



## Incentives to invest and to give access to non-regulated new technologies

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### ABSTRACT

We analyze the incentives of a vertically integrated firm, which is a regulated monopolist in the wholesale market and competes with an entrant in the retail market, to invest and to give access to a new wholesale technology. The new technology represents a non-drastic innovation that produces retail services of a higher quality than the old technology, and is left unregulated. We show that for intermediate values of the access price for the old technology, the vertically integrated firm may decide not to invest. When investment occurs, the vertically integrated firm may be induced to give access to the entrant for a low access price for the old technology. Furthermore, when both firms can invest, investment occurs under a larger set of circumstances, and it is the entrant the firm that invests in more cases. We also discuss the implications for the regulation of the old technology.

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## 1. Introduction

Consider an industry where a vertically integrated firm is a regulated monopolist in the wholesale market and competes with an entrant in the retail market. The vertically integrated firm can invest in a new technology for the wholesale market. The new technology is unregulated, and allows retail products of a higher quality to be supplied than those offered by the old technology. After investment, there will be two wholesale technologies of different qualities belonging to the same entity on the market. One will be regulated; the other will not. This scenario raises several policy questions regarding the incentives for the vertically integrated firm: (i) to invest in the new

technology, and (ii) to allow the retail market entrant access to the new technology.

Regarding the first issue, does the vertically integrated firm have more incentives to invest if the access price for the old technology is high or low? In some circumstances, only the vertically integrated firm can invest in the new technology, but in others, perhaps due to public policies, both firms can. If both firms can invest, will investment occur under a larger set of circumstances than when only the vertically integrated firm can invest?

Regarding the second issue, will the vertically integrated firm voluntarily give access to the entrant, or will the industry be monopolized if the new technology is left unregulated? The vertically integrated firm has conflicting incentives with respect to giving access to the entrant. Granting access allows the entrant to sell a higher quality product. This, on the one hand, reduces the vertically integrated firm's retail profits, but, on the other hand, increases the vertically integrated firm's wholesale profits.

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This discussion is motivated by several examples in the telecommunications industry, such as the deployment of fourth generation mobile networks and next generation fixed networks (NGNs), as well as by some theoretical support advocating the abstention from regulatory intervention.

Several mobile telecommunications firms have announced plans to deploy fourth generation mobile telecommunications networks. These networks enable broadband access to the internet at gigabit speeds. In several countries, sectoral regulators forced mobile network operators to provide wholesale reference offers for retail entrants, known as mobile virtual network operators (MVNOs), for second and third generation mobile telecommunications networks. In addition, there is an ongoing discussion on whether mobile network operators will voluntarily give MVNOs access to their new networks, or if wholesale reference offers for MVNOs should be extended to fourth generation mobile networks.<sup>1</sup>

Many telecommunications firms have also announced plans to invest in NGNs, which are multi-service infrastructures for audio, video, and data services. To give firms the right incentives to invest, and to encourage efficient use of these infrastructures, sectoral regulators must set an adequate regulatory framework for these new telecommunications networks. The *forbearance approach* is one of the regulatory approaches that has been adopted.<sup>2</sup> This approach consists of the abstention, permanent or temporary, from regulatory intervention.

The *forbearance approach* was followed, for instance, in the US, where it was argued that cable television and telecommunications firms, incumbents and entrants, are on an equal footing to deploy their own networks, and that competition among them to do so is welcomed. Telecommunications firms, like *Verizon*, are deploying NGNs, but they are only obliged to offer to entrants wholesale services equivalent to those they already offered through the old network. The *forbearance approach* was criticized in some jurisdictions on the basis that, when there are no alternative networks, it could allow the telecommunications incumbent to re-monopolise the market. In Germany, the sectoral regulator, *BNetzA*, granted a regulatory moratorium to the NGN of the telecommunications incumbent, *Deutsche Telekom*, in 2007. However, the European Commission objected, and forced the cancelation of the regulatory moratorium.<sup>3</sup> The Commission argued that the existing ex-ante regulation had to be extended also to this new network, since the lack of competition in the German market could lead to the re-emergence of monopoly.

<sup>1</sup> See Banerjee and Dippon (2009), Brito and Pereira (2010, 2009) and Ordovery and Shaffer (2007) for a discussion of the conditions under which mobile network operators have incentives to give access to MVNOs.

<sup>2</sup> Sectoral regulators have considered two other regulatory approaches: (i) the *continuity approach*, which consists of maintaining the current regulatory system; and (ii) the *equality of access approach*, which consists of forcing the functional separation of the incumbent's wholesale and retail operations, on top of the provisions of the continuity approach. See European Commission (2007).

<sup>3</sup> Case C-424/07 European Commission vs. Federal Republic of Germany, "Failure of a Member State to fulfil obligations – Electronic communications – Directive 2002/19/EC – Directive 2002/21/EC – Directive 2002/22/EC – Networks and services – National rules – New markets".

The *forbearance approach* has also been backed up in the economics theory literature, where it is presented as a solution to the regulator's commitment problem. Before the network is deployed, it is socially optimal to set a high access price to promote investment. However, once the network is deployed, it is socially optimal to set the access price to stimulate competition in the retail market. If the regulator is unable to commit to a policy, the incumbent anticipates that it will be expropriated from the incremental profit of its investment, and reduces investment. Gans and King (2004) argue that if the regulator cannot commit to a specific access price, investing firms should apply for a regulatory moratorium that would grant them a period of time during which they would not be subject to access regulation.

To analyze these problems, we developed a model that extends Biglaiser and DeGraba (2001), to allow the coexistence of two technologies: (i) an old and regulated technology, and (ii) a new and unregulated technology.<sup>4</sup> Since we want to focus on the analysis of the incentives of the vertically integrated firm to invest and to give access to a new wholesale technology, we assume that: (i) the access price for the old technology is set, exogenously, by the regulator, and (ii) the new technology is unregulated.

When the new technology represents a *non-dramatic* innovation, i.e. when the entrant, using the old technology at a low enough access price, can compete against the vertically integrated firm, using the new technology, our results are as follows.

When only the vertically integrated firm can invest in the new technology, we show that for intermediate values of the access price for the old technology the vertically integrated firm may decide not to invest. Regarding the access decision, we show that given a low access price for the old technology, the vertically integrated firm cannot foreclose the market by denying access to the new technology, and hence it voluntarily gives access to the entrant, leading to a duopoly with the new technology. On the contrary, when the access price for the old technology is high, i.e. when the entrant, using the old technology, cannot compete against the vertically integrated firm, using the new technology, the vertically integrated firm takes advantage of this and denies the entrant access to the new technology, becoming a monopolist in the retail market.

We also consider the case where both the vertically integrated firm and the entrant can invest in the new technology. We show that when the investment cost is low both firms invest, and when the investment cost is high only one of them invests. Furthermore, the entrant invests under a larger set of circumstances than the incumbent. Compared to the case where only the vertically integrated firm can invest, investment occurs under a larger set of circumstances when both firms can invest.

Typically, the access price for the old technology is set by the regulator in line with the conditions of the industry, i.e. the access price is endogenous. Hence, for completeness, we extend our analysis to derive the optimal access price for the old technology under the scenario of an

<sup>4</sup> Biglaiser and DeGraba (2001) focus on the telecommunications industry and assume: (i) two-part retail tariffs, (ii) linear wholesale tariffs, and (iii) a covered market.

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