



ELSEVIER

Available online at www.sciencedirect.com

SCIENCE @ DIRECT®

Technovation 25 (2005) 1025–1037

technovation

www.elsevier.com/locate/technovation

R&D networks and product innovation patterns—academic and non-academic new technology-based firms on Science Parks

Hans Löfsten*, Peter Lindelöf

Department of Industrial Dynamics, Chalmers University of Technology, SE-412 96 Gothenburg, Sweden

Abstract

This research has explored the R&D networks and product innovation patterns made by the NTBFs (University spin offs, USOs and corporate spin-offs, CSOs) located on Science Parks. It seems reasonable to believe that firms established by those with an academic background might be expected both to perform differently and respond to different incentives from those founded by personnel from the industry. The two research propositions were empirically tested on the basis of 134 new technology-based firms (NTBFs) on Science Parks in Sweden, USOs from the academy (74 small firms) and CSOs from the private sector (60 small firms). There were no significant differences regarding growth (sales) and profitability (profit margin) between the two groups. In order to separate the performance due to the firms capability and the impact of the environment, a control variable was created. This paper, building on the resource-based theory and empirical evidence, argues that NTBFs have an interest in co-operation between the university and the Science Park firms. The survey makes it clear that the proportion of USOs and CSOs on Science Parks with links with universities is comparatively high. Seventy percent of USOs co-operates with universities and 59 percent of the CSOs. This is surprisingly high percentages of the CSOs. One finding from this research is that USOs are not able to channel investments into greater R&D outputs (Patents) than comparable firms.

© 2004 Elsevier Ltd. All rights reserved.

Keywords: New technology-based firms; Science parks; R&D networks; Product innovation

1. Introduction

1.1. Background

By providing a Science Park location that is proximal to important customers, suppliers and researchers, it is assumed that *the new technology-based firms (NTBFs)* will be able to build *networks* that support their development. Most accessing of academic resources relates to low-level contacts based on recruiting university graduates or informal contacts. In different universities certain institutes or departments strongly relates to industry. According to Quintas et al. (1992), analysis of research links is possible only at the level of the firm involved. There are two principal forms of *academic-Science Park links* at the level of the individual Park NTBF:

- The establishment of spin-off firms, formed by academic staff taking research out of the laboratory and onto the Science Park, starting their own commercial firms.

- The occurrence of research links facilitating technology and knowledge transfers.

Research links may take many forms, from formal contracts for research to more informal contracts as well as the transfer of personnel between academia and industry (Quintas et al., 1992). The *linkage* between Science Park NTBFs and the university is fundamental to the concept of Science Parks. The universities and the smaller-firm sector have always played a part in economic progress. It is only in recent times that their roles were seen to overlap one another, most notably in the establishment of *Science Parks*. If small firms were shown to be more innovative than large firms, there would be some case for considering policies *to promote their development*. According to Monck et al. (1988), NTBFs are of key interest:

- They are thought to embody the technologies of the future and hence provide secure employment opportunities for several generations.
- In the United States NTBFs have exhibited spectacular rates of employment growth.

* Corresponding author. Tel.: +46-31-772-12-30; fax: +46-31-772-12-37.

E-mail address: halo@mot.chalmers.se (H. Löfsten).

- The quality of the jobs provided in NTBFs are significantly better than those in traditional manufacturing.

According to Monck et al. (1988), it seems reasonable to believe that firms established by those with an *academic background* might be expected both to perform differently and respond to different incentives from those founded by personnel from the private industry. Monck et al. (1988) found that businesses established by academics on Science Parks performed less well in terms of employment growth than did the other NTBFs located on the Science Parks. Monck et al. showed that when a direct comparison was made, and taking account of the different ages of the firms, those on Science Parks had achieved somewhat *lower* levels of *employment* by a given age than otherwise comparable firms located off-Parks. This might suggest that parks were actually *hindering the development* of such firms. Further analysis indicated a more plausible explanation, which was that almost one-fifth of businesses on Science Parks were founded by academics and ex-academics, and it was those businesses which under-performed, in terms of employment growth, compared with other businesses.

