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EU STRUCTURAL FUNDS INVESTMENT IN R&D AND ITS INFLUENCE ON INNOVATION DEVELOPMENT – THE CASE OF UNIVERSITY OF LATVIA

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As innovations are a crucial component of economic development and as European Union (EU) is now facing disparities among its member countries in this field, the purpose of this study was to examine if and how the support of EU structural funds (SF) investment in research and development (R&D) has influenced innovation development in Latvia. It was decided to first evaluate this influence in a single research institution – despite the fact that it is only one institution, it might nevertheless help to understand the main issues and trends that Latvia and therefore EU is dealing with. University of Latvia (LU) was chosen for the study due to several factors, one of them being the large amount of implemented EU SF projects that are related to R&D. The current EU SF programming period 2007-2013 is soon ending and this kind of study is needed to plan strategies for the upcoming period.

The following tasks were addressed: to characterize the existing innovation and R&D environment in EU and in Latvia; to analyze several innovation indicators influenced by EU SF in LU in period of 2000 – 2010 and evaluate the changes in them since 2004, after the EU SF investment was made available; examine if situation regarding R&D and innovations in LU reflects the one observed overall in Latvia and develop proposals on how to improve it.

The following methods were used to carry out the tasks: study of periodical publications and legislation; interviews of both research and administrative personnel – 8 interviews were held by the authors; analysis and evaluation of statistical data.

It was examined that EU SF is the most important source of R&D funding at LU. The availability of EU SF has established an innovation-friendly environment, most essentially, it has provided necessary infrastructure, financial support for fundamental and applied research and extra work places for researchers. However, EU SF investment has not yet promoted an increase in the number of licensed or assigned patents and developed proposals for the commercial use of inventions. These indicators are low due to conditions of EU SF project implementation but mostly because of an insufficient demand from the private sector for the inventions made by researchers at LU. This information shows that situation in LU actually reflects the overall situation in Latvia – cooperation between private and higher education sectors is unsatisfactory and needs to be improved in order to minimize the technological and innovation gap between Latvia and innovation leaders in EU.

To prevent this kind of problems in the future, upcoming project applications should be evaluated, first of all, according to their capacity of innovation development. Cooperation with the private sector should be strengthened to promote increase in innovation output indicators on the basis of discoveries and inventions made by researchers at LU and to increase the proportion of other sources of funding for R&D and innovation.

Keywords: *Innovation, Research and Development, EU Structural Funds, University of Latvia, Innovation Indicators.*

Introduction

This study is focused on analysis of the influence of EU structural funds (hereinafter - SF) financial support for research and development (hereinafter - R&D) – if and how it promotes innovation development within a research institution and what are the positive and negative factors affecting the performance. This kind of evaluation is important – funding from EU SF is being received, but the question, whether it is invested efficiently and whether it contributes in the process of solving problems EU is facing, still remains open.

EU SF has become a large contributor in promoting R&D and innovations in Latvia - in the programming period 2007-2013, 737 million EUR are available for entrepreneurship and innovations – 16% of all available EU SF funding for Latvia (*EU funds > General information,* Ministry of Finance of the Republic of Latvia). However, despite this support Latvia still significantly falls behind EU and other leading economies when talking about R&D and innovation indicators.

This difference between Latvia (and other countries with similar innovation performance) and innovation leader countries in EU is significant and affects the overall economic development in EU negatively. Archibugi D. and Filippetti A. (2011) emphasize the fact that the recent economic crisis has affected new EU member states (including Latvia, which joined EU in 2004) especially bad and that it is also affecting the process of convergence in innovation performance by slowing down the reduction of regional disparities, which according to Archibugi D. and Filippetti A. (2011; 19) is a key factor for EU to compete with countries like USA, Japan etc.

They also emphasize that for EU to compete it is necessary to strenghthen the innovative potential of slowly developing countries.

In this situation it also valuable to look not only at a whole country or a region, but a single organizations as well – see if and how they reflect the processes and trends in EU. Doing this might help to understand all these issues better.

University of Latvia (hereinafter - LU) was chosen as the studied institution due to several factors – it is the largest university in Latvia; it performs R&D activities and invests in them. LU was also chosen due to the high number of R&D projects funded by EU SF it implements. Within this study the data on LU do not include inputs from units, which are acting on the rights of public agencies.

The purpose of this work was to examine, analyze and evaluate the influence of EU SF funding for the R&D and innovation development at the LU. The results of the study may be used in determining strategies for the upcoming period.

1) The following tasks were addressed to achieve the goal:
2) To characterize the existing innovation and R&D environment, including available funding options in Latvia;
3) To analyze the changes in the LU research capacity including several innovation indicators in period of 2000 - 2010;
4) To analyze and evaluate the sources and amount of R&D funding in LU;
5) To evaluate the changes in innovation indicators since 2004, after the EU SF investment was made available.

