Editorial: Networks, diffusion of knowledge, and Regional Innovative Performance

1. Introduction to the special issue

Research in economic geography investigates the reasons why particular economic activities choose to establish themselves in particular places, and the role of agglomeration forces in generating these observed disparities in the distribution of economic activity and subsequent economic growth (Henderson and Thisse, 2004; World Bank, 2009). This literature made it into mainstream economics primarily thanks to the work of the 2008 Nobel Laureate Paul Krugman (Krugman, 1991a, 1991b). Three agglomeration forces, with variations, are generally discussed (Marshall, 1890): (i) labor market pooling; (ii) market for intermediate inputs, and (iii) technological externalities, that is to say, knowledge spillovers between firms in the same industry favored by their physical proximity (Duranton and Puga, 2004). Even though Krugman himself disregarded the latter because of their immeasurability, knowledge spillovers play a central role in the economic geography literature as a primary agglomeration force, and in particular, within the geography of innovation subfield, to which this Special Issue contributes (Audretsch and Feldman, 1996; Jaffe et al., 1993; Romer, 1990).

The relevance conferred to knowledge spillovers also lies in the belief that the combination and recombination of previously unconnected ideas lead to new knowledge production, subsequent technological innovations, and ensuing economic growth and well-being (Jones, 1995; Wuchty et al., 2007).

Several conceptual explanations were put forward to explain the presence of these knowledge externalities, including local cultural traits (e.g., trust, attitudes, and, in general, social capital) (Akçomak and ter Weel, 2009; Dakhli and Clercq, 2004), dedicated institutions (such as universities) (Anselin et al., 1997; Jaffe, 1989), and historical and cultural vestiges (Saxenian, 1994). A necessary assumption within these streams of literature is that spillovers are subject to a strong spatial decay, thus being accessible only at short geographical distances. This in turn requires assuming that tacit knowledge – as opposed to information – plays an important role: knowledge is tacit to

the extent that it escapes full codification in patents, articles or books. Hence, exchanges of tacit knowledge require face-to-face interactions, frequent meetings, and the formation of social capital (Audretsch and Feldman, 1996; Martin and Ottaviano, 1999). Still, despite the prominent role conferred to knowledge spillovers, measuring the actual channels through which knowledge is transmitted is far from straightforward. Thus, the assumption that knowledge spills over freely from its source to other agents – and it does more easily to physically close actors than individuals, firms and institutions located far apart – might have limited our understanding of the ways in which knowledge actually flows between actors and across the space (Coe and Bunnell, 2003).

More recent theoretical and empirical research within the geography of innovation has turned its attention to the role of innovation networks (Boschma and Frenken, 2010). This turn comes from the observation that networks and teams are becoming increasingly decisive for innovation and knowledge production (Jones, 2010; Wuchty et al., 2007). Knowledge flows easily across organizational boundaries through formal alliances among individuals, firms and through university-industry collaborations (Cantner et al., 2010; Katz and Martin, 1997). Furthermore, an increasing number of studies show that the quantity and quality of new innovations are increasingly the result of collaborative work among scientists, inventors, and organizations (Powell and Grodal, 2005; Singh and Fleming, 2010). This is more so when connecting heterogeneous contexts – such as different regions or countries, from which unusual combinations are more likely to arise and produce radical innovations (Bell and Zaheer, 2007). Yet, networks tend to be geographically bounded, as proximity eases communication and saves time and coordination costs (Phelps et al., 2012). Likely, networks can explain a great deal of the geographically constrained breath of knowledge diffusion (Breschi and Lissoni, 2009).

However, at the same time, it has been largely argued that knowledge accessed through local linkages might be less novel and less useful than knowledge transferred between geographically distant persons, with potentially harmful consequences – i.e., technological lock-in (Bell and Zaheer, 2007; Boschma, 2005). In this context, cross-regional research networks have the potential to act also as critical intentional, formal channels through which knowledge is transferred throughout the space and new recombination of ideas are allowed (Fratesi and Senn, 2009). While alliances between firms in similar spatial contexts merely duplicate already existing knowledge flows and

add little to the firm, these firms also build ‘pipelines’ in the form of alliances to benefit from knowledge hotspots around the world (Bathelt et al., 2004; Owen-Smith and Powell, 2004). Hence, distant milieus may offer access to new pools of knowledge and insights, highly valuable for innovation.

