



Absorptive capacity and the reach of collaboration in high technology small firms

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ABSTRACT

The current paper is concerned with exploring the role of absorptive capacity in extending the reach of innovation-related collaboration in high technology small firms. Drawing on survey data from a sample of 316 Dutch high-tech small firms, engaged in 1245 collaborations, we explore the relationship between R&D expenditure and distance to collaboration partners. In general terms, we find most partners to be 'local'. However, controlling for a variety of potential influences, higher R&D expenditure is positively related to collaboration with more distant organizations. The implications of our results for policy, practice and future research are discussed.

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1. Introduction

In the academic literature, there is increasing consensus that a firm's embeddedness in a network of interfirm relations matters for its economic and innovative performance (Gilsing et al., 2008). Simply put, few firms appear able to innovate alone (Tether, 2002). Moreover, and for some time, the benefits of collaborative innovation have been thought to apply particularly to small firms (e.g. Rothwell and Dodgson, 1991). The caricature of small firms as behaviourally advantaged but materially constrained (Nooteboom, 1994; Rothwell, 1983) has frequently seen networks presented as the logical means to ameliorating resources constraints, while preserving behavioural advantages (Hewitt-Dundas, 2006). Certainly, there is plenty of empirical evidence to support the importance of involvement in networks for innovation in small firms – from the classic accounts of the new industrial districts of the Third Italy (e.g. Becattini, 1978) to more recent empirical studies (e.g. Fukugawa, 2006). Innovation-related collaboration has also attracted the attention of policy makers. Bougrain and Haudeville (2002), for instance, note a growing preference for network promotion policies (over those that provide direct financial assistance) within OECD economies. Undoubtedly, much of the inspiration has been provided by the systems of innovation literature (e.g. Lundvall, 1992). The suggestion that underinvestment in R&D may not solely

be a consequence of market failure, but may also be caused by a lack of interaction between innovation actors, has proven to be particularly attractive to European policymakers struggling to meet the Barcelona targets.¹

A central feature of the more popular expositions of innovation systems is the treatment of 'space'. Whether systems are bounded at the local, regional or national level, the implication is that proximity matters. Empirically, studies typically indicate a distance decay function in communication, of varying extent (Howells, 1999). In this sense, the importance of proximity is thought to 'reflect the linguistic and geographic constraints imposed by person-embodied exchanges and transfers of tacit knowledge' (Patel and Pavitt, 1994: p. 218). Geographical proximity makes it more likely that firms will encounter potential collaboration partners and, after the collaboration takes off, it enables personal and more frequent contacts easing the transfer of tacit knowledge and offering better opportunities to resolve emerging conflicts. For policy makers the proposed significance of geographical proximity has been a key argument in the implementation of popular policies focussing on geographical clusters (Fritsch and Stephan, 2005).²

More recently, however, the necessity of geographical proximity has been questioned (e.g. Torr  and Rallet, 2005). Underpinning this, is the regularity with which empirical studies of innovation-related cooperation record a higher incidence of extra-local

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¹ BERD at 2% of GDP, within an overall target of R&D expenditure at 3% of GDP.

² For example, see the inventory of innovation policies in EU countries at www.proinno-europe.eu.

linkages over local linkages; suggesting that firms draw from innovation sources at a variety of spatial scales (e.g. Arndt and Sternberg, 2000; Kaufmann and Todtling, 2000). However, the ability to identify partners, to transfer knowledge and resources and to manage relationships at a distance is unlikely to be easily acquired. Rather, firms are likely to have to make conscious investments in such capabilities – principal amongst which will be investments in absorptive capacity. Here too, small firms may be particularly disadvantaged. Limited R&D expenditures and a focus on exploitation rather than exploration may lead small firms to be more dependent upon partners in their immediate locale.

The current paper adds to the literature by exploring the connection between firms' absorptive capacity and the geographical distance to their collaboration partners. This connection has been proposed before (Torré, 2008) but has not been demonstrated empirically. As absorptive capacity is a contingent factor in opportunity recognition, alliance formation and the accumulation of resources available through social networks (Soh and Roberts, 2005), we hypothesise that investment in absorptive capacity may help compensate for a lack of geographical proximity in innovation-related collaboration. Drawing on survey data of 316 Dutch high-tech small firms, our hypothesis is confirmed, suggesting a different emphasis for both business and industrial policy. We hereafter elaborate on our hypothesis, data, methods and results, and conclusions and implications.

