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### Interregional Knowledge Network Quality and Research Performance: Do Objective 1 and EU 12 Border Regions Follow Different Patterns than the Rest of Europe?

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#### OBJECTIVE

In this paper we address the relationship between interregional knowledge flows and productivity of research at the regional level with a particular attention given to Objective 1 and EU 12 border regions in this respect. We structure the problem by directing attention to the quality of a particular interregional network for a particular region. This quality is reflected by the contribution of knowledge accessed in the network to the production of new knowledge inside the region. In order to make the problem empirically tractable we quantify certain features of interregional networks that could be instrumental for regional knowledge production additional to what have already been accounted for in the spatial literature. Building on these measures we develop a novel comprehensive index to account for the quality of a region's global knowledge network. The index is called Ego Network Quality (ENQ). We also provide a test on the hypothesized positive relationship between interregional knowledge network quality and regional research productivity. In pursuit of this we investigate two interregional networks: EU Framework Program collaborations and European co-patenting, both considered at the level of EU NUTS2 regions.

The attention to Objective 1 and border regions is related to the neighboring country focus of the SEARCH project. Though it is not possible to directly test the effects of co-patenting and FP network quality on EU neighboring countries we were able to get some estimates by testing the impacts of co-patenting and FP network quality on research productivity of NUTS 2 regions which possess the characteristics of EU neighboring countries in two respects: first, their GDP per capita is below the 75 % or EU average (Objective 1 regions) and second, they are located at the border of the old EU 12 territory (border regions).

#### MAIN RESULTS

We found that the quality of interregional networks in both areas of knowledge production is indeed a significant contributor to R&D productivity. We also found that the pure number of collaborations, which is the most frequently used variable in spatial network studies is not a suitable proxy of interregional network effects in R&D

productivity contrary to ENQ. Our results show that a more comprehensive approach taking into account several local and global features of the network surrounding the given region provides better insights into the network effects in regional knowledge production.

Empirical analyses in this paper resulted in several additional interesting observations on the role of space in different types of knowledge generations. The finding, that non-spatially mediated learning in (FP or patent) collaboration networks significantly enhances research productivity, comes up strongly from the regression results for both types of knowledge creation. However, spatial proximity plays different roles in patenting and scientific publication. While local agglomeration of knowledge industries affect patenting positively together with patenting carried out in proximate regions, spatially mediated knowledge flows do not seem to be significant sources of science-oriented research resulting in publications. On the contrary, the significantly negative parameter of the spatially lagged publication variable suggests a “chessboard-like” spatial arrangement of scientific research institutions. They do not tend to spatially agglomerate but it also seems that their success in science do not necessarily need that agglomeration.

## **POLICY IMPLICATIONS**

The empirical analysis in this paper results in several interesting observations on the role of space in different types of knowledge generations. The finding, that non-spatially mediated learning in (FP or patent) collaboration networks significantly enhances research productivity, comes up strongly from the regression results for both types of knowledge creation. However, spatial proximity plays different roles in patenting and scientific publication. While local agglomeration of knowledge industries affect patenting positively together with patenting carried out in proximate regions, spatially mediated knowledge flows do not seem to be significant sources of science-oriented research resulting in publications. On the contrary, the significantly negative parameter of the spatially lagged publication variable suggests a “chessboard-like” spatial arrangement of scientific research institutions. They do not tend to spatially agglomerate but it also seems that their success in science does not necessarily need that agglomeration. This finding bears policy relevance as it proves that establishing a-spatial channels for knowledge flows which contribute to a higher quality of network embeddedness have positive effect on the productivity carried out in a region.

We were also able to get some estimates as to the likely situation in EU neighboring country regions by testing the impacts of co-patenting and FP network quality on research productivity in Objective 1 NUTS 2 regions. Our analysis yielded interesting findings. While the quality of co-patenting networks in Objective 1 regions is about two-third of that of in rest of EU regions, for publication the lag behind more advanced EU regions is less pronounced. Objective 1 region’s ENQ is about 80 percent of what is calculated for rest of EU regions. These differences are then reflected in differences in the corresponding research productivity values.

These latter observations suggest that those EU neighboring country regions where good quality universities and public research institutions are located could potentially build research collaboration networks competitive with networks maintained by many European regions. Thus intensifying the participation of neighboring countries in EU

Framework Program funded research projects could result in an increase in research productivity of those neighboring country regions where already substantial research capacities are built at local universities or public research facilities. This increased research productivity might later form the basis of regional economic development policies taking advantage of potentials accumulated at their higher education institutions or public research institutes. Policies aiming at attracting private research labs of industries closely related to the region's research specialization paired with suitable complementary interventions (such as building up human capital assets in the region or physical infrastructure development) could potentially initiate a longer run cumulative process that possibly ends up in a substantial regional industry concentration.