Within this study terms „innovation“ and „research and development“ were used according to the definitions given in OECD *Oslo manual* and *Frascati manual:*

1) Innovation - „an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method inbusiness practices, workplace organisation or external relations“ (OECD, 2005; 46);
2) R&D – „Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications“ (OECD, 2002; 30).

To characterize the influence on R&D and innovation, development, innovation indicators – „statistics that describe various aspects of innovation“ (Grupp Hariolf, Schubert Torben, 2010; 68) - were examined. According to Grupp Hariolf, Schubert Torben (2010; 68) „Individual indicators are generally partial, that is, they do not measure innovation as a whole“, therefore, a set if indicators were considered:

1) Funding for R&D;
2) Defended doctoral theses;
3) Researcher amount;
4) Publications referred in the *Web of Science* (hereinafter – WoS) database;
5) Patent applications;
6) Patents licensed.

Materials and methods

The following methods were used to carry out the tasks:

1) Study of periodical publications and legislation;
2) Interviews of both the research and administrative personnel in LU were held by the authors to gain knowledge about the positive and negative factors of attracting EU SF funding for R&D in means of promoting innovation development. So far 8 interviews have been held with employees from the following LU structural units/ projects:

- Department of Development and Planning (administrative personnel, 1 interview);
- Project in ERDF 2.1.2.1.2. sub-activity “Support for doctorate studies‘ implementation“ (administrative personnel, 1 interview);
- Project in ESF 1.1.2.1.2. sub-activity project (administrative personnel, 1 interviews);
- Project in ESF 1.1.1.2. activity „Human resource attraction to science“ project (administrative personnel, 1 interview);
- Project in ERDF 2.1.1.1. activity „Support for science and research“ (researchers, 3 interviews);
- Student who has received ESF funded scholarship (1 interview);

3) Analysis and evaluation of statistical data:

- *Eurostat*;
- *Central Statistical Bureau of Latvia*;
- LU annual reports – financial reports, scientific institution reports;
- EU SF project progress reports;
- Data provided by LU structural units – Department of Finance and Accounting, Department of Development and Planning etc.

As the funding is still being received, it is not yet possible to finalize the evaluation and the research is still ongoing – results achieved in projects are regularly updated and further evaluations will be done as the projects and programming period 2007-2013 end.

The first chapter in this article is about the overall innovation and R&D environment in EU and Latvia, the second chapter describes LU and its research capacity but the third chapter characterizes the changes in innovation indicators. The article is concluded with main conclusions and proposals.

Innovation and R&D environment in Latvia

Innovation plays a significant role in times of economic recession and especially in its receding stage, therefore, innovation is now very important to Latvia. However, the country falls significantly behind European Union (EU) average just as EU falls behind other leading economies in respect to the R&D and innovation indicators.

Numerous authors and EU policies emphasize the need for unified actions among EU countries. For example Pavitt (1998) mentions that technological differences between EU countries are far greater than those between EU leading countries and USA and Japan and that these differences harm living standards in EU. Pavitt described these issues even before the extension of EU in 2004 so we can probably assume that technologically less developed new member countries

slowed down the overall development of EU in different fields including R&D and innovation even more. Archibugi and Filippetti (2011) also describe this issue and refer to Sharp M. (1998) - „convergence in innovations influences European integration and is actually a crucial component of this process. Innovations can contribute in enhancing economic competitiveness of less developed EU regions". Lack of convergence in innovation activities can influence integration of technologically less advanced EU countries – those that are less developed could become dependent of innovation leader countries (Archibugi and Filippetti, 2011) and could also loose talented researchers who decide to do their researched in a more advanced environment.

These issues are also mentioned in *Europe 2020* (2010) - the crisis has made an impact on different areas including research and innovation and that has slowed down the development that Europe was experiencing before, therefore Europe now faces the need of transformation and change. (European Commission, 2010; 6). As many of EU member countries are among world's innovation leaders, lesser developed ones should be the ones integrated actively, because the best way for Europe to succeed, is to act collectively as a union (European Commission, 2010; 7). This is, however, quite challenging as the countries are experiencing problems of their own and each of the countries has achieved a different level of development. These differences can influence the overall development in a negative way and this is mentioned again in *Europe 2020:* „The 27 EU economies are highly interdependent: the crisis underscored the close links and spill-overs between our national economies, particularly in the euro area. Reforms, or the lack of them, in one country affect the performance of all others, as recent events have shown; moreover, the crisis and severe constraints in public spending have made it more difficult for some Member States to provide sufficient funding for the basic infrastructure they need in areas such as transport and energy not only to develop their own economies but also to help them participate fully in the internal market" (European Commission, 2010; 6).

