

Vertical integration and incentives to innovate

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Abstract

In this paper, two upstream innovators invest to improve process innovations used by two downstream producers. At the beginning of the game, each innovator licenses its technology to one producer and they can agree to integrate vertically. Then, investment takes place and successful innovators choose their licensees. When technologies are not costlessly substitutable, the prices of licenses rise with the size of the switching costs. This affects ex-ante incentives to invest, and efficient technologies with low switching costs may disappear. As a result, ex-ante vertical integration is privately beneficial.

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1. Introduction

Research and development (R&D) is a basic component of modern economies but market incentives and existing regulatory mechanisms are insufficient to induce firms to carry out their research projects efficiently. Although some large firms are monopolists in some R&D areas and have incentives to make substantial ex-ante investments, most innovations are developed in situations of oligopolistic

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R&D rivalry. Then, innovators are involved in patent races, in which losers do not receive patents and get small payoffs. Firms have incentives to protect themselves from such outcomes. For instance, they may integrate vertically with producers or develop technologies with switching costs. This last alternative increases the costs that producers and/or consumers incur if they decide to break the relationship with the innovator. Moreover, innovations become non-substitutable, which allows innovators to avoid patent races.

From a practical perspective, many industries have high equilibrium concentration levels and are characterized by the emergence of large firms able to carry out fundamental research, develop their innovations and market final products. Moreover, firms differentiate their innovations, which leads to different standards such as PC vs. Macintosh, Windows vs. Unix, PAL vs. SECAM, or (historically) VHS vs. Betamax. In so doing, innovators protect their monopoly power and can extract the surplus generated by their innovations, which makes them willing to embark on research projects in the first place.

Those strategies are associated with two important issues. First, there is an obvious relationship between non-substitutability and the emergence of standards. In that respect, it is sometimes argued that some inefficient standards are precisely those that survive. Given the impact of innovations on economic performance, the possibility that inefficient standards might be adopted is of primary concern. It is important to understand why this might occur and to find out how it could be avoided. Second, there is a link between substitutability and incentives to integrate vertically. Indeed, the degree of substitutability between innovations affects the prices of licenses and the extent to which innovators can capture the returns from their innovations, which can motivate vertical integration. Since the decision of two firms to integrate vertically is generally affected by the decisions of other firms, it is unclear whether the socially efficient industrial structure emerges. In our view, those two issues are closely related and the aim of this paper is to investigate them simultaneously. In particular, given that vertical integration is always a possible strategy for firms, there is a priori no reason why efficient technologies should disappear.

The literature on vertical integration focuses on mergers between producers of conventional inputs and outputs. The analyses determine when vertical mergers take place, identify the conditions under which market foreclosure is a consequence or a purpose of integration, and characterize the situations in which integration is beneficial.¹ By contrast, vertical integration in the specific case of

¹ See Hart and Tirole (1990), Ordover et al. (1990), Bolton and Whinston (1991, 1993) and Rey and Tirole (forthcoming). See also Chemla (forthcoming) for an analysis of the impact of downstream competition on the incentives to integrate vertically.

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