Strategic for University –Industry R&D Cooperation in Vietnam

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Abstract: *At this moment, innovation activities are considered risky and costly. From strategic Management perspective, companies would cooperate with University to share R&D costs and risks. This paper focuses on the motivation for cooperative arrangements with U&I. We can expect high-technology firms to have higher propensity to cooperate with U&I, however, a remaining question is whether the profile of the firm that cooperates with University and its motivation is different regarding the industry in which the firm operates.*

Keywords: *Universty and Industry (U&I), innovation, R&D, low- and medium-technology*

1. INTRODUCTION

Innovation strategy is strongly related with cooperation. Research has found that firms that undertake R&D are more rather than less likely to enter into cooperation agreements (Fritsch and Lucas, 2001; Tether, 2002). Firms carry on R&D partly in order to raise their absorptive capacity, i.e., their ability to learn from their environment and from the work of others (Cohen and Levinthal, 1990). The greater the importance the company gives to R&D, the greater its propensity to cooperate.

Collaboration as an innovation strategy allows individual firms lacking the specific resources or expertise to advance scientific discoveries. However, internal capability and external cooperation have been found to be complements rather than substitutes (Rothaermel, 2001). Some studies have found that higher levels of R&D spending and technological sophistication are positively associated with higher levels of cooperation (Hagedoorn, 1995). Firms with strong R&D possess the resources and technological base to offer potential partners, and, hence, are more likely to be presented with opportunities to cooperate (Rothaermel, 2001).

A firm's investment in internal R&D builds absorptive capacity that positions the firm to take advantage of external cooperation. Absorptive capacity is particularly acute when tapping university-based resources. "When outside knowledge is less targeted to the firm's particular needs and concerns, a firm's own R&D becomes more important in permitting it to recognize the value of knowledge, assimilate and exploit it. Sources that produce less targeted knowledge would include university labs involved in basic research" (Cohen and Levinthal, 1990).

Following this argument, some authors (Fontana et al, 2006; Schartinger et al, 2001) incorporate the level of R&D expenditure when analysing firm-university relationships. Firms that invest heavily in R&D are likely to possess high technological capability. This capability also allows them to absorb the knowledge developed outside the firm. According to the notion of absorptive capacity, the higher the firm's internal R&D, the higher the probability of cooperation with U&I. R&D intensive firms might be more likely to establish cooperation with U&I, as they are active at the technological cutting edge and thus are more dependent on innovation developments that other firms.Firms with little internal exploration will be poorly positioned to either recognize or assimilate knowledge generated externally as compared to firms that are actively generating new and diverse knowledge internally (Cohen and Levinthal, 1990).

2 LITERATURE REVIEW

The literature describes that from a theoretical point of view, why firms enter into cooperative arrangements. Hagedoorn, Link and Vonortas (2000) distinguished three broad categories of literature: Transaction Costs; Strategic Management and Industrial Organisation Theory. We will use Transaction Costs and Strategic Management as a framework to analyze the main reasons that lead a firm to cooperate with University.

Transaction costs economics (Williamson, 1985) consider cooperation agreements as a hybrid form of organization between the market and the hierarchy that facilitates carrying out R&D activities. R&D cooperation may enhance the potential for discovery as well as the potential for a loss of control over the intellectual property generated. The outcome of joint research is often known to and claimed by both parties. However, universities have limited incentives to act opportunistically; therefore, they may be preferred as research partners when firms face appropriability concerns (Bercovitz and Feldman, 2007).

From Strategic Management perspective, firms would cooperate with University to share R&D costs and risks (Hagedoorn, 1993; Tether, 2002). Innovation activities are considered risky and costly. The risk of innovation lies in the expected result not being obtained or in the necessity of more financial and technological funds (Tsang, 1998).

Firms collaborating with University can also increase efficiency, power and synergy gaining access to networks (Jarillo, 1988; Bayona et al, 2002).

Collaboration with universities provides access to national and international knowledge networks. Firms can gain access to the knowledge networks in which their public partners are included (Jones-Evans et al, 1999; Okubo and Sjöberg, 2000).

3. RESEARCH METHODOLOGY

In this paper, information regarding the firm's innovation and cooperation activities was drawn on Vietnam enterprise surveys data carried out by World bank project in 2018. The unit of analysis is the firm and the sampling covered both machineries and services and excluded firms with fewer than 10 employees. Our final sample consisted of 1175 firms: 990 firms in low- and medium-technology industries and 185 firms in high-technology industries. We compared both types of industries (high-technology and low- and medium-technology) in terms of cooperation among U&I , motivations to cooperate and innovation strategy. In addtion, two logistic regression models for cooperation U&I were tested, one for each type of industry. These models aim to explain the motivations of a firm to engage in R&D cooperation with U&I and the impact of the firm's innovation-strategy. The propensity of a firm to cooperate with U&I is them explained by its size, its motivations and its innovation-strategy.

4. RESULTS AND DISCUSSION

Table 1 shows the results of the logistic regression for the total sample and for both sub-samples. It shows the values of the coefficients, their levels of significance, the value of the χ^2statistic, Nagelkerke R^2, and the percentage of cases correctly forecast.

