

Determinants of successful R&D cooperation in Japanese small businesses: The impact of organizational and contractual characteristics

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Abstract

Using original survey data on Japanese small businesses, this paper analyses the impact of the organizational and contractual characteristics of cooperative R&D, such as membership structure, partner relationship, external support, and rules of cost and outcome sharing, on the probability of the technological and commercial success of the project. Empirical results suggest that cooperative R&D is more successful, the higher the quality and quantity of external resources available through cooperation, and the lower the transaction and coordination costs required for such arrangements. Moreover, we found that the determinants of technological and commercial success differ considerably.

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1. Introduction

Cooperative R&D¹ has attracted considerable attention from both academics and practitioners. Important theoretical literature on this subject highlight the following advantages of cooperative R&D: better access to external business resources, achieving economies of scale and scope and synergy effects for R&D, reducing risk and wasteful duplication of R&D efforts, and increased incentive for R&D investment by the reduced

appropriability problem (Katz, 1986; d'Aspremont and Jacquemin, 1988; Suzumura, 1992; Combs, 1993). On the other hand, cooperative R&D is also argued to have the negative effects of welfare loss or reduced R&D efforts if it leads to collusion in R&D and the product market (Jorde and Teece, 1990).

Cooperative R&D is a useful way to overcome the lack of internal business resources and to improve innovativeness and competitiveness, particularly for small and medium enterprises (SMEs). In fact, as pointed out by Kleinknecht and Reijnen (1992, p. 347), "R&D cooperation does not typically occur between big, high tech firms." A statistical survey carried out in Japan in 1991² revealed that 9% of SMEs (firms with 50–299

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¹ Based on the aims and objectives of their studies, scholars of this topic refer to cooperation in R&D differently—cooperative R&D, research partnership, research joint venture (RVJ), and research consortia. In this paper, we mostly use the word "cooperative R&D."

² This is the first, and thus far, the last official statistics in Japan that shows the number of cooperating firms by firm size classes.

Table 1
Japanese firms conducting cooperative R&D in 1991 (units: number of firms)

	(A) All Firms	(B) Firms conducting cooperative R&D	B/A
All manufacturing industries	13,688	1634	0.119
50–99 employees	4,080	311	0.076
100–199 employees	4,325	404	0.093
200–299 employees	1,906	202	0.106
300–499 employees	1,401	190	0.136
500–999 employees	1,089	191	0.175
1000–4999 employees	746	255	0.342
5000 and more employees	141	81	0.574
SMEs (50–299 employees)	10,311	917	0.089
Large firms (300 + employees)	3,377	717	0.212
Food	991	77	0.078
Beverages, tobacco, and feed	171	21	0.123
Textile	539	32	0.059
Clothing	430	23	0.053
Lumber and wood products	166	16	0.096
Furniture and fixtures	193	18	0.093
Pulp and paper products	342	7	0.020
Printing and publishing	517	29	0.056
Chemical products	643	102	0.159
Petroleum and coal products	38	5	0.132
Plastic products	487	49	0.101
Rubber products	99	6	0.061
Leather products	53	3	0.057
Ceramic, stone, and clay	529	50	0.095
Iron and steel	357	24	0.067
Nonferrous metals	257	18	0.070
Metal products	825	67	0.081
General machinery	1,209	134	0.111
Electrical machinery	1,268	131	0.103
Transportation equipment	719	61	0.085
Precision instruments	260	31	0.119
Miscellaneous products	218	13	0.060

Source: Ministry of Economy, Trade and Industry, “Results of the Basic Survey of Japanese Business Structure and Activities 1992” vol. 1, own calculation.

employees)³ in the manufacturing sector were involved in cooperative R&D with other firms (Table 1). Compared to large firms, the ratio of SMEs with cooperative R&D is lower but is still too high to be neglected. It should be noted that, in absolute terms, more SMEs cooperate in R&D than large firms. Moreover, cooperative R&D is not concentrated in a small number of high-tech industries but is found in all manufacturing industries.

The aim of this paper is to analyze the impact of the organizational and contractual features of cooperative R&D on project performance by using original survey data of Japanese SMEs in the manufacturing sector. This paper contributes to the study of cooperative

R&D in two major ways. First, few empirical studies have been conducted on the impact of the organizational and contractual characteristics of cooperative R&D thus far.⁴ Second, previous empirical researches have concentrated on research consortia among large firms and paid relatively slight attention to SMEs. In particular, econometric studies based on Japanese data have primarily focused on government-sponsored research consortia among large corporations (Miyata, 1995; Branstetter and Sakakibara, 1998, 2002; Sakakibara, 2001a,b). This study is the first comprehensive empirical study on cooperative R&D projects of Japanese SMEs.

The remainder of this paper is organized as follows. The next section provides a review of previous empirical

³ Firms with less than 50 employees have been excluded from this survey.

⁴ See Hagedoorn et al. (2000) and Link and Siegel (2003), chapter 11, for recent surveys of related theoretical and empirical literature.

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