from a significant fraction of households in the investment area (for FTTH), or on actual contracts with corporate customers (for FTTO). It should be noted though that penetration may depend on country-specific variables, such as population density and income distribution (see Boukaert et al., 2010). In our empirical specification, we address this problem by controlling for urban population density, which presumably affects network coverage.

The aim of this paper is to address the question of whether and how competition in the DSL market affects penetration of high-end fibre optic networks,1 i.e. fibre-to-the-home/business (FTTH/B), which (indirectly) reflects the incentives of operators to invest in the deployment of such fibre networks. Most earlier research on the drivers of investment in broadband technology has focused on the effect of mandatory access policies or competing infrastructures. We posit that competition in the DSL sector may also influence fibre penetration, possibly to a considerable extent. We illustrate that it is not sufficient to evaluate the effect of service-based competition by solely looking at the take-up of LLU. Instead, it is necessary to look more directly at competition between operators, to understand their incentives to escape competition by investing in the fibre network.

We draw from a sample of 27 European countries from 2004 to 2015, to illustrate this relationship. We posit that the relationship follows an inverted U-curve, where countries with a moderate degree of competition in their DSL markets have higher fibre penetration than countries where DSL competition is absent, or fierce. A correct understanding of the impact that competition in the DSL market has on investment in fibre deployment and on fibre penetration is pivotal to formulating the appropriate regulatory or competition policy response to achieve the objectives set out in the Commission’s Digital Agenda for Europe.

The next section considers the relationship between the intensity of competition and the incentive to invest from a theoretical perspective, and Section 3 provides background on the nature of competition in telecommunications markets. Section 4 relates our research hypothesis to the relevant literature. Section 5 presents the results of the empirical analysis, which are summarized in the conclusion in Section 6.

2. The theoretical relationship between competition and investment

Investment in fibre can be seen as a form of innovation, whereby operators improve their product offerings. For the purpose of this paper, we use the terms ‘innovation’ and ‘investment’ interchangeably to refer to the process whereby more fibre is added to the broadband network of a country. Economic theory suggests that the relationship between competition and innovation is typically not linear or uniform. Innovation can be influenced by two opposing forces: an ‘escape competition’ effect and a ‘Schumpeterian’ effect (Aghion, Bloom, Blundell, Griffith, & Howitt, 2005).

In markets where competition increases, firms may have an incentive to innovate to ‘escape competition’ by outcompeting their rivals. This supports the claim that strong product market competition can promote innovation (Tang, 2006). EU Commissioner Margrethe Vestager affirmed this by saying that “in business, innovation is the answer to the need to compete. You innovate because if you don’t, your rival certainly will. And then no one would want your tired old products anymore” (Vestager, 2016).

In contrast, innovation may also increase if competition decreases, as monopolists are faced with less market uncertainty and are better able to appropriate monopoly rents from investment in innovation. The ‘Schumpeterian’ effect – due to Joseph Schumpeter (1942) – creates an incentive for monopolists to innovate by using profit-maximising opportunities resulting from their market power (Romer, 1990). Firms that have “deep pockets” as a result of monopoly rents may have better access to finance than firms in more competitive environments where margins are small (Tang, 2006). The incentive to innovate may also be encouraged by the desire to maintain market power: Schumpeter (1942, p. 102) aptly states that “a monopoly position is in general no cushion to sleep on. As it can be gained, so it can be retained only by alertness and energy”.

The ‘Schumpeterian effect’ can be consolidated with the ‘escape competition effect’ into a non-linear, inverted U-shaped relationship between product market competition and innovation. Aghion et al. (2005) provide theoretical and empirical evidence in support of this relationship. The authors conclude that competition may increase the additional profit from innovating (the “escape-competition effect”), but when competition becomes sufficiently intense it may also reduce the innovation incentives of laggards (the “Schumpeterian effect”) (see Fig. 1).

Caution should however be taken when drawing conclusions about the causal relationship between market structure and innovation.

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1 FTTH/B includes fibre-to-the-home and fibre-to-the-apartment (with LAN distribution), but excludes FTTB/VDSL, which is classified as DSL. It also includes FFLAN (fibre-fed LAN), FTTH-POP and FTTH-PTP (Analysys Mason, 2016).
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