



The direction of firm innovation: The contrasting roles of strategic alliances and individual scientific collaborations



Jan Hohberger^{a,*}, Paul Almeida^{b,1}, Pedro Parada^{c,2}

^a University of Technology, Sydney P.O. Box 123 Broadway, NSW 2007, Australia

^b McDonough School of Business, Georgetown University, Washington, DC, USA

^c ESADE Business School, Av. Pedralbes 60-62, 08034, Barcelona, Spain

ARTICLE INFO

Article history:

Received 28 March 2014

Received in revised form 27 April 2015

Accepted 27 April 2015

Keywords:

Alliances

Research collaboration

University–industry interactions

Innovation

Knowledge search

ABSTRACT

In dynamic and uncertain technological environments, the focus of industry innovative activity changes over time and the position of each firm with respect to the industry's innovative focus changes as well. Drawing upon insights from evolutionary economics, we derive hypothesis on the role of R&D alliances and individual scientific collaborations in influencing a firm's innovative direction and its position relative to the industry's innovation focus. The analyses of patent and alliance data show that biotechnology firms that rely on external individual scientific collaborations are likely to grow closer to the future focus of innovation, while firms that emphasize R&D alliances grow more distant from the future industry focus. Thus, the use of collaborative mechanisms influences the position of firms in innovative space over time. Additionally, the effect of collaborative mechanisms on the direction of innovation is influenced by the technological specialization of the firm.

© 2015 Elsevier B.V. All rights reserved.

1. Introduction

In science and technology driven industries, the direction of innovation is often unpredictable. Firms competing in knowledge based industries face the complex challenge of identifying and recognizing the ever changing set of problems and solutions that may be relevant to their own technological and scientific strategies and, when necessary, building innovative capabilities and expertise along the emerging innovative areas in the field (Deeds et al., 2000; Grant and Baden-Fuller, 2004; Powell et al., 1996; Wilden and Gudergan, 2014; Zander and Kogut, 1995). Building innovative capabilities in new areas is not easy. Prior research has shown that firms tend to search for knowledge locally—in the neighborhood of their past practices and current capabilities and expertise (Benner and Tushman, 2003; Rosenkopf and Almeida, 2003; Stuart and Podolny, 1996). The path dependent nature of technology development and innovation makes adjusting the direction of innovation particularly challenging when critical knowledge inputs needed for this process lie in numerous and uncertain locations outside the

firm. Hence, keeping close to the forefront of science and technology is a daunting challenge for most firms. These firms may not fully understand where to go (in innovative space) and, even if they do, given their internal inflexibility, they may find it difficult to get there.

Prior research has highlighted the important role played by search processes beyond the borders of the firm in sourcing knowledge (Cassiman and Veugelers, 2006; Laursen and Salter, 2006). Numerous papers have highlighted the role of R&D alliances in enabling firms to access external knowledge and this research often relates these alliances to positive innovation outcomes (Hagedoorn and Duysters, 2002; Rosenkopf and Almeida, 2003; Rothaermel and Deeds, 2004; Srivastava and Gnyawali, 2011; Stuart and Podolny, 1996). In addition, a number of studies have pointed to the importance of external individual scientific level collaborations to knowledge access and innovation and have suggested that while R&D alliances and external individual scientific level collaborations are both collaborative mechanisms, they also have distinctive characteristics (Almeida et al., 2011; Cockburn and Henderson, 1998; Fabrizio, 2009). Thus, we examine and compare the role of these two mechanisms of external knowledge search and analyze their influence on the direction of future innovation. We define the focus of innovation in the industry as the set of technological areas along which a plurality of innovations is produced by the firms in the industry at a point of time. We see this focus of innovation as changing as firms in the industry innovate in different sets of

* Corresponding author. Tel.: +61 2 9514 3522.

E-mail addresses: Jan.hohberger@uts.edu.au (J. Hohberger), almeidap@georgetown.edu (P. Almeida), Pedro.parada@esade.edu (P. Parada).

¹ Tel.: +1 202 687 3822.

² Tel.: +34 932 806 162.

technological areas across time. We suggest that both R&D alliances and scientific collaborations of individuals across firms can foster knowledge exchange and innovation. However, individual collaborations are particularly suitable for knowledge exchange associated with scientific activities and often result in the publication of scientific papers co-authored by researchers belonging to different organizations (Carnabuci and Operti, 2013; Paruchuri, 2010; Singh, 2005). Since individual collaborations appear to often focus on scientific activities that benefit the circulation of new or emerging knowledge, we argue that external individual scientific collaborations are more likely to enable firms to innovate at the forefront of science and become aligned with the emerging innovative focus of the wider industry. (Almeida et al., 2011; Cockburn and Henderson, 1998; Jiang et al., 2011; Liebeskind et al., 1996; Narin et al., 1997; Zucker et al., 2002). On the other hand, R&D alliances are not only less frequently focused on scientific knowledge and they are often the result of firm-level management decisions oriented to the application of knowledge and therefore limited in scope and reach (Doz, 1996). Prior research in the area of biotechnology supports this idea – while interpersonal networks of inventors are seen as important mechanisms through which exchanges of new scientific knowledge takes place, alliances were most often used to apply and commercialize the knowledge developed (Liebeskind et al., 1996; Liebeskind et al., 1996; Liebeskind et al., 1996; Oliver and Liebeskind, 1998; Zucker et al., 1996).