Innovation gap between Europe and US, Japan and its reasons are also described in European Commission's *PROGRESS REPORT ON THE EUROPE 2020 STRATEGY* (2011) „Europe's research and innovation performance has not progressed satisfactorily in recent years, broadening an already important innovation gap vis-à-vis the US and Japan" (European Commission, 2011; 4) due to several facts including:

- Large number of European firms are present in more traditional, less R&D intensive sectors;
- Difficult access to finance;
- Relatively poor linkages between the "knowledge-triangle" across the EU etc. (European Commission, 2011; 5).

It is mentioned in *Europe 2020* that the main reason why the R&D spending in Europe (below 2%) still falls behind, for example, USA (2,6%) and Japan (3,4%) is below 2%, is the lower levels of private investment. It is also mentioned that focus should be on the impact and composition of R&D spending but not on the total amount of it (European Commission, 2010; 10). According to Freeman C., Soete L. (2009; 588), EU intended to reach a target of investing 3% of GDP (mostly funded by private sector) by 2010, but most enterprises were more willing to improve their own efficiency or enhance their global competitiveness, by developing innovations needed in market.

The *Innovation Union Scoreboard 2011* (2012) (hereinafter – *IUS 2011*) shows that Latvia ranks last among the 27 surveyed countries in the overall innovation performance in EU, while Estonia is ranked 15th and Lithuania 25th (Maastricht Economic and social Research and training centre on Innovation and Technology, 2012; 7). The growth of the innovation performance - 2.71 % - has not increased since 2010. According to *IUS 2011,* Latvia is a modest innovator with a below average performance and has relative strengths in the areas of human resources, firm investments, intellectual assets and economic effects (Maastricht Economic and social Research and training centre on Innovation and Technology, 2012; 37).

According to *Central Statistical Bureau of Latvia*, in the period 2006-2008, 26,9% of manufacturing companies and 14,5% of services providing companies in Latvia were innovative. Since this study is done every two years, the most recent data are not yet available (*Pieejamo tabulu saraksts tēmā: Inovācijas (Tables available on topic: Innovations)* Central Statistical Bureau of Latvia).

Innovation environment is closely linked to the development of R&D – research is essential for technological innovations. Table 1 summarizes the amount of institutions (including enterprises and organizations) performing R&D and research personnel in full time equivalent (FTE) in Latvia from 2008-2010.

Table 1. Institutions in Latvia engaged in R&D activities and number research personnel FTE, 2008-2010

	Institutions			Personnel (FTE)		
Sectors	2008	2009	2010	2008	2009	2010
TOTAL	463	321	318	4370	3621	3807
HE	41	38	37	3032	2596	2629
Public	22	19	14	851	708	567
Private	400	264	267	487	317	611

Source: *Science – Key Indicators Central Statistical Bureau of Latvia*

Table 1 shows that the total amount of both – research institutions and personnel – has decreased since 2008 which could mostly be explained with the economic recession, which caused a rapid decrease in R&D funding.

Research activities in Latvia are mostly concentrated in Riga and Riga Planning Region, but gradual development of research capacity can be seen in other regions as well (*Fact sheet Science* Ministry of Education and Science of the Republic of Latvia). According to a study by *Technopolis Group* (2011) the leading science and research centers in Latvia are *University of Latvia*, *Riga Technical University*, *Rīga Stradiņš University* and *Latvia University of Agriculture*, but the leading sectors are information technology, logistics, food processing and metalworking/ processing (Technopolis group, 2011; 18).

In 2010, 5409 workers (full time equivalent) were employed in research, 3807 of them were research workers, the others – technical and administrative staff supporting

research activities (*Pieejamo tabulu sarakts tēmā: Zinātne (Available data on topic: Science)* Central Statistical Bureau of Latvia). However, according to *Zinātnes un tehnoloģijas attīstības pamatnostādnēm 2009. – 2013.gadam* (*Guidelines for Science and Technology Development 2009-2013*) at least 2000 research workers are needed per 1 million inhabitants to ensure productive science development (Ministry of Education and Science of the Republic of Latvia, 2009; 16) – considering that in 2010 there were 2 248 374 inhabitants in Latvia (*Pieejamo tabulu saraksts tēmā: Iedzīvotāji – skaits un tā izmaiņas (Tables available on topic: Inhabitants – number and its changes)* Central Statistical Bureau of Latvia), it can be concluded that there were 1694 scientists per million inhabitants, which is insufficient.

Despite an increase since 2000, the number of Patent Cooperation Treaty (hereinafter - PCT) patent applications is low – 3 applications in 2000, 21 in 2007 and 26 in 2010 (*World Intellectual Property Organization Statistics on the PCT System)*. According to *IUS 2011*, Latvia ranks 22nd when evaluating PCT patent applications per billions of GDP among EU27, which is below average (Maastricht Economic and social Research and training centre on Innovation and Technology, 2012; 87).