The results show that *size* has a positive and significant effect on cooperation with U&I($\beta = 0.960$; $p<0.01$). The greater the firm, the greater its propensity to cooperate. Moreover, this positive effect is significant in both industries, however, it is higher in low- and medium-technology firms($\beta = 1.120$) than in high-technology industries ($\beta = 0.747$).

Regarding the motivations to cooperate, our results show that a *lack of financial* resources seems to be positively correlated with the propensity to engage in cooperation for innovation with U&I($\beta = 0.291$; $p<0.01$). This finding suggests that a motive that brings firms to cooperate with U&RI is a way of obtaining funds to conduct research. This is consistent with previous literature (Bayona et al, 2002; Bonaccorsi and Piccaluga, 1994) and the result holds for both types of industries. Firms cooperate for innovations because they do not have internally all of the necessary resources. Firms that have encountered difficulties in financing innovations are more likely to engage in cooperation agreements with U&RI. Moreover, U&RI also need funds to finance research, and they turn to business world as state budgets continue to reduce.

Motivations differ if we compare both industries. In low- and medium-technology industries *finance* is the main factor ($\beta = 0.331$; $p<0.01$), and *risk* perception has a marginal effect ($\beta = 0.150$; $p<0.1$). On the contrary, in high-technology industries, a lack of information on the *market* is the factor with a greater effect on the propensity to cooperate with U&RI ($\beta = 0.272$; $p<0.05$).*Lack of finance*($\beta = 0.234$; $p<0.05$) and perceived *risk* of innovation ($\beta = 0.222$; $p<0.05$) also have a significant and positive effect.

In table 1 we can observe that only two factors hampering innovation have a different effect in high-technology industries than in low- and medium-technology industries. Although not significant, cost and organization have a negative sign in model 2 (high-technology), and a positive sign in model 3. In high-technology firms, innovation costs and organizational rigidities reduce the probability of cooperation with U&RI. On the contrary, in less technology-intensive sectors, firms tend to mitigate these difficulties increasing their cooperation with public research centres. The fact that non of the factors that reduce the probability to cooperate with U&RI (negative sign) are significant, let us think that factors that hamper innovation or perceived obstacles motivate cooperation with U&RI but they do not discourage it.

Table 1 shows that all the innovation-strategy variables positive and significantly affect firm's propensity to cooperate with U&RI. This finding is consistent with Cohen and Levinthal's (1990) absorptive capacity, since, in order to absorb the basic knowledge generated by U&RI, firms need to have some internal R&D initiative.

From innovation-strategy variables, *external R&D* ($\beta = 0.046$; $p<0.01$), and *acquisition of other external knowledge*($\beta = 0.057$; $p<0.01$), are the factors with a higher effect on firm's propensity to cooperate with U&RI. These variables show the degree of openness of the firms regarding innovation[1]. The greater the firm's openness to innovation, the greater its probability to cooperate with U&I. Fontana et al (2006) in a recent study also found that openness impacts the probability of a firm to develop a research project with universities.

Finally, our findings show that the propensity to engage in cooperative arrangements for innovation with universities increases with firm *size*. This finding is similar to previous studies (Tether, 2002) and it reflects the greater resources of larger firms, which makes them attractive to these institutions, but also the greater awareness of larger firms as to the services available from U&I. Moreover, this influence is greater in low- and medium technology firms ($\beta = 1.120$; $p<0.01$) than in high-technology firms ($\beta = 0.747$; $p<0.01$).

Table 1 Results of the logistics regression for cooperation with U&I

	Model 1 TOTAL (n=1175)	Model 2 HIGH (n=185)	Model 3 LOW & MED (n=990)
	β	β	β
Risk	0.180**	0.222**	0.150*
Cost	-0.034	-0.106	0.015
Financing	0.291***	0.234**	0.331***
Organization	-0.022	-0.129	0.086
Personnel	-0.031	-0.047	-0.023
Technology	-0.113	-0.066	-0.137
Market	0.177**	0.272**	0.108
Regulations	0.055	0.014	0.069
Customer	-0.075	-0.112	-0.055
Internal r&d	0.045***	0.041***	0.044***
External r&d	0.046***	0.042***	0.046***
Machinery	0.026***	0.028***	0.025***
External knowledge	0.057***	0.055**	0.058***
Specifications	0.023***	0.020**	0.023***
Trainnig	0.016**	0.016	0.014*
Marketing	0.032***	0.036***	0.029***
Size	0.960***	0.747***	1.120***
Constant	-10.682***	-8.925***	-11.741***
X^2 model	1649.930***	466.566***	907.830***
Nagelkerke r^2	0.409	0.367	0.384
% Correctly predicted	95.2	86.1	97.1

*** p<0.01
** p<0.05
*p<0.1

5. CONCLUSION

Internal R&D capability is critical to basic research and research-based innovation. Moreover, high R&D intensity firms seek for collaboration with U&I. Firms that devote a significant amount of resources to research and product development, while focusing on their internal research capability, would utilize U&RI in order to advance their research-based innovation (Hall and Bagchi-Sen, 2007).

Our findings show that firms which carry out internal R&D have a greater propensity to cooperate with U&I. This result is in consonance with the idea that internal R&D provides the capacity to absorb the knowledge generated by U&I.

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