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Firms' knowledge search and local knowledge externalities in innovation performance

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ABSTRACT

We use an augmented version of the UK Innovation Surveys 4–7 to explore firm-level and local area openness externalities on firms' innovation performance. We find strong evidence of the value of external knowledge acquisition both through interactive collaboration and non-interactive contacts such as demonstration effects, copying or reverse engineering. Levels of knowledge search activity remain well below the private optimum, however, due perhaps to informational market failures. We also find strong positive externalities of openness resulting from the intensity of local interactive knowledge search—a knowledge diffusion effect. However, there are strong negative externalities resulting from the intensity of local non-interactive knowledge search—a competition effect. Our results provide support for local initiatives to support innovation partnering and counter illegal copying or counterfeiting. We find no significant relationship between either local labour quality or employment composition and innovative outputs.

1. Introduction

Interest in the local dimension of economic development has intensified in recent years stimulated by discussion of creative cities, intelligent cities and agglomeration (Carney et al., 2011). This has led to an increasing focus on the role of local conditions on innovation performance with strategic implications as firms search to establish coherence between their organisational strategies and their context, and maximise the value of organisational assets and capabilities (Akgun et al., 2012; Vaccaro et al., 2012). In England, for example, these broader debates have been paralleled by a move towards place-based policy structures oriented to addressing local development issues and stimulating local growth. In effect, this has created a new policy geography as Regional Development Agencies have been replaced with Local Enterprise Partnerships (LEPs) and other locally oriented business support mechanisms (Hildreth and Bailey, 2013).[1]

In this paper we focus on how elements of the local knowledge context influence firms' innovation performance. It is now well established that the ability to access and absorb external knowledge is central to innovation for most firms (Chesbrough, 2006; Dahlander and Gann, 2010), and that the knowledge underlying innovation has some degree of spatial specificity (Storper and Venables, 2004; He and Wong, 2012; Toedtling et al., 2011). From both an academic and a policy perspective, there is therefore interest in considering how firms access and use external knowledge both from their own direct knowledge sourcing, and from the wider local context.

Our analysis makes three main contributions to the developing literature on the role of contextual factors on innovation performance. First, at firm level, we differentiate between the innovation benefits of collaborative or interactive knowledge search and non-interactive (e.g. copying, imitation) knowledge search strategies for innovation performance. We anticipate that at firm level both interactive and non-interactive knowledge search will raise anticipated post innovation returns, and therefore increase levels of innovation, by reducing development costs in collaborative projects and/or providing access to otherwise inaccessible resources. Second, we explore the potential for local spillovers or externalities

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[1] Some have argued that this approach is consistent with EU emphasis on smart specialisation, and the potential for local actors to create local advantage (Asheim et al., 2007). Others have suggested that at least outside the major UK cities 'many of the LEP areas are far too small for effective policymaking'. (Hildreth and Bailey, 2013, p. 244).

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of openness to arise from the local intensity of firms' interactive and non-interactive knowledge search (Roper et al., 2013). Here, the anticipated effects are complex, with both types of knowledge search activity having the potential to generate knowledge diffusion effects which increase knowledge availability, reduce search costs and increase the returns to innovation. However, both types of knowledge search may also generate local competition effects intensifying market pressures and reducing the anticipated returns from innovation. For example, reflecting debates about the impact of counterfeiting on innovation (Qian, 2014), in localities where copying or imitation are common it will be more difficult for firms to appropriate the full benefits of any innovation. These opposing (positive) knowledge diffusion and (negative) competition effects create the potential for either positive or negative local spillovers. Third, we consider how the effects of both firm-level knowledge sourcing and externalities of openness may differ between larger and smaller enterprises. This is important because of the evidence that small firms access and use knowledge in the innovation process differently from larger enterprises (van de Vrande et al., 2009; Vahter et al., 2014). Throughout the analysis we allow for other relevant aspects the local environment on firms' innovation activity such as local occupational mix, labour quality, and the perceived barriers to innovation.

The remainder of the paper is organised as follows. In Section 2 we outline our conceptual framework which considers how local knowledge conditions may influence anticipated post innovation returns and hence firms' willingness to invest in innovation. Section 3 considers data and methods. Our analysis is based on data from the UK Innovation Surveys (UKIS) which cover the period 2002–2010 matched with other UK data which allows us to place UKIS observations in specific localities. Sections 4 and 5 consider our key empirical results. We conduct our analysis for two alternative levels of geographical disaggregation: Local Enterprise Areas (LEAs—the domain of Local Enterprise Partnerships), of which there are 39 in England, and more disaggregated Local Authority Areas (LAs) of which there are around 220. While the overall results from both levels of analysis prove very similar, there are subtle differences which suggest that the spatial scale over which knowledge externalities are influential varies between larger and smaller firms. Section 6 considers the implications.