According to *Development of Science and Technology in Latvia, 2011* report (Ministry of Education and Science of the Republic of Latvia, 2011; 25) „a continually low level of public and private sector investment and an insufficient number of employees in the research work has been the basis for Latvia's relatively low ratio (i. e., 132 publications per million inhabitants in 2008) of the number of international scientific publications per million inhabitants." According to *IUS 2011*, the number of research publications among the top-10% most cited publications worldwide as % of total research publications of the country, in Latvia is the lowest among 27 countries surveyed. There has been a strong decline of this indicator over the past 5 years - almost 10% per year (Maastricht Economic and social Research and training centre on Innovation and Technology, 2012; 78-79).

A significant indicator of the financial support for R&D is expenditure in R&D as % of GDP, which in Latvia according to *Development of Science and Technology in Latvia, 2011* report (Ministry of Education and Science of the Republic of Latvia, 2011; 13) has increased more than 2.8 times since 2000. Expenditure for R&D in % of GDP in Latvia from 2008-2010 is shown in Table 2.

Table 2. Expenditure in R&D in Latvia from 2008–2010, % of GDP

Sector	2008	2009	2010
TOTAL	0,61	0,46	0,6
Private	0,15	0,17	0,22
Public	0,17	0,11	0,14
Higher education	0,29	0,18	0,24

Source: *Eurostat Statistics, Main Tables*

Table 2 shows that total expenditure in R&D has decreased from 2008 which was mostly due to two factors:

1) An economic recession at that time;
2) A decrease in EU SF funding that was caused by the gap between programming periods.

However, the funding intensity has slightly recovered since 2009. Table 2 also shows that the most investments in R&D are accumulated in the higher education (hereinafter – HE) sector.

According to a study by *Technopolis Group* (2011), the private sector is the innovation driving force in Europe's innovation „hot-spots" – highly innovative regions such as Nordic capital regions etc. In these regions, private investments make more than 60% of total expenditure in R&D. In case of medium-high innovators, for example east Finland, northern Sweden, rural parts of Denmark and Estonia (Estonia between 2nd and 3rd groups), investments in R&D are driven by all three – public, HE and private sector (the last with a higher performance). Low to medium-low innovators – such as Latvia and Lithuania - are driven essentially by public and HE sector investments (Technopolis group, 2011; 5).

Despite the fact that the private sector was the only sector showing an increase in terms of private sector investment in R&D in Latvia since 2008 (Table 2), Latvia still falls behind its neighboring countries Lithuania and especially Estonia. While in 2010 this indicator in Latvia was 0,22% of GDP, it was 0,23% in Lithuania and 0,81% in Estonia. In Finland which is one of innovation leaders in EU, this indicator in 2010 was 2,69% of GDP (*Eurostat Statistics, Main Tables)*. In Finland and also in Estonia the majority of R&D funding comes from the private sector, which could be one of the reasons of their success.

One reason for the low amount of private investments in R&D according to Looy B. Van et al. (2011; 555), is that „basic scientific research is characterized by uncertain outcomes and long time frames before exploitation on markets becomes feasible." Therefore, investing in such activities is a challenge for profit oriented enterprises, who might avoid investing large sums in them (Looy B. Van et al. (2011); 555). Low amount of public and private sector investments in R&D is one of the main reasons for slow development of innovation, applied research and commercialization of research results in Latvia (Ministry of Education and Science of the Republic of Latvia, 2011, „Par uz rezultatīvajiem rādītājiem orientētu augstākās izglītības un zinātnes finansēšanas modeli un priekšlikumiem plāna ietvaros paredzētās valsts augstākās izglītības institucionālās reformas un augstākās izglītības un zinātnes pārvaldības modeļa reformas sekmīgai īstenošanai"; 23). Cooperation between sectors, especially private and HE sectors should be promoted.

The support from EU SF has improved the situation in the field of innovations and R&D in EU and especially in Latvia. In the programming period 2000-2006, where EU SF were available for Latvia starting with 2004, in EU 29,5 billion EUR were invested in R&D and innovation and, it is planned that during the current programming period from 2007-2013 these investments in all EU taken together will make up to approximately 70 billion EUR (León, L.R., Miedzinski, M., Reid A. of Technopolis Group (2011); 8).

Total amount of EU SF funding allocated for Latvia in current programming period is 4,53 billion EUR. Most of the funding is planned for transport and information and communication technologies (29,9%), while the amount for entrepreneurship and innovation it almost three times smaller

- 11,6% and for R&D only 5,9% of total available funding *(Division of EU total funding* Ministry of Finance of the Republic of Latvia). SF support in 2007-2013 is managed through 3 operational programs (OP). European Social Fund (ESF) investments are managed through the 1st OP *Human Resources and Employment*; European Regional Development Fund (ERDF) investments are managed through the 2nd OP *Entrepreneurship and Innovations*; ERDF and Cohesion Fund investments are managed jointly through 3rd OP *Infrastructure and Services* (*EU funds > General information,* Ministry of Finance of the Republic of Latvia). Latvia can also receive EU SF support for innovations through *European Territorial Co-operation objective* programmes (hereinafter – ETS).

