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Broadband access in the EU: An assessment of future economic benefits[☆]

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ABSTRACT

This paper evaluates the net economic benefits that would derive from the implementation of the broadband infrastructure deployment targets by 2020 as entailed by the Digital Agenda for Europe Initiative set forth by the European Commission. As a first step, we estimate the returns from broadband infrastructure for the period 2005–2011, differentiating the impact of broadband by levels of adoption and speed while accounting for reverse causality and extensive heterogeneity. In the second step, the cost of broadband roll-out is assessed under different assumptions of technical performance and contrasted with the forecasted benefits that derive from increased broadband coverage. We find that in the base case scenario the overall future benefits outweigh the investment costs for the European Union as a whole for the highest performance technologies. This holds also for the majority of member states individually. We further extrapolate the returns by country under different scenarios of implementation. In most cases the benefits are substantially well above the costs. Private sector is reluctant to invest, as investors in broadband infrastructure only can partially appropriate benefits. This would suggest a rationale for the public sector to subsidize build-out of high speed broadband infrastructure.

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1. Introduction

The policy debate in Europe has highlighted the relatively poor macroeconomic growth performance and the EU missing out on growth opportunities comparatively to its global counterparts. In this context, broadband networks are considered as an essential enabling infrastructure in most modern knowledge-based economies. General-purpose infrastructures, such as broadband, are also the enablers for measureable beneficial spillovers on adopting sectors including health, manufacturing, financial services, electricity, education and ICT. Consequently there is a risk in delaying high speed broadband build-out as the EU will fall behind on two fronts: (i) on the supply side of infrastructure, because telecommunications operators may not be able to develop and deploy advanced services while equipment providers may not develop appropriate standards and technologies; and (ii) on the demand side as the adopting sectors may not be able to benefit from the productivity enhancing features of ICT, with the perspective of declining social welfare and diminished ability to innovate. Telecommunication services are nowadays provided mostly on competitive market terms and therefore investment in broadband infrastructure has to take account of the (relatively short) financial return horizons taken by investors, typically

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well short of the technical and economic lives of the infrastructure assets. Hence the concern that the market forces guided by such incentives may not provide the socially optimum broadband coverage for a country and this concern may justify compensatory policy action. This call for action is however generally taking place in a context of little quantitative assessment of costs and benefits of such measures.

This study makes an assessment of the benefits of broadband adoption and compares them with the cost of investment for expanding the roll-out of broadband networks. The main consideration is that the economic benefits are determined at a macroeconomic level in terms of higher economic growth. These benefits are then compared with the investment costs of different technological options for infrastructure build-out determined in other studies. The finding is that under a relatively broad range of assumptions on benefits and cost, the increased roll-out of broadband infrastructure, also under the highest performing technology, pays off. There are two effects to take into account: firstly, a broader primary roll-out of broadband infrastructure in terms of household coverage; secondly, a higher performance of broadband infrastructure in terms of transmission speed. Both effects can be beneficial to varying degrees. This can then be used to provide estimates for the validity of the proposition to provide public subsidies to the construction of certain types of broadband infrastructure and to assess to what extent they can be justified. For instance, the Digital Agenda for Europe, presented in May 2010 by the European Commission,¹ entails a set of objectives in terms of universal broadband roll-out by 2013 as well as performance targets by 2020. To reach these targets, the existing network infrastructure needs to be extended by a mix of wireless and wireline technologies, which requires substantial investments. Because of the generally very long payback periods and low financial return a major part is financially not feasible from pure market sources. The European Commission therefore claims the need for entirely new finance instruments and mechanisms, including direct public intervention to ensure meeting of the targets set in the Digital Agenda. A major question in the policy debate is whether such additional resources constitute a good use of public funds at times of economic austerity induced by the protracted economic and financial crisis in Europe. The novelty of this paper is to show the condition under which the subsidies to broadband infrastructure may constitute an efficient use of public funds.

Section 2 presents a survey of the relevant economic literature and illustrates the way broadband infrastructure has a bearing on economic growth. Section 3 describes a set of scenarios for broadband infrastructure build-out to meet the coverage targets entailed by the Digital Agenda along with an estimate of the cost. In Section 4 the econometric model is presented to estimate the parameters for the economic return of broadband infrastructure. Section 5 proceeds to the evaluation of the economic benefits against the cost of broadband infrastructure build-out, and the conditions under which the use of public subsidies is efficient. Section 6 concludes.

2. The economic effects of broadband infrastructure

There is ample empirical evidence that the diffusion of broadband infrastructure and services provides substantial economic benefits and represents an important driver of economic growth. The economic benefits manifest themselves directly and indirectly for consumers and businesses and vary substantially across sectors. Moreover the local culture, managerial attitudes and indigenous regulatory frameworks have been found to affect the impact of these infrastructures.

The World Bank produced one of the earliest studies on the impact of broadband on national economic growth (Qiang & Rossotto, 2009), looking at a sample of 66 high-income economies for the period 1980–2002 (when in fact broadband was quite scarce and only the Republic of Korea, Canada and Hong Kong had achieved adoption levels beyond 10%). It found that – other things being equal – an additional 10 broadband lines per 100 people in high income economies increased the national Gross Domestic Product (GDP) per capita by 1.21% during that period. Studies that looked into the same effects for more recent periods have generally found lower figures. For example, with a sample of 22 OECD countries for the period 2002–2007 Koutroumpis (2009) finds a strongly positive and significant link for the impact of broadband adoption on GDP growth. He suggests that the annual GDP growth of the ‘average’ country in the dataset benefited by 0.24% from broadband adoption: this was equivalent to about 10% of annual GDP growth for these countries during the period 2002–2007. Czernich, Falck, Kretschmer, and Woessmann (2011) performed a similar exercise looking at a larger OECD sample between 1996 and 2007. They confirm that broadband adoption has a significant and positive impact on national GDP per capita, and estimate this to increase by 0.9–1.5% for every additional 10 broadband lines per 100 people. These last two studies control for reverse causality in explicit ways; they introduce structural models that disentangle the effects and perform several robustness checks. There is evidence that the impacts of growth in broadband are greater in countries with relatively high levels of take-up. Koutroumpis (2009) identified a threshold of 30 lines per 100 people (50% of households), at which broadband yielded returns double those achieved at lower levels of penetration.

Measuring consumer surplus is an analytic process that heavily depends on the quality of the end product vis a vis the final price. During – and soon after – the ‘dot com’ era the estimates for the returns of ubiquitous broadband access on the US economy were estimated to be 284–427 billion US dollars per year (see Crandall & Jackson, 2001). More recently these estimates were substantially reduced albeit the rapid drop in equipment costs and the experience gained over a decade of continuous network expansion. Dutz, Orszag, and Willig (2009) estimated the consumer surplus from household use of broadband in the US in the order of 32 billion US dollars per year, up from an estimated 20 billion US dollars in 2005. This

¹ Communications of the European Commission on the European broadband strategy (COM (2010) 472 final).

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