



## Firm innovation: The influence of R&D cooperation and the geography of human capital inputs

Jaakko Simonen <sup>a,b</sup>, Philip McCann <sup>c,d,\*</sup>

<sup>a</sup> Department of Economics, University of Oulu, PO Box 4600, FIN-90014, University of Oulu, Finland

<sup>b</sup> Finnish Doctoral Programme in Economics (FDPE), Finland

<sup>c</sup> Department of Economics, University of Waikato, Private Bag 3105, Hamilton 3240, New Zealand

<sup>d</sup> Department of Economics, University of Reading, RG66AW, UK

Received 4 March 2007; revised 16 October 2007

Available online 28 January 2008

### Abstract

This paper investigates the role played by the geography of labor inputs in the promotion of innovation. Knowledge can be transferred between firms by inter-firm interactions and inter-firm cooperation. In addition, knowledge can also be transferred between firms by human capital mobility. In order to examine these issues we employ a unique innovation dataset from Finland. This dataset provides information about a firm's innovation performance along with information regarding the origins of a firm's recent labor acquisitions. The origins of the labor are defined according to both the industry and the region. Analyzing these data allows us to identify the different roles which the geography of knowledge exchanges and the geography of labor markets play in the innovation process.

© 2008 Elsevier Inc. All rights reserved.

*JEL classification:* O310; J600; R300

*Keywords:* Innovation; Labor; Mobility; R&D; Cooperation

### 1. Introduction

Over the last two decades the relationship between innovation and geography has become an important theme for research into economic growth. While the links between innovation and growth have long been discussed (Nelson and Winter, 1982), more recently the work of Porter (1990), Scott (1988), Acs (2002) has focused attention on the ways in which localized knowl-

edge and technology spillovers may promote innovation. In particular, it is argued that face-to-face contact between local firms and organizations promotes knowledge exchanges, which in turn are assumed to facilitate innovation (Storper and Venables, 2004). However, knowledge can also be transferred by the movement of human capital embodied in labor mobility. Yet, the type of knowledge transfers associated with labor mobility are largely absent from the innovation literature within urban economics. Little is therefore known about the importance for innovation of human capital mobility.

In this paper we aim to identify the particular role which the mobility of human capital plays in promoting innovation. In order to do this we employ a unique

\* Corresponding author at: University of Waikato, Economics, Private Bag 3105, Hamilton, Waikato, New Zealand.

*E-mail addresses:* [jaakko.simonen@oulu.fi](mailto:jaakko.simonen@oulu.fi) (J. Simonen), [pmccann@waikato.ac.nz](mailto:pmccann@waikato.ac.nz) (P. McCann).

dataset from Finland on firm innovation behavior. This dataset combines firm-specific information about innovation, with information about the nature of inter-firm R&D cooperation, and also the pattern of a firm's labor recruitment. The role played by labor mobility in promoting innovation is estimated using nine different probit models. Our results suggest that human capital inputs acquired from other regions can be important for innovation. On the other hand, human capital inputs acquired locally appear not to promote innovation. As such, our findings appear to lend support to the human-capital migration literature rather more than the innovation-agglomeration arguments.

The paper is organized as follows. In the next section we provide a brief overview of the key theoretical features of the relationship between innovation, face-to-face interaction and labor markets. In Section 3, we discuss the data employed and our methodology. In Section 4 we examine the issues empirically using nine different probit models of innovation, and Section 5 provides some conclusions.

## 2. The determinants of innovation

There is currently no agreed model of innovation. Instead innovation studies adopt various lines of inquiry in order to determine which characteristics of the firm and its environment are associated with innovation. The wide-ranging literature on the determinants of innovation has tended to focus on two broad lines of inquiry. Firstly, research aims to identify which types of firms tend to be innovators. Here, some of the key issues found to influence innovation are: the levels of R&D expenditure; the stock of human capital inputs; the sector of activity and also the size of the firm. More recently, over the last two decades there has also emerged widespread interest in the role which geography may play in the innovation process. Modern approaches to the geography of innovation have tended to derive insights from models of clustering and agglomeration. These models emphasize the role played by interactions between firms and their local environments (Duranton and Puga, 2001). Various attempts at the identification of the specifically local factors which are conducive to innovation have focused on issues such as the geography of learning (Glaeser, 1999), the geography of creativity (Florida, 2002), the geography of labor skills (Audretsch and Stephan, 1996), the density of local employment (Ciccone and Hall, 1996; Carlino et al., 2007), and the geography of entrepreneurship (Acs, 2002). Work on these issues also tends to emphasize the role played by clusters of small firms,

because small firms are seen to produce a disproportionately large share of innovations (Acs, 2002). In such cases, many commentators (Scott, 1988; Saxenian, 1994; Becattini, 2002) argue that innovation also depends on firm cooperation and trust. The argument here is that small firms often have neither the scale nor the risk-bearing capacity to provide all of the key inputs on their own account, and are therefore forced to trust other firms.

In almost all of this literature on innovation and agglomeration it is generally assumed that increased face-to-face contact between individuals and firms is positively related to the levels of innovation. Yet, there are in reality four quite distinct mechanisms by which face-to-face contacts and innovation can be related. These are: firstly, by increasing the possibility of informal knowledge spillovers between firms and individuals (Krugman, 1991); secondly, by increasing the mutual transparency and awareness of competitor behavior and responses (Porter, 1990); thirdly, by increasing the levels of both cooperation and competition between firms (Scott, 1988); fourthly, by increasing the mobility of human capital between firms (Almeida and Kogut, 1999). Until now, analyses which emphasize the first three mechanisms predominate over labor mobility explanations. However, as much as anything else this tendency is driven by data availability. While data on patents and R&D are readily accessible, along with aggregate measures of labor skills and education, additional data on labor mobility and innovation are very hard to find. The lack of appropriate data means that there are only a small number of papers discussing the links between local labor mobility and innovation (Angel, 1991; Audretsch and Stephan, 1996; Almeida and Kogut, 1999; Powers and Lundmark, 2004). There are almost no papers discussing the links between interregional human capital mobility and innovation.

Our paper represents the first analysis of innovation to include detailed information on both local human capital mobility and also interregional human capital mobility. In order to identify the role which human capital mobility plays in innovation, we employ a variable which controls for the first three knowledge transfer mechanisms described above. This variable describes a firm's R&D cooperation relations. The reason we focus on R&D cooperation relations is that of all the possible types of inter-firm relations, R&D cooperation relationships require the most intense face-to-face contact and mutual trust (De Meyer, 1993). For high technology firms at least, these have already been demonstrated to be the type of relations most associated with geographical proximity (Arita and McCann, 2000). Therefore,

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

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