

## **Regional Patterns of Co-Patenting by Technological Field**

A Europe – US Comparison

**Henning Kroll, Nicolai Mallig**  
**Fraunhofer Institute for**  
**Systems and Innovation Research,**  
**Breslauer Straße 48,**  
**76139 Karlsruhe, Germany,**  
**henning.kroll@isi.fraunhofer.de**

From its very beginning, the question how knowledge flows in but also through regional innovation systems has developed alongside debates on spatially non-rooted sectoral and technological innovation systems. Due to a lack of available data, however, it has not always been possible to link those two debates together in a form sufficient to inform national innovation policy.

Nonetheless, in the past five to ten years, an increasing focus has developed on the linkages between intra-regional and inter-regional knowledge flows in both theoretical literature and policy making. A broad array of cluster studies has discussed the issue which mix of inter-regional and intra-regional knowledge sourcing is conducive to create a vibrant regional system of innovation and how such developments can be supported by research and innovation policy.

A guiding line of argument in this debate is that regions play an important in technological innovation systems role in that they provide a localised interface where inter-regional flows of knowledge intersect, are recombined and thus learning effectively takes place. An important consequence of this train of thought is that the innovative output of a region cannot solely be predicted based on the amount of effort put into innovative activities in that particular region and its immediate vicinity. Similarly, its connectedness to other centres of knowledge production has to be taken into account. Thus, it is not surprising that regional knowledge spillovers are often found to be significant, but to make but a small contribution to regional development (Bottazzi/Peri, 2003) or to become hard to capture when controlling for regional attributes (Tappeiner et al., 2008). Possibly, it is not the immediate environment that matters most.

The proposed paper, therefore, will argue that the degree to which actors in a region can draw on external knowledge sources to which they regularly connect through collaborative linkages (irrespective of spatial proximity) is likely to be a significant explanatory factor of or at least be significantly correlated to degree and intensity of activities in a region. A newly developed regionalisation template for patent data, now available from the OECD (REGPAT), makes parts of the PATSTAT database accessible to studies of patterns of inter-regional networkedness through co-patenting in a way that they were not before. The proposed paper will take up this opportunity and complement it by making use of a well established grouping of IPC classes by 19 technological fields.

Its first main contribution will thus be to shed light on the structure of inter-regional cooperative linkages in innovative activity – as evidenced by co-patenting. Additionally, it will attempt to enrich existing findings on regional knowledge generation by examining to what degree inter-regional knowledge exchange can be found to regionally co-incide with local innovative activity.

In summary the proposed paper will follow three main strands of analysis:

Firstly, it does seem likely that the main geographic nexus of co-operative linkages will differ by technological field. Repeatedly, economic and econometric studies have suggested that the degree of variety in regional specialisation patterns of innovative activity differs between the European Union and the United States. Whilst Europe, in which more barriers to mobility exist, is characterised by less specialised national centres of innovation, the United States have a tendency to develop more specialised self-contained geographical areas of nation wide importance that rely on their own R&D inputs (cf. e.g. Crescenzi et al. 2007).

The first section of the paper will thus, for illustrative purposes, determine and list the key points of intersection of knowledge flows for each technological field – using measures of centrality. For Europe the analysis will be performed at NUTS 1, for the US at state level. Additionally, networks will be investigated for their 'core structures' by reducing them to linkages above a certain threshold value.

Secondly, the paper will illustrate the overall relatedness of network structures in Europe and the United States to shed light on the question which form of 'networkedness specialisation' seems to be connected to each other based on the expectation that hubs in a certain technological field will be more likely to be co-located with those in complementary fields than it will be with others.

In the second section of the paper correlations will therefore be calculated between the degree of centrality in knowledge interchange that region have in a selected technological field and those that they have in others. Moreover, it will be examined if those correlation matrices differ between Europe and the United States. In doing so, it will also determine if a higher differentiation between hubs of knowledge interchange can be found in the US than in Europe.

Thirdly, the proposed paper will – by technological field – examine the relations between 'centres of intersection of knowledge flows' and more classically determined 'centres of activity': Patenting activity and patenting intensity in the regions will be correlated with the degree of networkedness of that particular region.

In its third section, the paper will thus demonstrate if and how the extent of correlations between innovative networking and innovative activity differs between different technological fields. Moreover, it will juxtapose the findings for selected technological innovation systems from the United States as well as from Europe.