In conclusion, the main characteristics of innovation and R&D environment in Latvia are:

- Funding amount and intensity for R&D (% of GDP) in Latvia is one of the lowest in EU;
- Most of the funding for R&D and innovation comes from public funds and is invested in the HE sector;
- Most of the private sectors expenditure in R&D is invested back into the private sector (*Science – Key Indicators* Central Statistical Bureau of Latvia), which shows the lack of cooperation between the public and private sectors;
- The amount of research personnel in Latvia is insufficient;
- Intellectual asset indicators are below EU average.

Performance of EU member states in different fields are closely linked, therefore, in order to increase the overall performance of the EU regarding R&D and innovation, it is necessary for countries with performance below EU27 average to work hard enhancing it and this should be achieved starting with the organization level. Therefore, as situation in country level has so far been examined in this paper and it is also necessary to find out if the situation in a single organization also reflects these trends, the next part of this article will cover situation with R&D and innovation in University of Latvia – a research institution chosen for the study.

The structure and research capacity of University of Latvia

LU is state founded derived public legal person, which operates according to *Constitution of the Republic of Latvia*, *Education Law*, *Law on Research Activities*, *Law on HE Institutions* and other normative acts, *Constitution of LU* and international rules governing universities (*Organizational Scheme* University of Latvia).

Rasmussen E., Moen Ø., Gulbrandsen M. (2011; 520) state that many universities have established support units for patenting and licensing. LU has also established several structural units providing assistance in enhancing research capacity – project proposal submission, patent application etc. – and communicating with private and public sector organizations as well. One such unit is the Department of Development and Planning, which includes LU Innovation Centre. The purpose of the Innovation Centre is to coordinate innovative activities, technology transfer and intellectual asset commercialization.

In 2010, 2954 employees were employed in LU and scientific personnel[1] reached 849 (full time equivalent), which, in comparison with 2000, shows a 24% increase. The first significant increase in scientific personnel was in 2006, when it increased by 15% in comparison to 2005. The rapid increase continued in 2007 as well. It can be explained by the increase in several budget lines – allocations for research within HE institutions, EU SF funding for research activities and other projects and which were first made available after the admission of Latvia to EU in May 2004.

Research activities in LU and its capacity are also reflected by the intensity and results of the Doctoral studies. The amount of defended Doctoral theses has increased significantly from 11 in 2000 to 85 in 2010. One of the main reasons for this is the implementation of ESF scholarship project „Support for Doctoral studies in University of Latvia“ in 1st OP‘s „Human resources and employment“ 1.1.2.1.2. sub-activity “Support for doctorate studies‘ implementation“. Year 2010 was the first when those who received the scholarship during this project defended their theses. In comparison to 2009, the number of defended theses consequently increased by 57% (*Financial reports 2000-2010 and research institution reports 2006-2009* University of Latvia.) This project might also have influenced the total amount of Doctoral students in LU because some of them might have entered the programs anticipating availability of the scholarships, but further research on this topic is needed.

The main outcome of Doctoral studies and other types of research is not only awarded degrees and published papers, but intellectual property as well. Since 2000 (including) LU has submitted 36 patent applications - 4 of them European patent applications (*Financial reports 2000-2010 and research institution reports 2006-2009* University of Latvia) and only two PCT patent applications (*WIPO Patentscope* World Intellectual Property Organization). However, the low number of patent applications does not mean that the research process has no results to commercialize - patent application is expensive and is often not needed or appropriate to defend the invention. The number of patent applications is not a priority indicator of commercialization potential in all research fields. This indicator is also commented in one of the interviews with an administrator of the ERDF project „Development of technology transfer contact-point in University of Latvia“ (2nd OP’s „Entrepreneurship and Innovations“ sub-activity 2.1.2.1.2. „Technology transfer contact-points“) - for a research institution patent registration is a side operation. Targets related to profit generation from patent registration should not be set. At this moment LU does not have any notable income from patents, only costs, therefore, patent application should be evaluated beforehand (Interviews held by the authors).

According to Rasmussen E., Moen Ø., Gulbrandsen M. *(2011; 521)*, common output indicators for the contribution that universities make to economic development through commercialization of research are the number of licenses and spin-off companies. The number of licensed patents by LU (just one) and 2 assigned patents (*Financial reports 2000-2010 and research institution reports 2006-2009* University of Latvia)

[1] Employees with higher education engaged in research activities (this indicator is calculated in accordance with the form for „1-pētniecība” report that LU submits to Central Statistical Bureau of Latvia.

