ABSTRACT

The article deals with the financial innovation system as a sectorial system of the National innovation System. In the terms of project funding, the paper focuses on funds obtained from demand-oriented projects (European Fund of Regional Development and European Social Fund). The comparative analysis uses financial data from projects calls and patent data from patent applications (Office of Industrial Property of Slovakia), both for year 2010. The main aim is to evaluated project funding in 8 regions of Slovakia. Results suggest that regions of Central and Eastern Slovakia lead in the sense of the intensity of use of financial resources.

KEY WORDS


JEL classification: O39.
generate and implement knowledge innovations [10]. The Financial Innovation System can be understood as a sectorial system of NIS, it is a financial and innovation linkage in the sense of funding supporting of innovation projects and activities, which tend to strengthen of economic performance of country. The support of the economic performance should be carried out through the effective allocation of capital [19] but, it should be note that it is still difficult to funding research and development activities in the free competitive market [11]. FIS can be considered to one of the determinants, which supports innovation activities in specific sectors and it supports the projects before they reach the level at which they generate particular products, which can be evaluated and competitive [2]. From this point of view, it is natural to study the allocation of funds suitable for R&D areas.

MATERIALS AND METHOD

Linear approach of NIS

To the analysis of processes that lead to the creation of innovations, linear thinking can be considered to still attractive and this approach explains the generation of innovations through the process which consists from several of stages with unidirectional causal relationship. In other words, the research leads to development, development to the production and production to the market [13]. Although the linear approach is the simple form of innovation processes, it still appears in economic and political context [10]. Note that studies which focus on this issue come from the original concept, but develop it further. For example “chain-linked model” [13], which adds feedbacks to the transformation process that are the driving force of development processes, “integrated innovation model” [1], which emphasizes the human capital as an important determinant of innovations conducive to the successful of organization, or “R&D labs” [4].

System approach of NIS

The system thinking focus on relations between actors of knowledge innovation process and its main aim is to understand, improve and strengthen the positive influence of environment, in which these actors operate. The system approach is a result of demand oriented innovation policy [5].

Effectiveness of NIS is the ability to transform innovation inputs (for example R&D expenditures) to innovation inputs under the influence of environment (actors) [16].

Dynamic approach of NIS

The model designed by [9] is linkage between linear and system thinking as “New dynamic innovation system” and it consists from five basic parts: ideas generation (the core of innovation processes – linear approach), NPDD, success of the product on market, internal and external factors
(national innovation environment with financial subsystem), which influence on the core of firms innovation processes. This “Concept of the creative factory” can be found at the following figure:

![Fig. 1 – The concept of the creative factory](source: According to [9])

Firms generating and bringing the innovation to the market, to the industry and to the country represent the concept core [9]. Such firms are mainly involved in the commercialization of innovations [7]. The fig. 1 shows that the funding system is the one of the factors that influences on the core of the innovation processes. In this sense, the allocation of funds seems like an important determinant of the success of research and development activities.

Financial Innovation System – private funding of R&D

Largest differences between financial innovation systems can be found in the general institutional properties of the financial supporting of R&D which consist from fragmentation, ability to transfer resources into new areas rapidly from social and political environment which is responsible for the realization of the research policy [14]. In the sense of the Principal-Agent Theory, research projects can express relation between funding agencies, principals and researchers, which are multiple agents [3]. [14] understands the public funding of R&D as the multilayer system characterized by diversity largely autonomous actors and there are two main allocation methods,
especially core funding of research institutions and project funding of research groups. Interactive spaces in the process of funding R&D can be illustrated as follows:

![Interactive spaces in the process of funding R&D](image)

**Fig. 2 – Interactive spaces in the process of funding R&D**

*Source: According to [14]*

The project funding is dedicated to the group or individual to conduct the research activity that is limited in scope, budget and time and usually it is based on submission of a proposal describing the research activity that has to be done. This category includes European Framework Programs and a lot of research contracts which are under ministries [15]. If the state is an actor which coordinates the distribution of resources to agencies and tools, this mechanism creates the interactive space, which consists from free coordinated financial agencies and a lot of research groups which seeking the financial support [14].

The typical examples of vertically integrated organizations are the academies of science in Central and Eastern Europe (CEE), which was established to carry out research activities [12].
Public funding of R&D in CEE countries

CEE countries have passed by significant changes in the area of funding research and development activities in sense of their performance, financial instruments or funding resources. Public funding of R&D in CEE countries can be characterized as follows:

- significant changes can be found rather in structure of research and development activities as in funding resources,
- high dependence of private funding on public resources,
- Academies of Science,
- Research institutions operate on two markets, “quasi market” for public funding and private funding of R&D contracts, products and services [18].

Financial innovation systems should basically satisfy the conflicting requirements. On the one hand they should satisfy the world science excellence, but at the same time they should focus on local needs, which not necessarily contribute to the world science, but rather to the development of local technologies [18].

Data and methods

The article use the comparative analysis to evaluate the structure of financial resources from the European Fund of Regional Development and European Social Fund and which should lead to innovation activities in 8 regions of Slovakia (level NUTS 1). Especially, the paper focus on resources allocated to the private sector, high educational institutions (HEI), Academy of Science of Slovakia (SAV – vertically integrated institution that is typical for CEE countries) and other research institutions. Dataset is created through calls for year 2010, special case of demand-oriented projects. The amount of patents is usually used as a proxy variable for innovation processes [20]. Effectiveness of innovation processes is simple evaluated as a share output (amount of patents) to input (funds). Patent dataset is created from patent applications (in the proceedings, stopped, made public), which are published by the Intellectual Property Office of Slovakia. Spatial differences are studied by maps designed in the statistical program R.

