Technological Forecasting & Social Change 81 (2014) 376–387

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

The impact of technology intermediaries on firm cognitive capacity additionality

Mirjam Knockaert [a,b,*], André Spithoven [a,c], Bart Clarysse [a,d]

[a] University of Ghent, Tweekerkenstraat 2, 9000 Ghent, Belgium
[b] University of Oslo, Centre for Entrepreneurship, Oslo, Norway
[c] Belgian Science Policy Office, Brussels, Belgium
[d] Imperial College Business School, London, United Kingdom

ARTICLE INFO

Article history:
Received 1 February 2013
Received in revised form 16 May 2013
Accepted 18 May 2013
Available online 17 June 2013

Keywords:
Technology intermediary
Absorptive capacity
Cognitive capacity additionality

ABSTRACT

Whereas the provision of R&D subsidies has been central to public policy for many years, governments have recently become increasingly involved in stimulating cooperation for innovation and R&D. In many countries, financial support for technology intermediaries has become one of the key measures of indirect public support. However, little research has assessed the impact of indirect policy measures. In this paper, we shed light on the conditions under which technology intermediaries contribute to knowledge and networking outcomes generated by the firms that call upon them. We hereby focus on firm network and competence additionality as measures for cognitive capacity additionality and study the impact of technology intermediaries on firms. In doing so, we distinguish between R&D and R&D related activity technology intermediaries engage in. The results indicate that absorptive capacity of the technology intermediary does not affect cognitive capacity additionality generated by firms in R&D activities, while the results for R&D related activities are mixed and depending on the type of cognitive capacity additionality studied. The absorptive capacity of firms does not directly affect cognitive capacity additionality, but the results of mediation analysis show that firms with higher levels of absorptive capacity use the services of the technology intermediary more intensively, and subsequently generate higher levels of cognitive capacity additionality.

1. Introduction

Over the previous decades, governments worldwide have been active in drawing policy measures oriented towards the stimulation of R&D. The main rationale for governments to intervene in innovation and R&D is the existence of a market failure [1]. According to this rationale firms under invest in innovation as they are unable to appropriate all the benefits arising from innovative activities [2–4]. In such circumstances, governments may be better endowed with abilities to shoulder risks related to R&D activity than individual firms as they have the means to enhance the appropriability of R&D investments [5]. Along the same lines, Dalziel [6] refers to the existence of an innovation gap in which firms are reluctant to invest in R&D due to the ever-increasing pressures to deliver measurable results. By consequence, the innovation gap refers to the disparity in goals and performance measures of the business and research communities.

There are many ways in which governments can help to mitigate the existence of this market failure. Traditionally, governments engage in the provision of direct incentives for R&D, such as R&D subsidies, government tax credits and loans. More recently, however, it has become clear that market failure increasingly relates to the transfer and flows of

* Corresponding author at: University of Ghent, Tweekerkenstraat 2, 9000 Ghent, Belgium. Tel.: +32 9 264 34 59; fax: +32 9 264 78 88.
E-mail address: Mirjam.knockaert@ugent.be (M. Knockaert).

0040-1625/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.techfore.2013.05.007

information between firms or between firms and public research organizations than to the production of R&D as such. This is confirmed by the observation made by many authors [7–9] that success of firms, and especially Small and Medium Enterprises (SMEs), will be dependent on their ability to utilize external networks efficiently. According to Mowery [10], as a result, public policy will engage in promoting transfer of knowledge through networking and collaborative R&D programs, since costs of transferring and exploiting scientific and technological knowledge are high. This was confirmed by Autio et al. [1] observing that policy initiatives are progressing and moving away from R&D subsidies towards initiatives promoting externalities that facilitate firm-level innovation and learning outcomes [11–13]. They argue that the rationale of governments to do so is related to the recognition of the importance of knowledge spill-overs as a facilitator for innovation [1]. Furthermore, by engaging in indirect policy initiatives, governments try to overcome 'network failure' which occurs when the activities of different actors are poorly coordinated following a lack of interaction [1]. Indirect policy measures include the financing of science parks, incubation centers, business network initiatives and technology intermediaries, among others.

