Determining Factors in Innovation of Small Firm Networks: A case of Cross Industry Groups in Japan

Nobuya Fukugawa

ABSTRACT. We examine the relationship between network characteristics and innovation under different phases of innovation. Based on micro data of cross industry groups, small firm networks for knowledge sharing and R&D cooperation, we show that close-knit networks, represented as dense communication and a high level of commitment among members, are correlated with initiating joint product development. Furthermore, the results show that establishing contact with external sources of knowledge such as public research institutes is important to achieve technical success in innovation. Lastly, engaging in cooperative activities in sales is correlated with commercial success in innovation.

1. Introduction

The relationship between innovation and networks is one of the most frequently discussed issues in relevant fields in economics, managerial science, and sociology. Theory suggests different benefit of different networks to innovation. Weak ties and non-redundant networks promote innovation through efficient transfer of codified knowledge while strong ties and close-knit networks promote cooperation through intense transfer of not-codified knowledge. Recent empirical studies attempt to integrate different views on network effect on innovation from the viewpoint of the contingency approach that assumes that different network characteristics are influential in innovation under different environments. Based on micro data of cross industry groups’ (CIGs), small firm networks uniquely established in Japan for knowledge sharing and R&D cooperation, this study examines the relationship between network structure of CIGs and their innovative output under different phases of joint product development. Foreshadowing the results, CIGs with more homogeneity, more routines for knowledge sharing, and higher commitment to activities in CIGs are likely to engage in joint product development. Among CIGs that have engaged in innovative activities, CIGs exploiting external source of knowledge, such as public research institutes, are likely to achieve technical success in innovation, while network structures that enhance connectedness within the CIG are not influential any more. Furthermore, among CIGs with technical success in innovation, CIGs engaging in cooperative activities in sales are likely to achieve commercial success in innovation, while determinants in other phases of innovation show insignificant results. The results imply that network structure conducive to innovation significantly varies according to the phase of innovation.

The remainder of this paper is organized as follows. We present a brief description of CIGs in Section 2. The dataset and empirical method are introduced in Section 3. Based on the review of the previous literature, we present four sets of empirical relationships between network characteristics and innovative output of CIGs under different phases in joint innovation in Section 4 and show empirical results in Section 5. We summarize empirical implications and refer to the agendas for further research in Section 6.

2. Cross industry groups

A CIG is defined as a voluntary organization among small firms belonging to various sectors,
which aims at knowledge sharing and R&D cooperation (SMEA, 1981). Its origin can be traced back to the SME (small and medium-sized enterprises) policy implemented in the early 1970s. In 1971, an advisory board of prime minister suggested that small firms be linked to respond demand fluctuation in the post high growth era. Based on this suggestion, in 1972, the SME council, an advisory board of minister of international trade and industry fostered associations among small firms conducting intensive R&D. In 1981, the technology transfer center where managers of small innovative firms exchanged information was established throughout Japan and several laws promoting cross industry groups were enacted in 1980s. Local authorities that were seriously concerned about regional development after the oil crisis actively intermediated in the networking of small firms to revitalize regional economies through innovations of small local firms. As a result of intensive coordination by local authorities and their related institutions, the number of CIGs greatly increased in 1980s. Figure 1 indicates that the number of CIGs and participants nearly doubled during 1990s. By 2001 there were assumed to be 2992 CIGs with 132,846 participants. While small firms account for a large section of the participants, some of them are large firms. Since most of the CIGs were established to have small local firms linked together and develop regional economies, the administrators of CIGs tend to be local economic agents, such as local authorities and their affiliated institutions (19%), the chamber of commerce and industry (24%), and SMEs themselves (20%). Figure 2 shows the distribution of CIGs according to the year of establishment. Figure 2 indicates that approximately 90% of CIGs that existed in 2001 were established after 1980s. The upsurge in 1985 is influenced by the national project for entrepreneur development in cross industry groups. The upsurge in 1988 is influenced by the enactment of the ‘Law for Temporary Measures to Develop a New Frontier by Knowledge Integration among SMEs in Different Industries.’ This law aimed to promote innovative activities of small firms through CIGs.

About 78% of the CIGs are organized as voluntary groups, which makes it difficult to compile the official database. However, 15% of the CIGs have legal entity as cooperative business associations. The main reason of CIGs to form cooperative business associations is that legal entity enables them to receive subsidies from the local and central government that aim

Figure 1. The number of cross industry groups and their members from 1988 to 2001.