Universities and other higher education institutions are an important source of new scientific knowledge. Industry can gain access to this knowledge or resources by developing formal and informal links with higher education institutes (OECD, 1981, 1993). Therefore, the development of higher education institute links is assumed to encourage innovation and production (Westhead and Storey, 1994).

The particular focus and attention here is the *educational qualifications of the founders* and the *links to the universities*. These elements will affect both the likelihood of the business being formed in the first place. Oakey (1995) criticizes the assumption that all NTBFs are alike, and has recognized the difference between categories of firms. Oakey claims that there are only two types of high-technology small firms entrepreneurs, the first being spin-offs from higher education centres (*university spin-offs, USOs*) and second, spin-offs from corporations (*corporate spin-offs, CSOs*). These two categories of firms are assumed to need and acquire different types of resources due to their different background. This study provides information relating to the formation of NTBFs in Sweden. Data was gathered from two types of firms with regard to their networks and product innovation (USOs and CSOs).

The main question for this research is:

Do academic NTBFs (USOs) benefit from the Science Park location different than NTBFs from the private sector (CSOs) regarding R&D networks and product innovation issues?

This question is to be developed with implications for entrepreneurs and policy makers. In this paper, we extend the literature by exploring how NTBFs can link elements of innovation in an entrepreneurial environment (Science Parks) regarding the background of the firm, university

spin-offs, USOs or corporate spin-offs, CSOs. In Section 1.2, we will briefly describe the frame of reference in the paper. In Section 2, there will be a brief review of networks, the resource-based theory and we present the research propositions in the study. Section 3 presents the sample, means and frequencies in our study. Section 4 shows the empirical results. Finally, Section 5 contains a discussion of the results and outlines the direction of future research.

1.2. Science parks and incubators—frame of reference

There is no uniformly accepted definition of a Science Park and there are several similar terms used to describe similar developments, such as *Research Park, Technology Park, Business Park, Innovation Centre* etc (Monck et al., 1988). Currie (1985) and Eul (1985) have attempted to distinguish between Innovation Centres, Science Parks and Research Parks. MacDonald (1987) says that each of these terms are used interchangeably to describe the following package (1) a property-based initiative close to a place of learning and (2) one which provides high quality units in a pleasant environment. However, Science Parks provide an *important resource network for NTBFs*. Government and other organisations (Swedish Board for Industrial and Technical Development) has introduced regionally targeted measures to provide an appropriate physical environment to encourage economic development in deprived and depressed localities. Central government has a long history of providing support for R&D, the transfer of technology and its diffusion into industry. Local authorities in Sweden have developed a range of local economic initiatives designed to create new employment opportunities. One element has been the encouragement of small high technology-based firms to achieve high rates of growth. Local authorities also have played a key role in encouraging universities to take a more active role in the revival of local economies (Löfsten and Lindelöf, 2001).

For the majority of Science Parks firms undertaking R&D, the ultimate purpose is the launch of new products and markets. Felsenstein (1994) examines the role of Science Parks as 'seedbeds' for innovation. Lorenzoni and Ornati (1988) have suggested that firms located in 'constellations' are more willing to seek information from outside sources such as higher education institutes, consultants and community entrepreneurs than other types of firms. They also assert that a supportive environment with a leading organisation, e.g. higher education institute/ Science Park is crucial not only to new firm formation but also to organisational survival and development. Universities have been shown to be significant actors in their regions both in terms of employment and economic activity.

The *incubator* is an organisation, private or public, which provides resources that enhance the founding of new small business, and are assumed, directly or indirectly, to support spin-offs, such as NTBFs (Löfsten and Lindelöf, 2001). With the popularity of the business incubation concept

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات