Complementarity in R&D Cooperation Strategies

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Abstract. This paper assesses the performance effects of simultaneous engagement in R&D cooperation with different partners (competitors, clients, suppliers, and universities and research institutes). We test whether these different types of R&D cooperation are complements in improving productivity. The results suggest that the joint adoption of cooperation strategies could be either beneficial or detrimental to firm performance, depending on firm size and specific strategy combinations. Customer cooperation helps to increase market acceptance and diffusion of product innovations and enhances the impact of competitor and university cooperation. On the other hand, smaller firms also face discom
domies in pursuing multiple R&D cooperation strategies, which may stem from higher costs and complexity of simultaneously managing multiple partnerships with different innovation objectives.

Key words: innovation, productivity, R&D cooperation.

JEL Classifications: O31, O32.

I. Introduction

Both the industrial organization and the management literature on strategic alliances have devoted substantial attention to the analysis of R&D cooperation. The industrial organization literature has largely focused on

* The empirical analysis for this paper has been performed at CEREM/Statistics Netherlands. We thank Bert Diederen of CEREM for his assistance. The views expressed in this paper are those of the authors and do not necessarily reflect the policies of Statistics Netherlands. We thank two anonymous referees, the editor (Lawrence White), Bonnie Beerks, Geert Duysters, Katrin Hussinger, and Pierre Mohnen for helpful comments on earlier drafts.

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the effects of R&D cooperation between competing firms on R&D investment and welfare (e.g., Suzumura, 1992; Martin, 1995; Amir et al., 2003).\(^1\) In practice, however, R&D links formed by firms with suppliers, customers, or research institutes and universities are as frequent as cooperation with competitors, and a substantial share of innovating firms are engaged in R&D cooperation with several partners simultaneously (Leiponen, 2001; Tether, 2002; Veugelers and Cassiman, 2003; Belderbos et al. 2004a, 2004b).

The alliance literature has emphasized the complexity of rationales behind cooperative strategies and the need to establish multiple alliances (e.g., Tyler and Steensma, 1995; Contractor and Lorange, 2002; Das and Teng, 2002). Alliance networks, their determinants, and composition have mostly been studied from the perspective of social network theory (e.g., Gulati, 1995).

The fact that many firms are engaged in multiple cooperative agreements raises the question whether there are synergetic effects between these strategies — i.e., whether forming a new alliance in R&D enhances the effectiveness of other existing R&D collaborations. Such a synergy, or complementarity, has been formally defined by Milgrom and Roberts (1990) and is assumed to exist if the implementation of one practice or strategy increases the marginal return to other practices. A number of studies have examined complementary effects of practices related to workplace organization, use of information technology, and obstacles to innovation (Ichniowski et al., 1997; Bresnahan et al., 2002; Mohnen and Röller, 2005).

Despite the growing literature on R&D cooperation in both the fields of management and industrial economics, surprisingly little evidence has emerged on the interaction of different cooperation strategies in innovation. Arora and Gambardella (1990) find a positive correlation between residuals of equations explaining large pharmaceutical firms’ R&D agreements with research institutes, minority participations, and acquisitions of new biotechnology firms. They take this to indicate that networked R&D strategies are most effective for firms active in biotechnology. However, Arora (1996) points out that the testing methodology of correlating residuals cannot serve as conclusive evidence of the greater effectiveness of joint adoption of the different cooperation strategies.\(^2\) Other empirical work has examined the impact of R&D cooperation on firms’ innovation output: sales of innovative products (e.g., Klomp and van Leeuwen, 2001;

\(^1\) Exceptions are models that examine vertical cooperation (Steurs, 1995) and vertical alongside competitor cooperation (Atallah, 2002).

\(^2\) Estimated correlations between residual terms may be the result of common omitted exogenous variables or measurement errors. Even in the case of robust correlation between practices, there is no guarantee that decision makers were sufficiently well informed such that they indeed chose efficiency or output enhancing combinations of practices.