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Regulatory legacy, VoIP adoption, and investment incentives

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ABSTRACT

The introduction of VoIP telephony raises concerns about current regulatory practice. Access regulation has been designed for PSTN and the liberalization of the PSTN market. This paper explores the effects of access regulation of PSTN networks on consumers' adoption of a new technology in the form of VoIP. It also discusses the link between access regulation and the incentives to invest in VoIP.

1. Introduction

The emergence of voice telephony based on the Internet protocol (VoIP) has had, and will continue to have, a profound impact on the telecommunications landscape. Without even mentioning the threat posed by Internet companies, incumbent operators were forced to think beyond milking the PSTN (public switched telephony network). A possible response is to introduce VoIP quickly and at low prices, while incurring the cost of cannibalizing PSTN revenues. For instance, in order to compete with cable operators, Dutch incumbent KPN had hastened to introduce VoIP telephony. The telecoms operator was not prepared for the large uptake during the first year, which resulted in serious installation problems and quality/service issues.[3] In this new landscape faced by incumbent operators in liberalized markets, the nature of competition between incumbents and entrants is substantially changing, compared to what has been observed in the early years after liberalization of the telecoms sector.

This paper explores competition between an incumbent offering both PSTN and VoIP telephony (or voice over broadband, VoB), and an entrant present only in the latter segment. It investigates the effects of regulation in one segment on competition in the other, unregulated segment, and explores possibly undesirable side-effects of access price regulation. Based on the obtained insights, it discusses various policy implications.

A situation is considered in which an incumbent with a history in PSTN telephony, competes with a newcomer in the VoIP segment. The incumbent has a local access network with complete coverage. The entrant may be a cable operator with a full-coverage broadband network, or a newcomer without a local network, making use of mandatory unbundling of the incumbent's local loop to reach end-users. The incumbent offers PSTN voice telephony to one segment of customers, as well as VoIP services to another segment, while the entrant only offers VoIP services in the latter segment. Consumers can choose between staying with the PSTN network versus migrating to VoIP services. In this setting, this paper explores to

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[3] KPN made VoIP telephony available in February 2006 (KPN Suffers VOIP Hiccup, 2007).

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what extent regulatory intervention in the PSTN segment may distort the adoption of VoIP by consumers, and operators' investment incentives.

In particular, the focus is on the effects of regulation of PSTN terminating access prices and the effects of regulation of the PSTN retail price. Accordingly, regulation of the VoIP market itself is outside the scope of this paper, which looks instead at the broader picture in which PSTN and VoIP are connected market segments. In particular, how the level of the PSTN access charge and the level of the PSTN retail price affect the intensity of competition in the VoIP segment and the speed of consumer migration to VoIP is discussed. By adopting a welfare perspective, policy implications are derived.

While short-run effects of regulation on retail competition appear to be important, the impact on investment levels should not be ignored. The analysis is therefore extended to study the effect of access regulation on investment incentives in the VoIP segment. One can then observe that, in general, an access price different from cost levels generates asymmetric incentives for incumbent and entrant. Often the incumbent has weaker investment incentives, because it cannabalizes revenues in the PSTN-segment. However, no unambiguous results with respect to investment incentives can be derived. Because of the effect of investment on wholesale PSTN revenues, the incumbent's rather than the entrant's investment may turn out to be more profitable at the margin.

The policy relevance of this paper is evident. It looks at the broader regulatory picture, in which PSTN and VoIP market segments cannot be viewed separately. The point is this may be at odds with the idea behind the European regulatory framework for communications markets, which has tended to view market segments in relatively isolated contexts, and offers regulatory instruments to be applied within "markets" in which a problem occurs.[4] This paper demonstrates that "compartmentalizing" communications markets may conflict with maximizing overall consumer or total welfare, especially if the regulatory process cannot keep up with the speed at which operators adapt their business strategies, and the speed at which consumers change their communications behaviors. The message is that, if only because of network interconnection, regulators should be aware of the explicit effects that PSTN regulation may have on the emerging VoIP market. It is surprising that regulatory practice has not paid more explicit attention to this type of interdependence. This may be due partly to considerations of a universal service obligation regarding PSTN or by market power with regard to PSTN call termination, creating a bias towards existing regulations. Nevertheless, within the European regulatory framework, such considerations can easily introduce distortions when the technological environment changes over time (for a policy document on such considerations, see OECD, 2006). This paper articulates how regulation in one segment can have undesirable side-effects in another segment, both through strategic pricing interaction and through investment incentives.

The paper builds on the literature on "one-way" and "two-way" access (for overviews, see e.g. Armstrong, 2002, and Vogelsang, 2003; for references to recent contributions on two-way access see Peitz et al., 2004) by analyzing the emergence of VoIP networks in a PSTN environment, and in which the PSTN and VoIP networks are interconnected.[5] Part of this paper draws on De Bijl and Peitz (2009), which provides a formal (game-theoretic) analysis of imperfect competition between an incumbent active in both PSTN and VoIP, and a VoIP entrant. The present paper is also related to the literature on investment incentives in infrastructure markets (see Valletti, 2003, and Gans, 2006). Foros (2004) models a situation of a vertically integrated firm controlling both local access and providing broadband access, and a downstream Internet retailer. The focus of that paper is mainly on regulation as a way to induce the integrated firm to invest efficiently and to deter it from foreclosing the market—in this paper the regulator cannot commit to a particular policy before investment decisions are made. Also related is Hansen (2006), addressing regulatory concerns with respect to the migration from fixed to mobile.

This paper is organized as follows: Section 2 contains some illustrative data and discusses some elements of the analysis. Section 3 presents the stylized model. Section 4 explores how access regulation in the PSTN segment affects competition in the VoIP segment. Section 5 discusses how the incentives to invest in VoIP can be affected by PSTN access regulation. Section 6 concludes the paper.

2. Developments in broadband and VoIP

The emergence of VoIP is closely linked to developments in broadband Internet access. Initially, broadband connections were primarily meant for Internet access. Worldwide, (narrowband) dial-up access to the Internet has been in decline due to migration to broadband access. In January 2009, the penetration rate of broadband was 23.9% of the EU population.[6] One year earlier, it was 20.2%, coming from about 7% in 2004. Penetration is different among EU member states. At the beginning of 2009, it ranged from 11% in Slovakia to almost 37% in Denmark and the Netherlands. Outside of the EU, Korea was traditionally leading (25% in 2005, and 32% in the fourth quarter of 2008), but was recently overtaken by Denmark, the

[4] This tendency has diminished with the reduction of the number of predefined markets over time, but nevertheless, the underlying philosophy places little weight on the interconnectedness of market segments (De Bijl & Peitz, 2008).

[5] Relevant contributions to the access price issue in environments in which firms enjoy market power include Ebrill and Slutsky (1990), Laffont and Tirole (1994), Armstrong and Vickers (1998), Lewis and Sappington (1999) and De Bijl and Peitz (2006b).

[6] The data reported in this section is taken from European Commission (2009) and the OECD Broadband Portal at 〈http://www.oecd.org/sti/ict/broadband〉. See also De Bijl and Peitz (2006a).