2. Localised knowledge and innovation

Knowledge has a degree of geographical specificity. Despite the capacity of firms to tap into international knowledge networks, knowledge is still to some extent 'local': it has some dimension of spatial specificity which makes the pool of knowledge in any location different to that available elsewhere (Roper et al., 2014). Some areas are simply more 'knowledge rich' than others with potentially important consequences for anticipated post-innovation returns and the potential for firms to innovate (van Beers and van der Panne, 2011).

The richness of local knowledge, and the nature of local knowledge networks and connectivity, will help shape the potential for firms to benefit from knowledge spillovers. For example, there is a strong geographical dimension to spillovers from universities, with the impact of university R&D being confined largely to the region in which the research takes place (Audretsch and Feldman, 1996; Anselin et al., 2000, 1997). To some extent, the spatial specificity of such effects is linked to the tacit nature of knowledge. In this sense, local knowledge may have the character of a (semi) public good, with properties of non-rivalry. In addition, local firms may be more willing to share knowledge with geographically close neighbours 'as a result of shared norms, values, and other formal and informal institutions that hold down misunderstanding and opportunism' (He and Wong, 2012). To the extent that local knowledge influences innovation performance, variations in the specific characteristics of local knowledge have the potential to shape corresponding variations in innovation success at the spatial level (Toedtling et al., 2011; Jensen and Tragardh, 2004).

Aside from the capabilities of individual actors, the accessibility or availability of knowledge in any locality will also depend on the density of local connections which facilitate knowledge sharing and diffusion.[2] On the basis of an examination of technology diffusion in the flat-screen television sector, for example, Spencer (2003)[3] suggests that high levels of network density are likely to be associated with higher levels of innovative activity and competitiveness, and that dense or strongly centralised networks are more likely to facilitate convergence on a dominant design than less dense networks. The suggestion is that network structure as well as the density of connections itself is important in shaping knowledge diffusion and, hence, innovation. In particular, Kesidou and Snijders (2012) find that gatekeeper firms, with strong external connections and extensive networks of linkages within the cluster play a particularly important role. Feldman (2003) and Agrawal and Cockburn (2002) call similar firms "anchor" companies, while Ferriani et al. (2016) also highlight the 'anchoring' role of multinational firms and universities.

This suggests that the knowledge-sourcing activities of individual firms, as well as the knowledge richness the areas in which they operate, will influence innovation at the firm level. It also suggests that firms may vary in their capacity both to engage in knowledge sourcing activities, and to take advantage of the local knowledge infrastructure. In the sections that follow we develop hypotheses which identify these possible effects.

2.1. Interactive and non-interactive knowledge search

When a firm positively assesses the anticipated post-innovation returns and does decide to innovate based on knowledge developed fully or partially outside its boundaries, the organisation faces further choices relating to its knowledge acquisition strategies. For example, should the firm develop collaborative or interactive connections with partners to jointly develop new knowledge? These might be partnerships, network linkages or contractually-based agreements entered into on either a formal or informal basis. This type of connection is characterised by strategic intent and mutual engagement of both parties, and will be characterised by interactive learning (Glückler, 2013). Such strategies may generate new-to-the-world knowledge but may also involve significant commercial, technical and managerial risks (Astebro and Michela, 2005), as well as high management and co-ordination costs (Crone and Roper, 2003). Alternatively, should the firm adopt non-interactive, imitation or copying strategies focussed on the exploitation of knowledge previously implemented by others (Glückler, 2013)? Here, the technical risks and management and co-ordination costs will be lower but the firm may forego the potential first mover advantages associated with more interactive knowledge search strategies (Xin et al., 2010). The choice of one of these knowledge search strategies, or the combination of both, will reflect both the nature of firms' evaluations of the post-innovation returns from different types of innovation and the anticipated cost-benefit of each type of search strategy.

[2] This is not to suggest – for the moment – that the extent or density of firms' own networks do or do not matter for innovation but rather that the extent of networking activity in the area in which a firm is located may be influential (Belussi et al., 2011; Spencer, 2003)

[3] Comparing the diverse experience of US and Japanese networks Spencer (2003) also suggests that cultural factors may also shape network structure: Corporatist countries are more likely to have greater network density than pluralist countries.