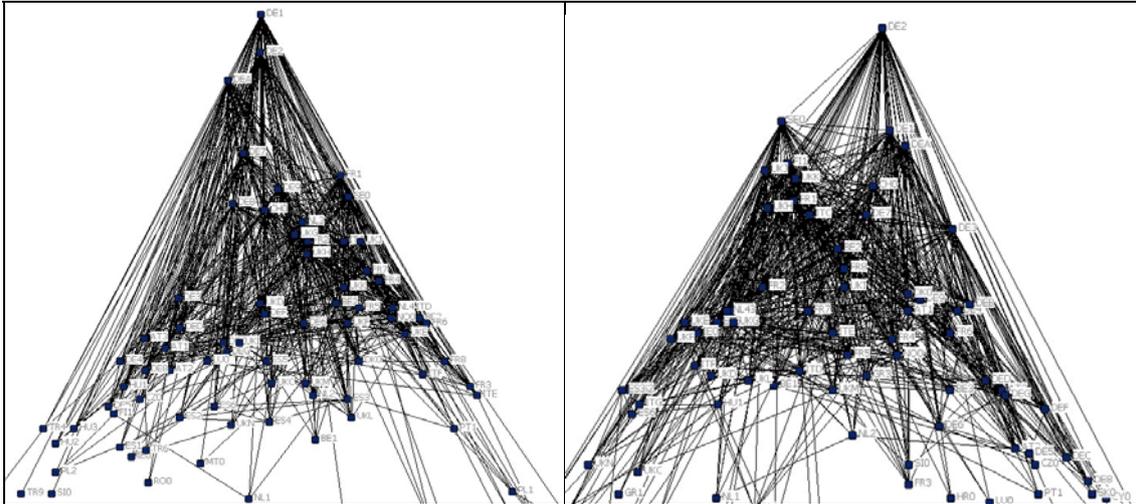
Finally, implications for innovation policy will be briefly discussed.

## Annex

Figure 1: Preliminary Findings: Section of Regions Ordered by Closeness Centrality  
*Europe (European Union, Switzerland, Norway, Turkey, Croatia)*

Transport

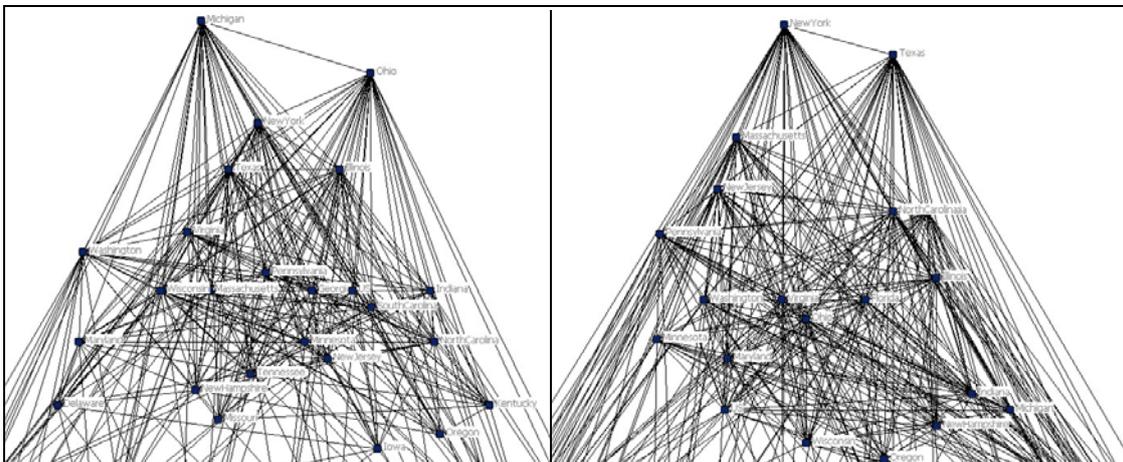
Telecommunication



*United States*

Transport

Telecommunication



Source: Own Calculations, PATSTAT, OECD REGPAT, NetDraw

## References

Crescenzi, R./Rodriguez-Pose, A./Storper, M. (2007): The territorial dynamics of innovation: a Europe-United States comparative analysis, *Journal of Economic Geography*, 7, 673-709.

Bottazzi, L./Peri, G. (2003): Innovation and spillovers in regions: Evidence from European patent data. *European Economic Review*, 47, 687-710.

Tappeiner, G./Hauser, C./Walde, J. (2008): Regional knowledge spillovers: Fact or artifact? *Research Policy* 37, 5, 861-874.