



Fixed and mobile broadband substitution in Sweden

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ABSTRACT

This paper aims to investigate whether mobile broadband (MB) is a complementary or substitute service to fixed broadband (FB) by examining survey data collected by the Post-och telestyrelsen (PTS) in 2009. These data are supplemented with provider broadband service price data. Study findings indicate that price and housing mode are important determinants for broadband connections. In addition, the living area and service provider affect the probability of broadband access. In particular, the own-price and cross-price elasticities show that MB is substitute service to FB in most geographic area of Sweden.

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1. Introduction

Broadband services are now not only recognized as an effective means to deliver information and digital services to subscribers but also for their importance to the economic development of society in general. The traditional broadband service is fixed broadband (FB)—developed and upgraded from dial-up telephone modems to an Asymmetric Digital Subscriber Line (ADSL) or broadband connection through cable or fiber. Mobile broadband (MB)¹ services are delivered via wireless networks and enhance consumer access to information because of the technology's 'any place' at 'any time' attributes (Cheong & Park, 2005).

The introduction of MB allows consumers to access and interact with a wide range of content and businesses to exploit new market opportunities. To be specific, MB provides an alternative mode of access for customers residing in under-served or remote areas without adequate FB infrastructure. MB can also be used as the main household Internet with a USB modem to access the mobile network. The introduction of MB has meant more choice (Gans, King, & Wright, 2005), lower prices (Mölleryd, Markendahl, & Mäkitalo, 2009) and high levels of broadband adoption (ITU, 2010). MB can play a significant role in the broadband market, which was previously predominantly DSL and cable. MB seems to have more advantages than fixed broadband in terms of mobility, compatibility and quality of service to support this burgeoning growth in demand for Internet service, although FB has enjoyed a premium due to its high-speed Internet capacity, which also influences demand for access (OECD, 2009).

The growing magnitude of MB has had a big impact on several telecommunications regulations including market definition, competition and infrastructure planning. There has been intense debate in the US and the EU on how to define broadband markets properly and whether there is a need for regulation (Cardona, Schwarz, Yurtoglu, & Zulehner, 2009). The purpose of a market definition is to determine the boundaries of a given market and use these to analyze further the level of competition in the market, the possibilities for particular firms to gain and exercise their market power and the implications for consumer welfare.²

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¹ MB refers to an Internet connection that supports data, voice and video information at high speeds through mobile devices (Ergen, 2009).

² See European Commission (2002).

Market definition focuses on the substitutability of differentiated products or services. In the broadband Internet services market, two main questions were raised in the discussion on substitution. The first was substitution between narrowband and broadband services (Flamm & Chauhuri, 2007; Ida & Kuroda, 2006; Rappoport, Kridel, Taylor, & Alleman, 2003; Yanelis, Christopoulos, & Kalantzis, 2009), which seems to have been quick due to the technological progress. The second was substitutions within broadband services (Crandall, Sidak, & Singer, 2002; Ida & Sakahira, 2008; Pereira & Ribeiro, 2011). These studies focused only on FB however. MB subscription is growing, and only a study by Cardona et al. (2009) has investigated the substitution pattern in the broadband market by taking MB into account.

In Sweden, the broadband market is very dynamic. Broadband penetration, including FB and MB, has grown over time from 0.88 per 100 inhabitants at the end of 2000 to 40 per 100 inhabitants in mid-2010 (PTS Statistic Portal, 2010). In general, Post-och telestyrelsen (the Swedish telecom regulator, PTS) revises the definition of the telecom market every 3 years, including the broadband market, by implementing the Small but Significant and Non-transitory Increase in Price test (SNNIP test).³ The latest decision, which was made recently (PTS, 2010a), is that DSL, cable and LAN/Fiber are all in the same wholesale broadband market but that MB is not in the same market as FB.