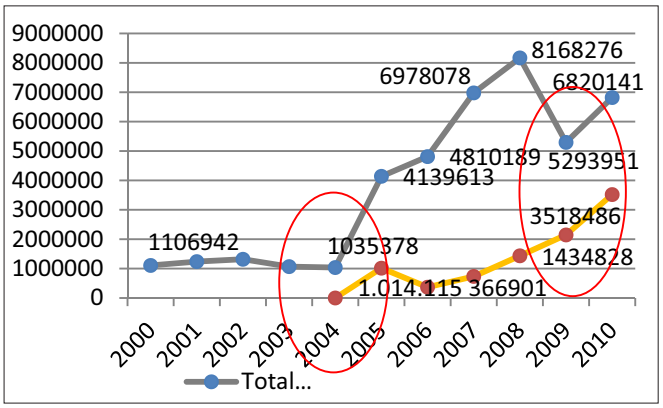
reflects the lack of cooperation between entrepreneurial sector and LU, the lack of promotion activities, etc. Since the number of licensed patents is low the need for investing in filling out the patent applications may be a challenge.

Research capacity of LU is significantly influenced by budget income and structure. The main budget income sources are:

- State allocations for HE;
- Income from tuition fees;
- EU SF projects;
- Research base support funding for research institutions, since LU is registered as a research institution since 2006, and other financial support determined in *Law on Research Activity. (*University of Latvia, 2011; 229)

In period 2000-2010, LU budget income has overall increased, however, in 2009, after a decrease in state budget funding for HE, R&D and due to a gap between two EU SF programming periods, the total budget income decreased by 27.5% in comparison to 2008. However, mostly because of funding from EU SF, LU budget income increased again by 28,9% in 2010, which was the highest LU budget income in period 2000-2010.

Part of LU budget is allocated to R&D activities. Till 2008 largest amount of R&D funding in LU came from research base funding and funding for research activity development and infrastructure, but starting with 2009 EU SF funding makes the bulk of the funding. In 2010, it reached almost 52% of total R&D funding in LU. Meanwhile income from research contracts with local or foreign enterprises made just 3% of total R&D funding – this indicator reflects the low demand from private sector for the services provided by LU *(*University of Latvia, 2011; 229).



Edited by author, source: (University of Latvia, 2011; 229)

Figure 1. Total R&D funding and EU SF funding in LU 2000-2010, Ls

Figure 1 shows the influence that EU SF investment has on total R&D funding in LU – it increased significantly during the years when a more rapid increase in EU SF funding took place.

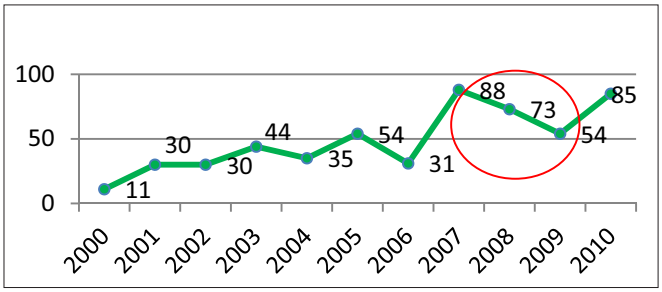
Increase in EU SF investment can be considered positive, because in general it is very important to attract funding for R&D in Latvia. The negative aspect of this increase is the high proportion of EU SF funding among all the possible sources (52% of total R&D funding 2010 in LU), not only because the private sector should be the driving force of innovation and R&D, but also because R&D activities become dependent mostly of this funding and might face financial support problems in the future, especially during the next period of transition from the current EU financial programming period to the next one (2014-2020). Another negative aspect of EU SF investments is the restrictions for commercial use of the results achieved in EU SF project implementation (patents, products developed etc.) – "If the co-operation authority establishes during the project implementation or within five years after the end of the deadline for the project implementation that a project not connected with economic activity does not conform with the criteria referred to in Sub-paragraph 3.1 of these Regulations, the public financing granted without justification shall be deducted as a percentage from the total eligible costs of the project and repayable to the State budget" (Cabinet of Ministers of the Republic of Latvia, 2009).

Non-commercial projects are the ones implemented the most because of the beneficial ERDF funding rate – in the case of projects connected to commercial activity ERDF funding is less but the projects can be used in commercial activities.

EU SF projects implemented in LU and their results

LU started to implement EU SF projects in 2004. In 4 of EU SF activities in programming period 2007-2013 research projects are being implemented. Expected results in several projects include at least one of innovation indicators examined in this study, but some activities were started recently, therefore any significant results have not yet been achieved.

One of the projects, in which results can already be observed, is a project in ESF sub-activity 1.1.2.1.2. - doctoral students and doctoral candidates, that are taking part in this project, are awarded ESF funded scholarships during their studies. The influence that this project has on the total amount of defended doctoral theses is shown in Figure 2 – the number of theses defended has decreased in the period where a gap between the implementation of two ESF scholarship projects occurred.