The aim of this special issue is to discuss research on innovation and knowledge diffusion, and their linkages with regional economic performance. It has collected three contributions focusing on two intertwined issues on the relationship between networks, knowledge diffusion, and regional innovation. The first issue is concerned with the determinants of network formation, with emphasis on the role of geography as well as other a-spatial distances between potential partners. The second issue refers to the effects of scientific networks on regional innovation, measured as patenting growth, in Europe.

2. Contributions of this special issue

The first paper of this collection, by Marrocu, Usai and Paci, investigates how different proximities across firms affect the diffusion of knowledge between the agents involved. In particular, the authors look at a sample of Italian firms and their agreements in the form of joint ventures and strategic alliances (with other Italian firms and abroad) to assess how these partnerships and the knowledge transfers they may bring about are influenced by their bilateral geographical, technological, organizational, institutional and social proximities, and by their position in the network. Indeed, the largest majority of studies on the geography of innovation have traditionally looked at geographic proximity as the best platform for the diffusion of ideas and information. Proximate contexts increase the efficiency and efficacy of communication and save time and coordination costs. Yet, other non-geographical similarities have been highlighted as producing the same type of outcomes – such as social, cognitive, institutional, or organizational, as already established by the French School of Proximity (Carrincazeaux et al., 2008), and all of them are likely to influence the diffusion of knowledge across agents. Their study represents a novel contribution in investigating five dimensions of proximity within a multi-sector framework and in testing whether they exert distinctive effects or they can substitute each other to some extent. In the end, all dimensions

considered are found to exhibit a positive and significant effect, which confirms that knowledge exchanges, in the form of firms' alliances, are not only mediated by geographical proximity. Interestingly, the highest impact is in fact for technological proximity, followed by institutional, organizational, and geographical ones.

The next contribution, by Maggioni, Uberti, and Nosvelli, deals with inter-regional knowledge diffusion, and its impact on the innovative performance of European regions. As the authors argue, while scientific and technical knowledge flows very easily within regions, it does not across different agglomerations. Their framework of analysis is a regional knowledge production function (KPF) and they consider spatial econometric tools to test the effect of knowledge flows across regions mediated either by geographical proximity or by relational/social proximities (as measured by joint participation in research projects under the EU's Sixth Framework Program, FP6). A critical dichotomy put forward by the authors is the distinction between unintended spatial spillovers (i.e., knowledge diffuses to neighboring areas following a geographical pattern) versus intentional, a-spatial knowledge exchanges (i.e., knowledge diffuses through networks and formal agreements). Among many interesting results, it is found that intended knowledge diffusion has a nonsymmetrical top-down structure, with knowledge flowing mainly from scientific coordinators to partners in other regions. On their side, as the authors posit, geographical spillovers are almost inexistent in Eastern European regions. On the contrary, New Member States' regions largely benefit from a-spatial knowledge flows through the participation in and coordination of scientific projects under the FP6 framework.

Finally, the last contribution by Sebestyén and Varga also deals with EU Framework Program participation as a channel of innovation-related knowledge flow that does not necessarily require the spatial proximity of actors. The key point raised by the authors is that there is missing evidence on whether the impact of such FP participation on patenting masks important and regular spatial differences in Europe. Specifically, the focus is set on the existence of different trends in core and peripheral regions, suggesting a spatial regime effect. The authors use a measure that summarizes the knowledge accessed from research networks according to the particular position in the network as well as control for extra-regional knowledge flows mediated by geographical proximity through a systematic panel spatial econometric methodology. Among the main results obtained with data from FP5, 6 and 7 for the ICT research field,

it is found that clear differences exist between Central and Eastern European lagging regions and the rest of EU regions. While knowledge transmitted via FP networks is a relevant input to patenting in CEE lagging regions, this is not observed for the rest. This suggests that since FP subsidies are substitutes for other research funds in core UE regions they do not influence patenting significantly there, whereas in peripheral regions FP research support would act as a complementary resource and as such it would become an important factor in innovation.

References

Akçomak, İ.S., ter Weel, B., 2009. Social capital, innovation and growth: Evidence from Europe. European Economic Review 53, 544–567. doi:10.1016/j.euroecorev.2008.10.001

Anselin, L., Varga, A., Acs, Z., 1997. Local Geographic Spillovers between University Research and High Technology Innovations. Journal of Urban Economics 42, 422–448. doi:10.1006/juec.1997.2032

Audretsch, D.B., Feldman, M.P., 1996. R&D Spillovers and the Geography of Innovation and Production. American Economic Review 86, 630–40.

