

Are knowledge flows all alike?

Evidence from European regions

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EXTENDED ABSTRACT

The creation and the diffusion of technology are crucial pre-requisites for economic growth (Romer, 1986). Both phenomena have an important geographical content since the dynamics of the former depends on local increasing returns and that of the latter on local knowledge spillovers. Arthur (1989) and Krugman, (1991) provide convincing theoretical arguments to explain the multifaceted nature of local agglomeration economies which make innovation activity a polarized activity across space. At the same time, Grossman and Helpman (1991) explain that knowledge has both a tacit and a codified nature, and, as a result, a public good component which may work in different ways across territories.

This paper studies mainly the technology diffusion phenomenon by discriminating among three different types of knowledge flows across regions as suggested in an influential contribution by Picci (2010), who discusses the extent and the determinants of the internationalization of European inventive activity. To this aim, Picci uses a new set of indicators based on information provided by the European Patent Office's Patstat database by introducing two measures of international cooperation based on the distinction of inventors and applicants of the same patent when they reside in different countries. More specifically, he distinguishes collaborations among inventors and relationships among inventors and applicants, that is firms. Maggioni et al. (2011) uses the same data but at a more disaggregated territorial level, i.e. Italian provinces. More recently, Cappelli e Montobbio (2013), study how knowledge diffuses across European regions by using inventor collaborations compared to citation flows. Their main aim is to assess the effect of the processes of European integration from 1981 to 2000 on knowledge diffusion.

We follow this research avenue by putting these different perspectives together. As a matter of fact we use all three indicators of knowledge flows across regions in Europe in the last decade. Knowledge flows are measured by using patent information drawn by the OECD RegPat Database, and in particular data on co-inventors, co-applicants, and citation flows. The empirical strategy builds upon the traditional gravity model applied to knowledge flows as in Maurseth and Verspagen (2002), Usai and Paci (2009), Picci (2010), Maggioni et al. (2011). We adopt a gravity model to study the determinants of the intensity of knowledge

flows between pairs of region, i.e. flows between two regions are assumed to increase in their economic size, and decrease in their.

Moreover, we follow the intuition by Lafourcade and Paluzie (2010), who show that border regions, which often appear to be disadvantaged areas because of their peripherality within the country, may experience a counter effect due to the fact that they are the closest regions to other countries. This effect may compensate the disincentives for domestic firms and research centres to locate there due to their remoteness with respect to their national cores. In other words we test if border regions along the national frontier benefit more from closeness to other trans-border regions because their access to external international knowledge, due to their closer location to foreign firms and economic agents.

Besides the importance of the 'border effect', we also assess the impact of other moderating factors with respect to distance. We accept Boschma (2005) suggestion to consider other dimensions of proximity other than the geographical one. We therefore introduce institutional, technological/cognitive and social/relational proximity as other potential dimensions which may affect the quantity of knowledge flowing from one region to another. Finally, we take into account other region-specific variables related to the industrial structure, the absorptive capacity, the economic framework and the properties of the regional knowledge bases.

We estimate our model with respect to three different knowledge flows : citations, applicant-inventor links and co-inventorships in order to ascertain if knowledge flows are all alike. We hypothesise that the effect of distance and cross border contiguity regional border effects may have diverse impact on these different flows. In particular we believe that the effect of contiguity may be stronger when the personal and physical contact is more important, as it happens in cooperative relationships such as co-inventorship. Breschi and Lissoni (2009), for example, show that, after controlling for inventors' mobility and for the resulting co-invention network, the residual effect of spatial proximity on knowledge diffusion is found to be greatly reduced. They explain this result by arguing that researchers are not likely to relocate in space, so that their co-invention network is also localized. This effect, albeit still present, is supposed to fade away as we move from cooperation to other forms of knowledge flows, such as applicant-inventor relationships and most importantly citations.

The main results of the estimation of our gravity model are very interesting and potentially very useful for their policy implications. First of all, we find that distance is important for all three types of knowledge flows and most importantly without remarkable differences once we take into account other moderating factors.

As a matter of fact when we introduce some proximity effects which may moderate the impact of pure geographical distance we find that while distance becomes equally important for all our knowledge flows, the other proximities dimensions have a very differentiated impact.

The first moderating factor is still geographical in nature and refers to contiguity, that is the presence of a common border between regions. We find a general expected result: the presence of a common border is more important when the two regions are within the same national borders rather than when they are contiguous but across national borders. It is the

usual well known effect which is sometime referred to as “institutional proximity”, which is higher among regions pertaining to the same country than among regions in different countries.

Moreover, we find that these difference is not the same across knowledge flows. In particular, we find that, as expected, the highest impact of contiguity is registered by co-inventorship links, that is those flows which are based on cooperations and require face to face contacts. Such contact are less important for applicant-inventors links and are the least important for citations flows, since they are less dependent on personal contacts.

Other two moderating effects are measured by technological and relational proximity. As regards the former, we find that citation flows are relatively much higher when regions share a similar technological background. Co-inventorships and applicant-inventor relationships are equally affected. As for the latter, we find that again citation flows are relatively the more inclined to increase if the geodesic distance is shorter. Co-inventorships are the least affected by relational proximity.

The paper is structured as follows. In the first section we present and discuss our theoretical and empirical background. In the second section we deal with some important measurement and methodological issue and we introduce our database in order to provide a description of the phenomena under examination. In the following section we present our regression model and the main results of our estimations. In the final section we conclude with some policy implications.

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