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Impact of cooperation on the R&D activities of Brazilian firms

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Abstract

Cooperation between private firms and public research institutes improves knowledge flows between these agents. This study analyses the factors associated with decisions in manufacturing firms on whether to engage in Research and Development (R&D) cooperation activities and then evaluates the effect of such decisions on the performance of these firms. Probit models were used for the estimation of propensity score matching to determine the impact of cooperation on the performance of the firms studied. The source of data was the 2008 Technological Innovation Survey (*Pintec*). The results indicate that cooperation positively influences the rate of success in product innovations.

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1. Introduction

In order to stimulate innovative activity, much attention has been given to cooperation agreements on research and development (R&D). These agreements are designed to incorporate mechanisms by which firms can profitably appropriate and protect knowledge flows. Agreements of this kind are therefore interesting objects for economic regulation, which should create appropriate incentives without harming market competition.

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R&D cooperation agreements have become a topic of interest to public managers. According to López (2006), most of the funding for R&D in the European Union (EU) is aimed at stimulating cooperation between private firms and public institutions, and among the firms themselves. The underlying logic is that the economic growth and performance of the National Innovation System (NIS) can be positively impacted by improved information flows (spillovers) generated through these cooperative agreements.

In addition to the flows of knowledge and information, Belderbos et al. (2004a) identified three other important reasons for firms to engage in R&D cooperation agreements: sharing of costs and risks; skill sharing or complementarities; and factors related to the absorptive capacity of the firm.

In the first case, cooperation agreements for R&D can be used to determine the rules of sharing costs and risks in initiatives where these are high. Therefore, when costs and risks are serious obstacles to innovation, firms would tend to engage in cooperation agreements for R&D.

In the second case, cooperation agreements for R&D could allow the firms to acquire skills and capabilities held by its partners. The greater the availability of technological know-how internalized by the firms, the greater the possibility that complementarities will benefit both partners in a cooperation agreement for R&D.

Finally, in the third case, as the absorptive capacity of a firm (a factor closely related to knowledge flows and complementarities) denotes its ability to take advantage of the R&D activities of other firms, the higher the absorptive capacity of a firm, the greater the benefits of cooperation agreements for R&D (LÓPEZ, 2006; VEUGELERS and CASSIMAN, 2002).

Given the above rationale, it is important to examine R&D cooperation agreements in order to assess their impact on the performance of innovative firms. In addition, it is vital to elucidate the mechanisms and key factors associated with the firm's decision on whether to participate in R&D cooperation agreements with research institutions and other firms, considering the innovative patterns and technological intensity that characterize distinct industrial sectors.

The use of microdata from the Brazilian Technological Innovation Survey (PINTEC), including 16,371 firms (14,355 of whom belong to the industry sector and 2,016 to the service sector) to estimate the impact of the participation in R&D cooperation agreements on the economic performance of firms is one of the contributions of this study to the industrial organization literature. The analysis of the determinants and impacts of R&D cooperation for each group of technological intensity, as defined by the OECD taxonomy is another contribution of this study. Finally, considering that the Brazilian innovation system is in the early stages of development, this study provides important insights for the Brazilian NIS by showing that R&D cooperation is an important element for the innovative and consequently economic performance of firms.

2. Methodology

2.1. Model specification

In addition to the traditional variables (e.g. sharing of costs and risks, complementarities and absorptive capacity of the firms) that have been shown to affect the decision to cooperate, the model postulates the likelihood of cooperation as a variable dependent on the spillovers. Two variables were defined to specify spillovers: *incoming spillovers* and *appropriability*. The first is measured by the importance given to publicly available information for the innovative process of the firm). The second form of spillover, *appropriability*, can be understood as the control the firm can exert over outgoing spillovers, and is measured by the importance given to multiple strategic methods to control the outflow of commercially sensitive information.

The rationale with regard to *income spillovers* it that the greater these spillovers, the greater the scope of learning resulting from cooperation agreements for R&D and consequently the marginal benefit derived from such agreements. Therefore it is expected that the presence of *incoming spillovers* has a positive effect on the likelihood of cooperation.

The effect of *appropriability* on the likelihood of cooperation is not clear, a priori. On the one hand, a low level of control over *outgoing spillovers* (i.e. low *appropriability*) increases the information flows between firms, and then the *incoming spillovers* that are expected encourage more cooperation for R&D. On the other hand, the incentives for a firm to become a *free-rider* on other firms' investments reduce both the profitability and stability of cooperation agreements.

As regards the other variables in the model, the possibility of *sharing costs and risks* through cooperation is

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