There is increased competitive pressure from MB on FB network connections due to the high adoption growth of MB in Sweden however. Most broadband providers have their own FB and MB infrastructures and provide broadband services to the public. If there is substitution between these two services, it will not have much impact on the providers' revenues, but it could affect competition as service providers can design corporate strategies to mitigate the extent of FB and MB substitution and abuse their market positions. There is then a need to confirm whether MB services are a relevant market for broadband services, otherwise the market definition could be misleading for market analysis and implementation of related regulations. This paper therefore aims to investigate whether MB is a complementary or substitute service to FB by examining survey data collected by the PTS survey in 2009. Empirical results of own- and the cross-price elasticities of broadband demand suggest that PTS should include MB in the same relevant market as broadband services.

The rest of the paper is organized as follows. Section 2 presents previous studies on the relationship between FB and MB. The current situation on the Swedish broadband market is discussed in Section 3. The empirical evidence from the survey is described in Section 4. Section 5 explains the estimation model. Section 6 analyses the estimation results, while the discussion and implications of the study are provided in Section 7. Section 8 ends with the Conclusion.

2. Literature review and state of practice

A number of papers have analyzed the relationship between mobile and fixed line telephony, but only a few papers have investigated the connection between MB and FB. The discussion in this section starts with the relationship between mobile and fixed line telephony followed by the implication for the relationship between FB and MB.

The paper by Vogelsang (2010) presents a survey of the literature on the issue of fixed to mobile substitution (FMS). FMS means replacing fixed line services with mobile services (Albon, 2006) or using a mobile phone instead of a fixed phone for calls or access to telecom services (Vagliasindi, Güneş, & Taubman, 2006). Vogelsang found that theoretical models explaining FMS are scarce and inconclusive regarding the balance between substitution and complementarity of the fixed and mobile sectors. Empirical explanations hinge on the interaction of positive cross-elasticities of demand and reductions in mobile relative to fixed communication prices (Ahn & Lee, 1999; Garbacz & Thompson, 2005, 2007; Grajek & Kretshmer, 2009; Narayana, 2008). FMS is also supported by relative declines in mobile network costs, network effects on demand and quality improvements of mobile services (Briglauer, Schwarz, & Zulehner, 2009; Heimshoff, 2008; Yong & Song, 2003).

In contrast to FMS, few papers discuss substitution in Internet services, in particular broadband services. As mentioned in the Section 1, the first discussion is about the substitution between narrowband and broadband services (Flamm & Chauhuri, 2007; Ida & Kuroda, 2006; Rappoport et al., 2003; Yanelis et al., 2009). Rappoport et al. (2003) estimate the model of consumer access to the Internet in the US. Their results show that, apart from the socio-economic factors, the availability of broadband service matters. For example, when the only alternative is DSL or cable, there is a strong substitute for dial-up. Flamm and Chauhuri (2007) later confirmed the results of the previous study that the cross-price elasticity of broadband demand with respect to the dial-up price supports the notion of the two services being substitutes in the US. Experiences from other countries, for example Japan and Greece, are also investigated. Ida and Kuroda (2006) analyze the demand for broadband in Japan. They include five Internet access alternatives that are available in Japan: narrowband (dial-up and ISDN), DSL, cable and fiber to the home (FTTH). The result reveals that DSL is independent of other services but competes actively with narrowband, cable and FTTH. The result differs from the case of Greece (Yanelis et al., 2009), which shows that cross-price elasticity for DSL to ISDN is negative, indicating that ISDN is a complement to DSL.

The second is substitutions within broadband services (Crandall et al., 2002; Ida & Sakahira, 2008; MCA, 2006, 2007; Ofcom, 2007, 2008; Pereira & Ribeiro, 2011). Due to the availability of broadband technologies, several studies estimated the extent of retail demand elasticity for particular FB access types such as DSL and cable so far. For example, Crandall et al. (2002) use the nested logit discrete choice model to estimate the own-price elasticity on the demand for DSL service and the cross-price elasticity of demand for cable modem service with respect to DSL service. They find that DSL and cable

³ The SNNIP test is a standard tool for market definitions that is embraced by the European Commission (Schwarz, 2007).

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