Bathelt, H., Malmberg, A., Maskell, P., 2004. Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. Progress in Human Geography 28, 31–56. doi:10.1191/0309132504ph469oa

Bell, G.G., Zaheer, A., 2007. Geography, Networks, and Knowledge Flow. Organization Science 18, 955–972. doi:10.1287/orsc.1070.0308

Boschma, R., 2005. Proximity and innovation: a critical assessment. Regional studies 39, 61–74.

Boschma, R., Frenken, K., 2010. The spatial evolution of innovation networks. A proximity perspective. Handbook of evolutionary economic geography 120–135.

Breschi, S., Lissoni, F., 2009. Mobility of skilled workers and co-invention networks: an anatomy of localized knowledge flows. Journal of Economic Geography 9, 439–468. doi:10.1093/jeg/lbp008

Cantner, U., Meder, A., ter Wal, A.L.J., 2010. Innovator networks and regional knowledge base. Technovation 30, 496–507. doi:10.1016/j.technovation.2010.04.002

Carrincazeaux, C., Lung, Y., Vicente, J., 2008. The Scientific Trajectory of the French School of Proximity: Interaction- and Institution-based Approaches to Regional Innovation Systems. European Planning Studies 16, 617–628. doi:10.1080/09654310802049117

Coe, N.M., Bunnell, T.G., 2003. “Spatializing” knowledge communities: towards a conceptualization of transnational innovation networks. Global Networks 3, 437–456. doi:10.1111/1471-0374.00071

Dakhli, M., Clercq, D.D., 2004. Human capital, social capital, and innovation: a multi-country study. Entrepreneurship & Regional Development 16, 107–128. doi:10.1080/08985620410001677835

Duranton, G., Puga, D., 2004. Chapter 48 Micro-foundations of urban agglomeration economies, in: Economics, B.-H. of R. and U. (Ed.), Cities and Geography. Elsevier, pp. 2063–2117.

Fratesi, U., Senn, L. (Eds.), 2009. Growth and Innovation of Competitive Regions, Advances in Spatial Science. Springer Berlin Heidelberg, Berlin, Heidelberg.

Henderson, J.V., Thisse, J., 2004. Handbook of Regional and Urban Economics (Handbook of Regional and Urban Economics). Elsevier.

Jaffe, A.B., 1989. Real Effects of Academic Research. The American Economic Review 79, 957–970. doi:10.2307/1831431

Jaffe, A.B., Trajtenberg, M., Henderson, R., 1993. Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations. The Quarterly Journal of Economics 108, 577–598. doi:10.2307/2118401

Jones, B.F., 2010. Age and Great Invention. Review of Economics and Statistics 92, 1–14. doi:10.1162/rest.2009.11724

Jones, C.I., 1995. R & D-Based Models of Economic Growth. Journal of Political Economy 103, 759–784.

Katz, J.S., Martin, B.R., 1997. What is research collaboration? Research Policy 26, 1–18. doi:10.1016/S0048-7333(96)00917-1

Krugman, P., 1991a. Increasing Returns and Economic Geography. Journal of Political Economy 99.

Krugman, P., 1991b. Geography and trade. MIT press.

Marshall, A., 1890. Principles of Economics, (New York, 1948). Marshall8229Principles of Economics1948 229.

Martin, P., I.P. Ottaviano, G., 1999. Growing locations: Industry location in a model of endogenous growth. European Economic Review 43, 281–302. doi:10.1016/S0014-2921(98)00031-2

Owen-Smith, J., Powell, W.W., 2004. Knowledge Networks as Channels and Conduits: The Effects of Spillovers in the Boston Biotechnology Community. Organization Science 15, 5–21. doi:10.1287/orsc.1030.0054

Phelps, C., Heidl, R., Wadhwa, A., 2012. Knowledge, Networks, and Knowledge Networks: A Review and Research Agenda. Journal of Management 149206311432640. doi:10.1177/0149206311432640

Powell, W.W., Grodal, S., 2005. Networks of innovators. The Oxford handbook of innovation 56–85.

Romer, P.M., 1990. Endogenous Technological Change. Journal of Political Economy 98, S71–S102. doi:10.2307/2937632

Saxenian, A., 1994. Regional advantage: Culture and competition in Silicon Valley and Route 128. Harvard University, Cambridge, MA.

Singh, J., Fleming, L., 2010. Lone Inventors as Sources of Breakthroughs: Myth or Reality? Management Science 56, 41–56. doi:10.1287/mnsc.1090.1072

World Bank, 2009. World development report. Reshaping Economic Geography. The World Bank, Washington DC.

Wuchty, S., Jones, B.F., Uzzi, B., 2007. The Increasing Dominance of Teams in Production of Knowledge. Science 316, 1036–1039. doi:10.1126/science.1136099