2. Cognitive proximity, absorptive capacity and reach

In a well received review, Boschma (2005) argues that other forms of proximity may frequently substitute for geographical proximity. He distinguishes between five forms of proximity – geographical, cognitive, organizational, social and institutional. Boschma suggests that the importance of geographical proximity cannot be assessed in isolation, but should always be examined in relation to other dimensions of proximity that may provide alternative solutions to the problem of communication and coordination in collaborative projects. Importantly, he proposes that geographical proximity is neither a necessary nor a sufficient condition for effective innovation collaboration, but may facilitate innovation largely through strengthening other dimensions of proximity. While geographic, social, organization and institutional proximities increase the likelihood of partners coming together, cognitive proximity determines whether or not interactive learning processes may take place (Boschma, 2005, p. 71). Thus, while acknowledging that there will be practical exceptions, this suggests a trade-off between geographical and cognitive proximity. The more external collaboration partners are cognitively proximate, the less need for geographical nearness, and vice versa.

Boschma (2005) defines cognitive proximity to be a function of the similarity between organizations' knowledge bases. Simply, organizations are cognitively proximate where they possess similar market and technological competences. And, building on shared experiences and understandings, cognitive proximity facilitates effective communication and collaboration. One can identify clear parallels between this elaboration of cognitive proximity and the concept of 'absorptive capacity' (and this is also explicitly discussed by Boschma). Both start from the proposition that organizational search processes are constrained by existing knowledge. In this way, learning is seen to be cumulative, self-reinforcing and path dependent, such that it is easier to recognize and evaluate knowledge (and the returns to learning are higher) in areas of prior familiarity (Levinthal, 1996). Or, to restate, a firm's ability to recognize, evaluate, acquire and use external knowledge – its absorptive capacity – is a function of its prior related knowledge (Cohen and Levinthal, 1990). To the extent that studies indicate an increasing

dependence of innovation on extramural knowledge, absorptive capacity represents an important component of a firm's ability to create new knowledge. Yet, to the extent that the development of current knowledge requires resources, resource constrained small firms are likely to have both a narrower and shallower absorptive capacity than their larger peers (Cohen and Levinthal, 1990).

However, our concern here is not simply with absorptive capacity and the acquisition of external knowledge or, with absorptive capacity and the propensity to engage in innovation-related collaboration – both of which have been firmly established in the literature (e.g. Bougrain and Haudeville, 2002; Lane et al., 2001). Rather, our concern is with the spatial dimension of collaborations and with the potential for a developed absorptive capacity to increase the effective reach of search and acquisition processes in small firms. As Torr  (2008) notes:

“...firms with higher absorptive capacities within a cluster are those that are most likely to establish linkages with external sources of knowledge. This is explained on the basis of cognitive distances between firms and extra-cluster knowledge, so that firms with high absorptive capacities are considered more cognitively proximate to extra-cluster knowledge than firms with lower absorptive capacity” (p. 874).

Firms in the same industry, occupying the same locale, are likely to be highly cognitively proximate on the basis of shared experiences and understandings. However, excessive cognitive resemblance may limit innovation opportunities, since there would be little left to learn (Boschma, 2005; Nooteboom, 1999; Nooteboom et al., 2007). Rather, to access the cognitive diversity that is required for innovation, firms may have to venture further afield. Their ability to do this is likely to be contingent upon the strength of their absorptive capacity. In this context, Nooteboom et al. (2007) empirically demonstrated that the negative effect of cognitive distance is reduced by absorptive capacity – especially in the case of explorative learning. Accordingly, a highly developed absorptive capacity allows firms to increase their cognitively proximity to potential partners, including geographically distant ones.

In sum, when firms' absorptive capacity is low, geographically proximate collaborations may be their only option. When cognitive gaps cannot be bridged, geographical proximity may be a necessary condition to collaborate effectively. In contrast, high absorptive capacity is anticipated to diminish the cognitive distance to other innovating actors, enabling firms to collaborate for innovation at greater geographical distance. It enlarges the 'innovation bandwidth' in which firms may operate. To the extent that cognitive proximity implies that collaboration partners are more alike in terms of their domain-specific and technological knowledge, so many of the learning costs implied by physical distance may be reduced. Moreover, in addition to improving firms' ability to collaborate with geographically distant partners, highly developed absorptive capacities are likely to see firms quickly exhaust their local learning opportunities (Drejer and Vinding, 2007). Accordingly, we hypothesize a positive connection between firms' absorptive capacity and the geographical distance to innovation-related collaboration partners.

3. Data

We test our hypothesis drawing on data collected via a survey of high-tech small firms in the Netherlands. While these firms are the primary target of most innovation policy instruments their actual innovation features are poorly identified in standard Dutch statistics. Therefore, in the spring of 2006 the Dutch Ministry of Economic Affairs commissioned a survey to map their innovation and

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