Industry and location effects on UK plants’ innovation propensity

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Abstract. This paper uses UK plant-level survey data to examine the relative importance of industry concentration, technological opportunity and locational factors in determining innovation propensity.

The results suggest no evidence that industry concentration has any significant positive effect on innovation. Industries’ technological characteristics are important, however, with the potential for industry-specific spill-over effects. Plants’ own technological activities in terms of undertaking R&D and having an R&D department were also important determinants of innovation propensity as were plants’ participation in technology transfer and inter-firm networks. Strong locational effects were identified relating to industrial composition, the level of R&D activity, external ownership, the preponderance of small firms and the general level of regional prosperity. In addition, strong interactions were evident between plants’ R&D activity and their regional environment. Undertaking R&D enabled plants to take advantage of any environmental benefits for innovation and insulated them from potential negative effects.

1. Introduction

Contemporary interpretations of the Schumpeterian view of innovative behaviour have emphasised the relationship between industrial concentration and innovative activity (Kamien and Schwartz 1982; Geroski 1990). Other studies, supported by recent empirical work in the US (Audretsch and Feldman 1996) and Israel (Frenkel 1997), have emphasised the potential importance of enterprises’ operating environment or milieu (Camagni 1991; Maillat 1991). In this paper we use UK plant-level survey data to examine the relative
importance of concentration and regional factors on enterprises’ probability of innovating. The results shed some light on the validity of the Schumpeterian hypothesis, and more importantly suggest the limitations of regional initiatives to increase plants’ innovative capability.

The remainder of the paper is organised as follows. Section 2 outlines the conceptual approach we adopt and describes our data sources. Section 3 includes a brief profile of the regional distribution of technological development activities in the UK and reports the main empirical results. The paper concludes in Sect. 4 with an assessment of the relative strength of industrial and locational influences on innovation propensity and a discussion of the lessons for regional innovation policy.

2. The model and data

Under standard optimising assumptions plants’ investments in technological development are usually said to vary positively with the expected post-innovation price-cost margin. Geroski (1990) points out that such a relationship is suggested by the first order conditions of the type of decision theoretic models of research intensity outlined by Levin and Reiss (1994) and by the zero profit equilibrium condition in models of rivalry (e.g. Loury 1979). In either case, the extent to which plants will be able to appropriate the returns from any innovation will depend on the degree of monopoly in the industry, the market position of the plant itself, and other plant and industry specific factors. In effect this means that industry structure will influence the level of innovative activity both directly and indirectly through its effect on expected post-innovation returns\(^1\). At the industry level this suggests an innovation equation of the form:

\[
I_k = \gamma_0 + \gamma_1 \pi_k + \gamma_2 M_k + \gamma_3 Z_k
\]  

(1)

where \(I_k\) is the level of innovation in industry \(k\), \(\pi_k\) is the expected post-innovation price-cost margin, \(M_k\) is the degree of concentration in the industry, and \(Z_k\) is a vector of other industry characteristics. As in Geroski (1990), pp. 588–89, the direct effect of industry concentration on innovation will be captured by \(\gamma_2\) and the indirect effect of actual industry monopoly will be given by \(\gamma_1 (\delta \pi_k / \delta M_k)\). Extending this framework to the level of the individual plant suggests the value of adding indicators of the market power of the enterprise and other enterprise level variables. If \(M_{ik}\) is the market power of enterprise \(i\) in industry \(k\) and \(Z_{ik}\) is a vector of other plant characteristics, we may therefore write an expression for the level of innovation of the enterprise:

\[
I_{ik} = \gamma_0 + \gamma_1 \pi_{ik} + \gamma_2 M_{ik} + \gamma_3 M_{ik} + \gamma_4 Z_{ik} + \gamma_5 Z_{ik}
\]  

(2)

Here, the direct effects of concentration and enterprise market power will be given by \(\gamma_2\) and \(\gamma_3\) respectively, and the indirect effects of concentration and

\(^1\) This is the distinction made by Scherer (1980) between the direct ‘stimulus’ effect and the indirect ‘market room’ effect. See Love and Roper (1999) for a more extensive discussion.