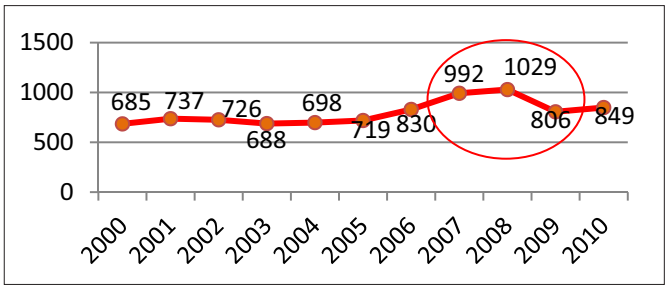
Edited by author, source: *Financial reports 2000-2010 and research institution reports 2006-2009* University of Latvia

Figure 2. Defended doctoral theses in LU, 2000-2010

The administrators of this project or the former students who received the Doctoral scholarship were also interviewed within this study and admitted that this project has motivated students to engage in R&D activities and to take up working within the research programs (Interviews held by the authors).

Implementation of R&D projects within period 2007-2013 in LU first began in ESF activity 1.1.1.2. „Human resource attraction to science", which is aimed at the involvement of human resources in research. The results achieved within this

activity till the third quarter of 2011 were examined during this study. Increase of several innovation indicators are also among the deliverables – number of researchers, defended Doctoral theses, patent applications and publications. Other deliverables are planned within this activity as well, but they are very fragmented, mutually incomparable and not aimed at a unified goal. However, some conclusions may be drawn from the results considering innovation indicators. Figure 3 shows the changes in scientific personnel (full time equivalent) in LU in 2000-2010.



Edited by author, source: *1-pētniecība (HE institution's reports of implementation of scientific operations 2000-2010*, University of Latvia

Figure 3. Scientific personnel in LU (FTE), 2000-2010

A decrease can be seen starting from 2008, which might have mainly occurred because of a decrease in overall researcher amount in Latvia at that time (Table 1). As the interviewed researchers and other respondents have indicated (4 of 8 interviews) (Interviews held by the authors), the ability to take part in EU SF projects have been a motivator to continue their work in HE sector, therefore it is possible to assume that the drop in LU researcher numbers would be much steeper without EU SF investments.

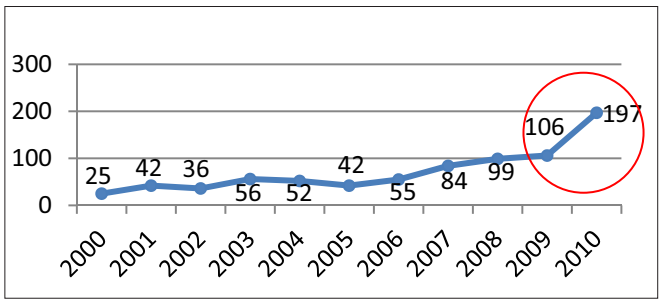


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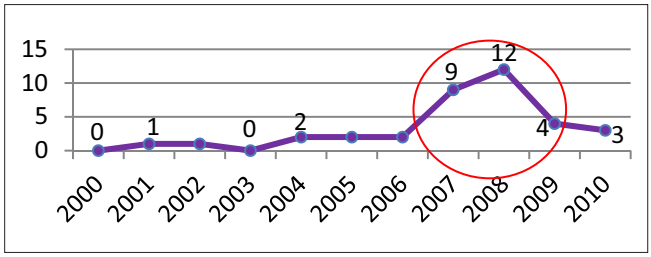
Figure 4. LU Publications (WoS), 2000-2010

Figure 4 shows that there has been an increase in amount of publications in 2010 – as publications are one of the main results in two ESF activities, projects implemented within them might be one of the causes for this increase. This can be assumed due to the fact that 189 publications within projects in ESF 1.1.1.2. activity are expected and approximately 90% of them have been published in period 2009-2011.

Figure 5 shows the changes in patent applications in LU in 2000-2010.

Till 2009 the patent application curve shows a similar pattern as the one reflecting changes in total R&D funding in LU (Figure 1). The increase seen in 2008 was mostly caused by ERDF projects in the previous planning period where patents were one of the results. EU SF funding could have also had some indirect influence such as motivation for researchers. Most of LU patent applications in 2000-2010 were local – one of the reasons for this might be the restrictions of commercial use - international patent application is more expensive and the restricted possibilities and complicated procedures to use them in commercial activities might prevent the applications.



Edited by author, source: *Financial reports 2000-2010 and research institution reports 2006-2009* University of Latvia

Figure 5. LU patent applications, 2000-2010

Figure 5 shows that the number of patent applications did not increase in 2010 when funding for R&D increased, therefore it might be assumed that EU SF funding in this programming period has not yet significantly influenced it. The reason for this is that EU SF projects targeted towards innovation within the current programming period (ERDF 2.1.1.1. activity) were started only at the end of 2010 or beginning of 2011, so the planned contribution to increase in patent number is still on the way. The number of patent applications should increase significantly in future - 21 international patent filings are planned. However, the restrictions for commercial use of these patents would again be applied and this would not improve the situation with licensed patents and developed proposals for commercial use of inventions. This will most likely create a situation where investments have been made, a patent has been registered, but is not licensed and later used in any commercial activities and therefore the ultimate purpose of patent filing is not achieved.

