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Regulation, investment and efficiency in the transition to next generation broadband networks: Evidence from the European Union



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ABSTRACT

This article explores the impact of public policy on technological change and the development of broadband infrastructure in EU member countries. The analysis explores contradictory findings in previous empirical literature on the interplay between regulation, competition, and investment, noting the importance of the construction of indicators employed to evaluate these interactions. Furthermore, the article points out that the traditional policy model and related empirical literature treat fixed capital inputs in networks as a measure of broadband infrastructure quality. However, relatively higher capital inputs do not necessarily translate into the development of relatively higher quality broadband networks. Using broadband network performance measurements between 2007 and 2012, the article addresses this contradiction in the literature and evaluates the determinants of broadband infrastructure quality in the EU. The analysis suggests countries that have been more effective at promoting entry and competition in the provision of Internet access services have developed relatively higher quality broadband networks.

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1. Introduction

This article investigates the relationship between public regulation and the development of broadband infrastructure in member states of the European Union. Understanding this link is important because of the potential for private sector under-investment in capacity upgrades or in rolling out new platform technologies. Poorly designed access regulations could exacerbate the under-investment problem, while efficiency enhancing regulations can encourage risk sharing and industrial cooperation that might be necessary for overcoming the fixed cost problem that limits the potential for the diffusion of new platform technologies (Cambini and Silvestri, 2012; Krämer and Vogelsang, 2012). This article asks if and how regulatory diversity in the member states can explain differences in the quality of broadband Internet connectivity end users experience in the EU.

Recent international studies on the impact of public policy on broadband network development highlight an empirical puzzle that is particularly relevant for the design of regulations that support the transition to next generation connectivity. There is some evidence that access regulations, requiring facilities operators to interconnect with third parties so that third parties can deliver services using existing facilities, are negatively correlated with capital expenditures on fixed assets at the national level and by incumbent network operators (Grajek and Roller, 2012). This observation is important from a policy

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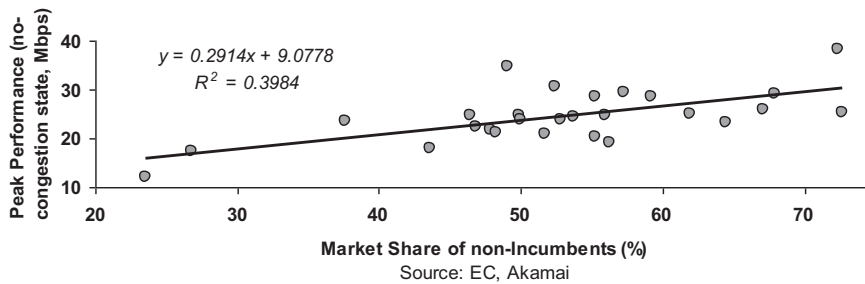


Fig. 1. Entry and network quality in the EU.

perspective because inter-platform competition (facilities-based, not access-based) has been an important driver of broadband penetration growth in advanced economies over the past decade (Bouckaert et al., 2010). These results have led some observers to argue that open access policies (allowing interconnection) are not desirable because they reduce incumbent operators' incentives to invest in network facilities that operators may have to share with others. On the other hand, there is also some evidence that countries with open access policies (which creates service-based, or intra-platform competition) have developed higher quality broadband systems (Berkman Center for Internet, 2010; Choi, 2011).

This contradiction suggests that higher levels of capital inputs do not always translate into a higher rate of network capacity improvements, presumably because there is some efficiency loss due to a lack of competitive discipline and/or risk sharing in the presence of demand uncertainties. Too much inter-platform competition can also imply too much duplication, which could further help explain why some countries with relatively high capital expenditures on telecoms do not necessarily have relatively high quality network infrastructure (Rajabiun and Middleton, 2013a). This article explores the broader empirical puzzle in the context of the experience in the European Union. The ambiguous policy implications of previous research are of concern since they limit the scope for evidence-based decision making. This is particularly important for the design of future policies that might be necessary for overcoming the under-investment problem so as to achieve specific minimum quality of service targets that various governments have recently adopted (e.g. 30 Mbps in the EU), diffusion of next generation access networks (NGNs), and attempts to build a single telecoms market (Kroes, 2013).

This article argues that a key problem with previous quantitative studies is that their dependent variables are not a very good reflection of broadband network quality end users' experience, especially in maturing markets where near universal access to 1st generation broadband technologies has already been achieved. The research has primarily focused on analyzing the impact of access regulation and market competition on investment and/or past broadband penetration levels. Although penetration rates may have been a good indicator of market outcomes in the transition from dial-up to broadband, the actual quality of service end users achieve represents a more realistic indicator for measuring the pace of progress in the diffusion of next generation platform technologies. Furthermore, fixed capital expenditures are only one of the many inputs into the process and their impact on network outcomes will depend on the ability of operators to translate them into capacity upgrades and new technology deployments. Firm specific internal factors such as managerial efficiency and technical expertise, as well as external constraints imposed by competitive discipline on network providers, are likely to influence the efficiency by which capital inputs improve network quality. As Fig. 1 illustrates, the recent experience in EU member states lends some support to the hypothesis that countries where incumbents face more competition in the market tend to have developed relatively higher quality broadband networks.¹

The objective of the article is to help reconcile some of the gaps in the literature by focusing on the impact of national regulatory strategies within the EU on the pace of progress in broadband network quality improvements. Section 2 provides an overview of the empirical puzzle in the context of the standard model for the analysis of competition and regulation in network development. Section 3 reviews previous studies and explores their relevance using a wide range of indicators that help capture some of the cross-country variation in regulatory regimes, competitive environments, and investment patterns in EU members. Section 4 investigates the association between capital expenditures, diffusion of more advanced broadband platforms, and the quality of Internet connectivity end users experience. Section 5 concludes by drawing inferences for the design of national and EU level policies intended to promote universal access to next generation connectivity over the next decades.

2. Motivation for the research: competition, regulation, and efficiency of network investments

As technological innovation made it more difficult to sustain the traditional regulated monopoly model in telecommunications, by the late 1990s and early 2000s most advanced economies adopted broadly similar policy strategies to shape telecommunications infrastructure development (Noam, 2010). In addition to liberalizations and privatizations of that period, most countries also adopted a relatively similar set of formal regulatory obligations on incumbent operators of copper tele-

¹ For description of the data in the figures and the empirical analysis that follows see the Appendix to this article.

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