The Role of Higher Education Institutions in Developing Science, Technology and Innovation in Romania

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ABSTRACT  
Currently methods and modern techniques of knowledge transmission and changes in the geography of knowledge production are certainly notable. The discoveries made in research institutions in a country of innovators can be used in other parts of the world. Countries should not be indifferent and increase their share of research - the great achievements may have positive economic and academic effects through wide spreading - but should not be afraid of the multiplying discoveries elsewhere. Trans-border scientific collaboration as measured by the volume of publications written by co-authors from different countries has doubled in the last two decades. Undoubtedly more powerful research aspirations of developing countries have eroded long-term dominance of North America, the European Union and Japan.

KEY WORDS  
Tertiary education sector, staff in the research - development activity; expenditure on research-development; knowledge

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1. Introduction

"... if wise investments are not done in professors, if we do not respect them or involve them in making decisions, as do countries with top education, students pay the price ".

Weigarten Randi, president of the American Professor Federation

This paper aims to present the place and role of higher education institutions in developing science, technology and innovation in Romania between 2005-2010. The National Institute of Statistics latest in Science, Technology and Innovation presents and develops a much broader range of indicators structured in four chapters. A first indicator concerns the level and dynamics analysis of employees from research and development sector by performance.1

1 Employees from research-development activity, by sector of performance
2. Body of the paper

From our perspective this effort indicator illustrates the distribution aspect of R & D by sector and the absorptive capacity of sectors.

Table 1. The dynamics of employees in research and development by sector of performance between 2005-2010

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>41035</td>
<td>40758</td>
<td>42484</td>
<td>43502</td>
<td>42420</td>
<td>39065</td>
<td>-1970</td>
</tr>
<tr>
<td>Enterprises sector</td>
<td>16647</td>
<td>14438</td>
<td>13468</td>
<td>12144</td>
<td>11147</td>
<td>8691</td>
<td>-7956</td>
</tr>
<tr>
<td>Government sector</td>
<td>10258</td>
<td>8706</td>
<td>9185</td>
<td>10795</td>
<td>9018</td>
<td>8987</td>
<td>-1271</td>
</tr>
<tr>
<td>Tertiary education sector</td>
<td>13889</td>
<td>17444</td>
<td>19649</td>
<td>20363</td>
<td>22126</td>
<td>21179</td>
<td>7290</td>
</tr>
<tr>
<td>Private non-profit sector</td>
<td>241</td>
<td>170</td>
<td>182</td>
<td>200</td>
<td>129</td>
<td>208</td>
<td>-33</td>
</tr>
</tbody>
</table>

Source: Data taken and processed by NSI 2011 Statistical Yearbook of Romania Bucharest.

According to the statistical data and analysis in dynamics it can be observed that the overall employee level in this area between 2005-2010 decreased by about two thousand people, meaning a decrease of 4.8%. This decrease was due to lower employment of the staff: enterprise sector with approximately 8000 people, 1271 people in the government sector (-12.39%) and non-profit private sector by 33 people (-13.69%).

![Comparative evolution of employees in research and development, by sector of performance between 2005-2010](image)

Figure 1.

The only sector where the number of employees in R & D has increased significantly in the 6 years analyzed is tertiary education sector (Figure 1). In this sector the number of researchers increased by 7290 persons which represents an increase of over 50% compared to 2005.

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2 Employees (number) - end of year
It is known that many universities across the world have created a world renowned education system through their own centers/institutes of research and development.

![Figure 2](image-url)

**Figure 2.**

From structural point of view, the share of employees in research and development between 2005-2010 shows significant changes, if in 2005 the enterprise sector had 40% of total domestic researchers, in 2010 more than 54% of the researches are in the tertiary education sector, followed by the government sector with 23%. (Figure 2)

In our opinion this is due to the European projects launched in 2007 (as Romania entered in the EU) and the criteria imposed by the Ministry of Education in the doctoral school, the criteria for granting university titles and criteria for ranking institutions of higher education. Another indicator that NIS presents relates to the full-time employee level in the research and development activity. This indicator shows more accurately the human resources involved in the research and development sectors.

**Table 2. The full-time employee level in research and development by sector of performance between 2005-2010**

<table>
<thead>
<tr>
<th>Sector</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Shift 2010/2005%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. employees^3</td>
<td>Absolute (persons)</td>
<td>Relative (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>33222</td>
<td>29340</td>
<td>28977</td>
<td>30390</td>
<td>28398</td>
<td>26171</td>
<td>-7051</td>
</tr>
<tr>
<td>Enterprises sector</td>
<td>16157</td>
<td>13761</td>
<td>13107</td>
<td>11525</td>
<td>10758</td>
<td>8271</td>
<td>-7886</td>
</tr>
<tr>
<td>Government sector</td>
<td>10055</td>
<td>8381</td>
<td>8786</td>
<td>10312</td>
<td>8708</td>
<td>8704</td>
<td>-1351</td>
</tr>
<tr>
<td>Tertiary education sector</td>
<td>6803</td>
<td>7101</td>
<td>6931</td>
<td>8433</td>
<td>8824</td>
<td>9054</td>
<td>2251</td>
</tr>
<tr>
<td>Private non-profit sector</td>
<td>207</td>
<td>97</td>
<td>153</td>
<td>120</td>
<td>108</td>
<td>142</td>
<td>-65</td>
</tr>
</tbody>
</table>

Source: Data taken and processed by INS 2011 Statistical Yearbook of Romania Bucharest

^3 Employees (number of persons in full-time equivalent)
www.hrmars.com/journals 134
In this chapter decreases are more dramatic, if at the previous indicator the decrease in 2010 compared to 2005 was of 4.8%, according to the data below (Table 2) human potential in full time research employees has decreased with over 7000 people (-21.2%), of which 7886 people in the enterprise sector, 1351 persons in the government sector and 65 people in non-profit sector.

![Comparative evolution of full-time employees in research and development, by sector of performance between 2005-2010](image)

Figure 3.

Although in the tertiary education sector there is an increase of 2251 persons, this increase does not compensate for other sectors’ decreases. Unfortunately this means that in the sectors that create Gross Value Added, R & D activity is "dissolved" gradually.

![Structural changes of full-time employees in research and development by sector of performance between 2005-2010](image)

Figure 4.
If we develop the global university system, the importance given to the careful selection of high quality professional professors, these professors could be involved (in different ways) in an academic program, which enable the presentation of lectures (or pedagogical methods) at a broader level to many academic institutions. We believe that this approach would cause/increase further scientific work; so many colleges/institutions should optimize the teaching process and therefore would increase the universality of the academic process.

3. Conclusions
In conclusion, any national system of education - no matter where it is - has the obligation to provide all its citizens quality education. And the country must find ways to maintain in the national arena all those who would help (increase) the socio-economic development and/or increase academic prestige which subsequently recovers other generations.

References

*** Statistical Yearbook of Romania Bucharest NSI 2011
*** www.ins.ro