Though R&D alliances also act as conduits of learning, therefore, they may not be the best mechanisms for the development and circulation of newly emerging knowledge and firms engaging in these collaborations may find themselves more distant from the emerging innovative focus of the field. Additionally, as the scientific nature of knowledge is an important factor influencing innovation outcomes in high technology industries and in explaining the differences between individual collaboration and R&D alliances (Almeida et al., 2011; Cockburn and Henderson, 1998; Fabrizio, 2009; Hess and Rothaermel, 2014; Jiang et al., 2011), we explore the influence of scientific orientation of both collaborative mechanisms.

Understanding both what leads firms to innovate close to the focus of innovation in an industry and what leads firms to deviate from that focus is important because, both innovating close to the focus and distant from the focus can be attractive. Competition often takes place within particular technological domains or sub-fields (Dosi and Nelson, 1994; Stuart and Podolny, 1996). The most rapidly evolving and potentially attractive technological areas, while presenting opportunities for innovation with the associated economic benefits, could also attract attention from other players, making the economic and technological gains of competing in these spaces questionable (Dosi and Nelson, 1994). On the other hand, competing in technological spaces that appear to present less innovative opportunity, may attract fewer other players and hence present greater rewards (Dosi and Nelson, 1994). Given the high costs of technological development, and the vast and continuously emerging array of technological areas along which firms innovate, it is important to understand the influences on the direction of innovation.

While prior literature has investigated the influence of collaborative mechanisms on innovative performance (Almeida et al., 2011; Rothaermel and Hess, 2007; Srivastava and Gnyawali, 2011) and the direction of firm innovation or search activities (Jiang et al., 2011; Lavie et al., 2011; Phelps, 2010; Rosenkopf and Almeida, 2003), this paper makes a novel contribution as it focuses on the mechanisms that facilitate knowledge exchange to explain the movement of the firm relative to the industry in the evolving innovative space. The firm's innovative focus may, or may not, be distant from past practice and exploratory search may not necessarily lead the firm toward the industry's focus of innovation. Depending on the direction of the movement of the field at any given

time, the firm's innovative capabilities may involve varying levels of exploitation and exploration.

Our study finds that firms with increasing numbers of external individual scientific collaborations are likely to become more closely aligned to the emerging focus of innovation in biotechnology, while firms with increasing number of R&D alliances are likely to become more distant from the innovative focus of the field. We also find that technological specialization negatively affects the match with the future innovation focus and it reinforces the effect of R&D alliances and internal publications on moving away from the innovation focus of the field while it reduces the effect of external individual collaborations. Thus our paper builds on the existing literature on the mechanisms that aid the external search for knowledge by: (a) highlighting the contrasting roles those mechanisms play, (b) exploring the outcomes of the search processes, (c) acknowledging the dynamics of the innovative field and, (d) looking at the direction of the changes in innovative expertise. Firms may find it useful to understand how their position in future innovative space is affected by the extent of their use of different types of collaborative mechanisms.

2. Theory and hypothesis

The behavioral theory of the firm (Cyert and March, 1963) suggests that individuals are boundedly rational. In the face of uncertainty and complexity, individuals do not rationally evaluate the complete range of choices before them. They are, instead, strongly influenced by current practices when making decisions about future actions. Individuals select actions that tend to be in the neighborhood of current practice rather than those that may be the most attractive in terms of future success. Evolutionary theorists, like Nelson and Winter (1982), make a similar point when they suggest that organizations, like individuals, are bounded in their decision processes. Using these insights to explain the evolution of organizations, they suggest that firms are path dependent – actions (including technology development and innovation) tend to be along well established and familiar paths. They ascribe this to the formation of routines within the organization. These routines favor local search processes that make it difficult for the firm to adapt to any changes that depart from past practices and trajectories (Nelson and Winter, 1982). In complex and dynamic environments, local search routines may fail to identify the best solution to a problem (Fleming and Sorenson, 2004). Similarly, Leonard-Barton (1992) suggests that in dynamic environments, existing capabilities may become core rigidities that prevent firms from changing and adjusting to external needs. Levinthal and March (1993) argue that prior experience could be a 'poor teacher' – often leading to myopia of learning and an inability to incorporate new knowledge to address changes in the external environment.

Since innovation involves a recombination of existing knowledge, access to a diverse set of knowledge sources is crucial for innovative success (Fleming and Sorenson, 2004; Henderson and Clark, 1990; Nelson and Winter, 1982). Yet we know that firms have the tendency to recombine familiar knowledge (Levinthal and March, 1993; March, 1991) making it more likely that they will perform incremental innovations close to the existing trajectory of firm. Experimenting with novel and diverse knowledge components, on the other hand, allows the firm to develop new and different innovation outcomes (Ahuja and Lampert, 2001; Laursen, 2012). However, firms find it difficult to search for, and utilize knowledge in areas that are distant from their existing areas of expertise and may find it challenging to move in new directions even when these could be related to organizational success. Even in dynamic and rapidly evolving innovative environments, firms often tend to exploit and build existing capabilities and continue

Download English Version:

<https://daneshyari.com/en/article/10482941>

Download Persian Version:

<https://daneshyari.com/article/10482941>

[Daneshyari.com](https://daneshyari.com)