RESULTS AND DISCUSSION

The article collects input data of 8 regions of Slovakia with aim to find out which sectors (private sector, HEI, SAV, other research institutions) have obtained the most of funding resources from European Fund of Regional Development and European Social Fund (demand-oriented projects), especially in 2010.
Columns labeled (Table 1) “PS”, “HEI”, “SA” and “ORI” indicate funds directed to different sectors, in absolute value (AV) and as a share on the overall amount of received funding in the region (share).

<table>
<thead>
<tr>
<th>Region</th>
<th>EFRD (mil. €)</th>
<th>HEI (mil. €)</th>
<th>SA (mil. €)</th>
<th>ORI (mil. €)</th>
<th>∑ Pat</th>
<th>pat/∑</th>
<th>Inh</th>
<th>∑/inh</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV share</td>
<td>AV share</td>
<td>AV share</td>
<td>AV share</td>
<td>AV share</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BA region</td>
<td>36.51/0.31</td>
<td>51.98/0.44</td>
<td>27.58/0.23</td>
<td>2.91/0.02</td>
<td>121.08</td>
<td>63</td>
<td>0.52</td>
<td>622706</td>
</tr>
<tr>
<td>TT region</td>
<td>11.03/0.61</td>
<td>5.49/0.30</td>
<td>-</td>
<td>-</td>
<td>11.99</td>
<td>18.21</td>
<td>9</td>
<td>0.49</td>
</tr>
<tr>
<td>TN region</td>
<td>7.37/1.00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7.37</td>
<td>10.77</td>
<td>33</td>
<td>3.06</td>
</tr>
<tr>
<td>NR region</td>
<td>6.97/0.26</td>
<td>12.79/0.47</td>
<td>3.93/0.15</td>
<td>6.83/0.11</td>
<td>28.73</td>
<td>15</td>
<td>0.52</td>
<td>705661</td>
</tr>
<tr>
<td>ZA region</td>
<td>10.64/0.30</td>
<td>20.85/0.58</td>
<td>3.33/0.09</td>
<td>0.94/0.04</td>
<td>35.75</td>
<td>37</td>
<td>1.03</td>
<td>697502</td>
</tr>
<tr>
<td>BB region</td>
<td>11.25/0.22</td>
<td>29.50/0.57</td>
<td>10.50/0.20</td>
<td>0.86/0.02</td>
<td>52.11</td>
<td>27</td>
<td>0.52</td>
<td>653186</td>
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<tr>
<td>PO region</td>
<td>7.86/0.35</td>
<td>13.68/0.61</td>
<td>-</td>
<td>-</td>
<td>7.86</td>
<td>22</td>
<td>0.80</td>
<td>807011</td>
</tr>
<tr>
<td>KE region</td>
<td>4.23/0.06</td>
<td>50.85/0.73</td>
<td>14.70/0.21</td>
<td>-</td>
<td>27.58</td>
<td>53</td>
<td>0.73</td>
<td>778120</td>
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<tr>
<td>Overall</td>
<td>110.96</td>
<td>-</td>
<td>185.14</td>
<td>-</td>
<td>60.03</td>
<td>-</td>
<td>10.57</td>
<td>366.70</td>
</tr>
</tbody>
</table>

Note: BA – Bratislava region, TT – Trnava region, TN – Trenčín region, NR – Nitra region, ZA – Žilina region, BB – Banská Bystrica region, PO – Prešov region, KE – Košice region

Tab. 1 – Structure of funding R&D in regions of Slovakia

Source: Self-processed

Results obtained from Tab. 1 indicate, that project funding in Slovakia is domain of HEI except of TN region, in which applications were submitted only by private firms in year 2010. On the other hand in TN region is located only one HEI. The relative high share of private sector in the obtaining financial resources can be found in BA, BB and TT region (Western and Central Slovakia). HEI are dominant recipients mainly in BA and KE region (strong university base). SAV which are typical for CEE countries reach the highest share of project funding in BA and KE regions, but on the other hand it is not surprising because these regions have the most of research centers. This situation is illustrated on the following network graph:
The graph 1 similar to Tab. 1 indicate the relative strong dominance of HEI in the terms of project funding. The TT regions seems like the most balanced region, from the view of the sectoral structure. In TT and ZA regions are situated other research institutions, which obtained the most funding sources from European Programms in 2010.

In terms of intensity, it is interesting to compare the share of funds obtained from European Programms attributable to the number of inhabitants in each region and the share of patents on these funds. Leadings regions are BA, BB and KE in the first case but on the other hand BA and BB are lagging regions in the second case. Although one would expect that areas of Western Slovakia are leaders in the groups, on the contrary, central and eastern areas lead in the number of patent applications attributable to obtained funds from European programs. Note, patent applications entering the observations come from private and public institutions.
Fig. 3 – Intensity of R&D funding

Source: Self-processed
CONCLUSION

Using comparative analysis and spatial economy, this paper evaluates the project funding of research and development activities in 8 regions of Slovakia in year 2010. Note, that financial innovation systems in CEE countries are characterized with high dependence of private sector on the public funding, research institutions operating on two markets (quasi market for public funding and private market for funding of projects, products and services) and Academies of Science as typical vertically integrated institutions. Project funding in Slovakia is domain of HEI except for TN region. TN region is characterized by private project funding due to only one existing HEI in the area. The relative high share of private sector in the obtaining financial resources can be found in BA, BB and TT region, too. On the other hand, HEI are dominant recipients mainly in BA and KE region. The TT regions seems like the most balanced region, from the view of the sectoral structure (private sector, HEI, SAV, other research institutions). In the terms of intensity, readings regions are BA, BB and KE in the share of rogramms attributable to the number of inhabitants but BA and BB are lagging regions in the share of patents attributable to these funds.

BIBLIOGRAPHY


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