



POLICY NOTES OF WORKING PAPER 4.26

EU Framework Program participation and innovation: The role of regional development

Attila Varga*^, Tamás Sebestyén^*

**University of Pécs, Faculty of Business and Economics *
MTA-PTE Innovation and Economic Growth Research
Group^**

1. OBJECTIVES

The research question of this paper is related to existing findings in the literature, which have already discovered several aspects of spatial regime effects in regional knowledge production. Our focus is on the effect of participation in FP projects and the resulting knowledge flows on regional patenting activity. Wouldn't it be the case that the missing evidence on a direct knowledge transfer impact on patenting mediated by FP participations masks important and regular spatial differences in Europe? Influenced by earlier findings in the literature in this paper we hypothesize that the direct impact of knowledge transfers between FP network partners on regional patenting follows different trends in core and peripheral regions in Europe. As to the nature of the expected differences in the trends there are no antecedents in the literature that could guide us to formulate one single hypothesis. Consequently, the hypothesis that lagging areas are not yet equipped to utilize learning from FP research networks in patenting because of their low levels of absorptive capacities can be raised with a chance similar to that of the other, which states that FP subsidies are only substitutes for other research funds in core EU regions and as such do not influence patenting.

2. SCIENTIFIC METHOD

Our empirical framework is built on the Romerian knowledge production function. Using this vehicle we empirically test the role of network-mediated and localized knowledge flows on

regional patenting activity in Central and Eastern Europe as well as in old member states of the EU. The empirical analysis in this paper is based on a sample of 262 European NUTS2 regions. We use a panel database, covering the period between 1998 and 2009. As made possible by the thematic diversification of our FP database, the sample is restricted to those projects and the respective participants which fall under the broad thematic area of information technologies and society (the specific thematic areas are: User Friendly Information Society in FP5, Information Society Technologies in FP6 and Information and Communication Technologies in FP7). The dependent variable is patenting activity in the ICT sector at the regional level as proxied by patent applications to the EPO. In order to capture the importance of knowledge stocks (or a 'standing on the shoulders of giants' effect) for knowledge production we use proxies of regional knowledge stocks by calculating patent stocks for each region according to the perpetual inventory method for the 1995–2009 period.

Knowledge flows between regions are captured by FP cooperation networks in the information technology and society thematic areas over the period of 1998-2009. To measure knowledge flows, we apply in this paper the index of Ego Network Quality (ENQ), the aim of which is to overcome a frequent shortcoming of previous studies in the geography of innovation field, which focus exclusively on the effect of partners' knowledge. ENQ also takes into account important structural features of knowledge networks are. Additionally, with the application of the ENQ index it is possible to explicitly account for dynamic changes in extra-regional knowledge networks contrary to the usual approach, which operates with temporarily fixed collaboration matrices. We carry out the analysis with two European sub-samples: Central-Eastern European (CEE) Objective 1 regions (51 regions) and non-CEE regions (211 regions) in the old member states of the European Union. The selected research area of study is information science and technology (IST).

Due to the availability of a panel data, we apply spatial panel econometric methods to test for the aforementioned effects of knowledge flows. In the econometric analyses the following specification issues will be considered: network effect identification, localized knowledge transfer impact identification and panel effect identification. We test network effects directly and in interaction with FP funding intensities in the regions. With respect to the impact of localized knowledge flows on regional patenting, three types of spatial models will be tested against each other: the spatial lag, the spatial error and the spatial Durbin models. In spatial lag models spatial dependence is modeled through the spatially lagged dependent variable, in spatial error models it is captured in the error term and alternatively, with the spatial Durbin model spatial dependence is modeled through both the dependent as well as the independent variables.

3. MAIN RESULTS

The descriptive analysis of our dataset shows that CEE regions show a significantly worse performance than their counterparts in old member states: number of patents, patent stock, regional FP funding, R&D, ENQ and high tech employment. In a dynamic context, though a moderate catching up process is visible. In the case of FP funding, CEE regions improve their position from 15% to 25% of the average regional funding intensity of regions in old member state. With regards to network knowledge access (measured by the ENQ index), the relative position improves from 50% to around 60% between 1999 and 2009. These numbers still show a remarkable gap in spite of the improving tendency.

Our estimation results for the non-CEE regions first show that after controlling for unmeasured regional and temporal characteristics as well as spatial dependence, the effect of network network-mediated knowledge flows on the efficiency of FP funding in patenting activity is

insignificant. This result is a strong indication that in non-CEE regions knowledge flows from FP networks do not play a meaningful role in regional patenting. Second, we detect significant and positive parameters of the spatially lagged dependent variable and the spatially lagged R&D and high technology employment variables. These results together with the insignificant FP network effect indicate that regions in old EU member states tend to rely on localized knowledge inputs in patenting instead of extra-regional knowledge communicated via FP research networks.

Our results document markedly different patterns for CEE Objective 1 regions. Contrary to the case of the old EU member, the significant and positive parameter for network-mediated knowledge flows indicates that knowledge transferred from FP networks is an important element of regional patenting in these regions. An additional difference between the results for the two sets of regions is related to the role of localized knowledge transfers in regional patenting. The parameters of the spatially lagged dependent variable as well as that of high technology employment are negative while significant. These results indicate a chessboard-like structure of regional knowledge production in CEE regions. Regions with relatively high levels of patenting are generally surrounded by low patent producing regions with small high technology sectors. Considering the marginally significant parameters of the spatially lagged R&D and ENQ variables only a weak evidence is found for the influence of geographically mediated extra-regional knowledge flows on patenting in CEE Objective 1 regions.

To sum up, we found that with respect to the role of localized knowledge flows and FP network learning in patenting clear and marked differences exist between CEE-Obj 1 and non-CEE regions. While knowledge transferred from FP networks acts as an additional source of patenting in CEE-Obj 1 regions, network knowledge is not a significant input in patenting in regions of the old member states. On the other hand it is clear that while localized learning in patenting is extremely important for regions located in the EU 15, knowledge flows from neighboring regions play only a marginal role in CEE Objective 1 regions' innovation.

4. POLICY VALUE-ADDED

Our results suggest that while for regions in old EU member states FP research subsidies seem to act as a substitute for funding from other sources, innovation in CEE Objective 1 regions tends to rely more on external knowledge transferred from FP funded research networks to compensate for their less developed local knowledge infrastructure. Our findings are important as they suggest that strengthening research excellence and international scientific networking in relatively lagging regions (such as regions in CEE and ENP countries) could be a viable option to increase regional innovativeness, which in combination with other policies could form a base for a systematic support of regional development.