As mentioned previously, 8 interviews were held by the authors in order to deepen the analysis. All persons interviewed consider the EU SF investment in R&D being a positive factor for innovation development (Interviews held by the authors). Some other positive outcomes mentioned are the following:

- Adds additional funding for R&D (4 of 8 interviews);
- Initiates additional fundamental applied research that would not be carried out without these investments (5 of 8);
- Provides the ability to increase the number of researchers (4 of 8) or increase salaries for the ones already employed (2 of 8), gives the opportunity to attract researchers from foreign countries (1 of 8);
- Gives the opportunity to implement large scale projects that require massive investments (1 of 8);
- Improves the infrastructure needed to for R&D activities (5 of 8);
- Enhances the quality and productivity of research (3 of 8) through the need to achieve anticipated results in a given period of time (1 of 8).

- Supports publicity and funding available for publicity events (1 of 8).

Some negative factors were mentioned during the interviews as well:

- Administrative burdens, requirements, which are hard to meet and which also interfere with R&D commercialization activities (5 of 8);
- Restrictions for commercial use of project results (4 of 8);
- Imbalanced and inelastic investment flow between projects, project activities (2 of 8);
- Poor linkage between ES SF activities and projects (2 of 8);
- Lack of direct incentive for the research personnel involved in EU SF projects to cooperate with the private sector, which is a must for innovation development (1 of 8 interviews).

The innovation related indicators described in this paper were influenced by a lot of processes taking place at that time, but the statistics and changes in them nevertheless reflect one of the main reasons why it is hard for Latvia to integrate in EU in terms or R&D and innovation – one of the main obstacles that slows down Latvia's research institutions' inclusion in EU research environment is the low amount of private funding for R&D. To support Latvia's integration, cooperation between sectors should be initiated in organizational level and the situation in LU shows that very clearly.

Conclusions

From 2007 – 2010 LU has begun implementation of 69 EU SF projects, which have contributed to such indicators as:

- Doctoral students and Doctoral theses;
- Number of research publications.

EU SF funding has also contributed to the number of employed researchers and quality of research – increased motivation and possibility to take part in different projects might have prevented the decrease in the number of researchers from being more rapid (Figure 3).

One of the problems indicated during the research - lack of cooperation between private and HE sectors – is reflected by the number of LU patent applications, licensed patents and developed proposals for commercial use of inventions, which is low; the contribution from EU SF projects in current programming period still cannot be traced.

Another issue that is important for innovation development not only in LU, but in broader sense as well, is lack of convergence in innovation activities. This is reflected by the results in EU SF projects implemented in LU - they can be considered as a significant gain in strengthening LU research capacity, but the deliverable outcomes sometimes are not:

- Easy to compare and categorize;
- Directed towards innovation development;
- Coordinated among EU SF activities in Latvia and other research projects implemented at the university.

To increase the potential of commercialization of the results from the projects funded by EU SF and to reduce the risk of inefficient investments:

- Coordination of R&D and innovation activities starting at organization and ending with regional level are essential;
- Before submitting any new projects in the future, a pre-selection should take place - project proposals should be evaluated according to their eventual contribution to innovation development.

Each organization should engage in activities that match specific priorities or their strengths. This would not only make cooperation between all levels more possible, but would also allow less developed regions to gain access to different resources, allow combination of resources and prevent research organizations from implementing similar or analogous activities. These types of activities might reduce the differences in innovation development between EU countries.

The overall conclusion is that Latvia faces number of challenges in order to reduce the gap in innovations between innovation leaders in EU. EU SF funding for R&D has been a significant contributor in this process - the development of LU research capacity and has secured implementation of R&D activities in time of economic recession. It has provided environment appropriate for R&D and innovation development, but the efficiency of outcomes in form of innovative products, cooperation with private sector etc. is still to be improved – there is a lack of convergence in EU SF activities and projects implemented, and lack of inter-sector cooperation. The activities to be considered in this regard should be directed towards facilitating information exchange and cooperation between HE and entrepreneurial sectors:

- Informative seminars, printed materials un TV broadcasts with the aim to inform possible investors etc. about LU research achievements, success stories and products/ services offered;
- Public lectures for entrepreneurs and scientists to explain cooperation possibilities and gain from them;
- Development of attractive and easy to use web page of the LU Innovation Center.

More research on this should, however, be done, to examine if publicity events have had some positive influence before and would in the future, but nevertheless LU should establish its Innovation Centre as the main link between an entrepreneur and a researcher and encourage entrepreneurs engage in R&D activities by directly addressing them more often, thus improving innovation development and exploitation of intellectual assets in LU.

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