As a result of political choices which have, until recently, focused on direct R&D mechanisms, research on the efficiency and effectiveness of public financing has mainly focused on the analysis of direct R&D promotion mechanisms. David et al. [14], Hsu et al. [15], Koga [16] and Clarysse et al. [17] for instance analyzed the impact of R&D subsidies, whereas Hall and Van Reenen [18] studied the impact of fiscal incentives and Lee [19] studied the impact of R&D tax credits, grants and loans. The few studies that have assessed the impact of indirect R&D related measures have focused on output-related measures, such as firm performance [20]. Exceptions are the study by Davenport et al. [21] who studied a New Zealand government scheme sponsoring collaborative research and the study by Autio et al. [1] who studied intermediate results of collaborative R&D programs by assessing the extent to which collaborative R&D programs enhanced firms' identification with a community of practice. Our study complements these studies by analyzing the intermediate output linked to the generation of knowledge and networking at firm level, generated through interaction with a specific and under studied type of indirect R&D support mechanism, namely technology intermediaries.

Technology intermediaries may facilitate the interaction between different organizations. They are involved in a wide range of activities such as knowledge brokerage, diffusion of new ideas, and boundary spanning activities (we refer to Howells [22] for an excellent overview of technology intermediary activities). These intermediaries have received attention by scholars in technology transfer, innovation management, innovation systems and service innovation (Howells [22]). According to Dalziel [6], these intermediaries are organizations that purposefully position themselves in the innovation gap. Technology intermediaries are often framed in an industry-level analysis in which innovation systems, constituent sectors and their boundaries are central [23,24] and in which they are instrumental in the mission of technology transfer [25,26]. Even though technology intermediaries have existed for many years, they remain relevant mechanisms in recent times characterized by open innovation [27,28] and open source technological developments [29]. To our knowledge, no research has studied the extent to which technology intermediaries succeed in their main mission of technology and knowledge transfer and network creation. This study, therefore, does not focus on the output effects of technology intermediary–firm interaction but studies the intermediate results linked to network and knowledge generation. Specifically, this study analyzes the extent to which firm–technology intermediary interaction results in cognitive capacity additionality, uniting network and competence additionality. Cognitive capacity additionality occurs when new partnerships are built and competences of actors are enforced [30,31].

This study builds upon interviews carried out with the managers of technology intermediaries, namely the twelve collective research centers in Belgium, and the results of a survey conducted with their member firms. These centers are private initiatives allowed by policy in the aftermath of the Second World War which were, initially, created to encourage scientific and technological research in sectors of the economy to improve productivity, quality and production. Although collective research centers are unique actors, the results of this research are representative for other technology intermediaries. For instance, we found the functioning of the "Centres Techniques Industriels" in France to be quite similar to that of the collective research centers.

In what follows, we first provide an overview of the origin, definition and use of the concept of cognitive capacity additionality, which is a subdimension of behavioral additionality, followed by an elaboration of the theoretical framework used and present our conceptual framework. Next, we provide an overview of the methodology used. We subsequently elaborate on the research results. Finally, we present conclusions and directions for further research.

2. Origin, definition and use of cognitive capacity additionality

The concept of additionality originally rests on the neo-classical market failure rationale [32], and has gained importance over the past decades [2]. Following the study by Buisseret et al. [33], Falk [30] indicates that several additionality concepts can be used to measure the effects of public assistance on firms' innovation activities. The author classifies these concepts in three broad categories: resource-based concepts, result-based concepts and concepts that measure the success of policy intervention by examining desirable changes in the process of innovation. The most refined of the resource-based concepts is *input additionality* which measures whether, and to which extent, firms increase their private spending on innovation-related activities when supported, i.e. whether the firm itself spends at least one additional Euro on the research project for every Euro received in subsidy. *Output additionality*, as a result-based concept, deals directly with the most decisive impact, and is either defined in terms of marketable output (e.g. patents or successful innovations) or commercial outputs (e.g. sales or profits). While input and output additionalities have received quite some attention over the past decades (e.g. the studies by Hewitt-Dundas and Roper [34], Aerts and Schmidt [35]), only recently researchers focused on a third type of additionality, namely "behavioral" additionality. Behavioral additionality indicates whether there was a change in the