Patents and Spillovers in Some European Regions: A Dynamic Count Panel Data Model

Myriam ABDELMOULA, Georges BRESSON, Diégo LEGROS,
University of Paris 2
bresson01@aol.com

This submitted paper proposes to identify and to estimate the effects of research externalities in generating innovation across European regions. As already shown in the literature (see Romer (1990), Jones (1995), Bottazzi and Peri (2003), ...), localized R&D spillovers exist if the productivity of R&D in a region is affected by the amount of R&D resources used in other regions in spatial proximity. This definition is derived as the reduced form of a model in which new ideas are generated using R&D resources and existing ideas as inputs. We will focus on the estimation of the reduced form of the dynamic innovation-generating equation for some economic sectors of some European regions both for short and long run (using the total number of patents granted to inventors residing in sectors of a region as a measure of that region 's innovative output).

R&D externalities are identifed as the effect of R&D intensity from one sector k of region i on the innovative output one of more sectors of region j. We allow such an effect to depend on several characteristics of sectors of the regions i and j. In order to identify these externalities using panel data, we assume that they depend on the geographical distance between the regions.

For each sector, and to explicitly model the dynamics of patents, we consider the linear feedback model (LFM). In this model, the conditional mean of the count variable is modelled linearly in the history of the process. As shown by Blundell, Griffith and Van Reenen (1995), this specification is well adapted to economic applications and especially convienent for understanding the dynamic properties of count data processes, such as patenting activities and R&D expenditures. The dynamic framework of patents of sector s in region i at time t (P_{sit}) is: $P_{sit} = g(P_{s,i,t-1}, RD_{s,i,t-1}, P_{mean,i,t-1}, RD_{mean,it-1}, P_{s,k,t-1}, RD_{s,k,t-1}, P_{mean,k,t-1}, RD_{mean,k,t-1}, \ldots)$ where $RD_{s,i,t-1}$ are the R&D expenditures of the past time of the same sector in the same region, $P_{mean,i,t-1}$ are the total patents of the other sectors of the same region, $RD_{mean,it-1}$ are the total R&D expenditures of the other sectors for the same region. Variables with index k are related to other European regions (k=1,…,K) and parameters of these variables are linked with a geographical distance index between region i and region k. Our specification is an extension of the Romer (1990), Bottazzi and Peri (2003), Blundell, Griffith and Van Reenen (1995) and Blundell, Griffith, Windmeijer (2002). With this LFM specification, we are able to estimate the short and long run elasticities of innovation (e.g., patents) to R&D resources of all sectors and all regions and to patents of all sectors and all regions. Such dynamic specification allows embodied knowledge contained in patents in all sectors of region j to have different impact on innovation of a sector s of region i, depending on the distance between region j and region i.

We use a panel data set of variables relative to 2 sectors (public and private) in 150 regions of 13 European countries over the period 1995-2001. We choose as regions for our analysis the territorial units identifed by Eurostat in each country, called Nomenclature Units Territory Statistics (NUTS). Following Blundell, Griffith and Windmeijer (2002), we use a quasidifferenced GMM estimator for our dynamic count panel data model.