

## **PROBLEMS IN FINANCING THE DEVELOPMENT OF INNOVATION AND SCIENCE**

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**Abstract.** From year to year, sources of finance and the efficiency of their use is one of the key issues concerning contributing to the development of innovation and science. In identifying and analysing related problems, the author particularly focused on examining the factors influencing the problems.

The research aim is to examine trends and problems in financing the development of innovation and science in Latvia. The following specific research tasks were set: to identify the change in Latvia's competitiveness among the Baltic States based on the Global Competitiveness Index, to perform an analysis on the attraction of investments contributing to science and innovation, to analyse the factors influencing it based on a survey of experts and to assess the factors hindering the attraction of venture capital.

The research employed the qualitative and quantitative methods of economic analysis: monographic, logical construction, SWAT analysis, an expert survey, and analysis and synthesis. The research revealed important changes in the field of fostering the development of innovation and science, analysed the application of a new management model and the establishment of an institutional framework in Latvia for the period 2014-2020 as well as highlighted the problems in financing the development of science and innovation and the necessity to solve the problems.

**Key words:** innovation, expenditure on science, R&D costs, venture capital investment, Latvia.

**JEL code:** G24, G28, G32

### **Introduction**

A model for the support of science, technology and innovation, the efficiency of its use and the identification of opportunities for enhancing the model are important to contribute to growth in the national economy through orientating towards the production and exports of higher value-added products. From year to year, sources of finance and the efficiency of their use is one of the key issues concerning contributing to the development of innovation and science. In identifying and analysing related problems, the author particularly focused on examining the factors influencing the problems, including those in the field of attraction of venture capital.

The research aim is to examine trends and problems in financing the development of innovation and science in Latvia. The following specific research tasks were set in line with the aim: to identify the change in Latvia's competitiveness among the Baltic States based on the Global Competitiveness Index, to perform an analysis of the attraction of investments contributing to science and innovation, to analyse the factors influencing it based on a survey of experts and to assess the factors hindering the attraction of venture capital.

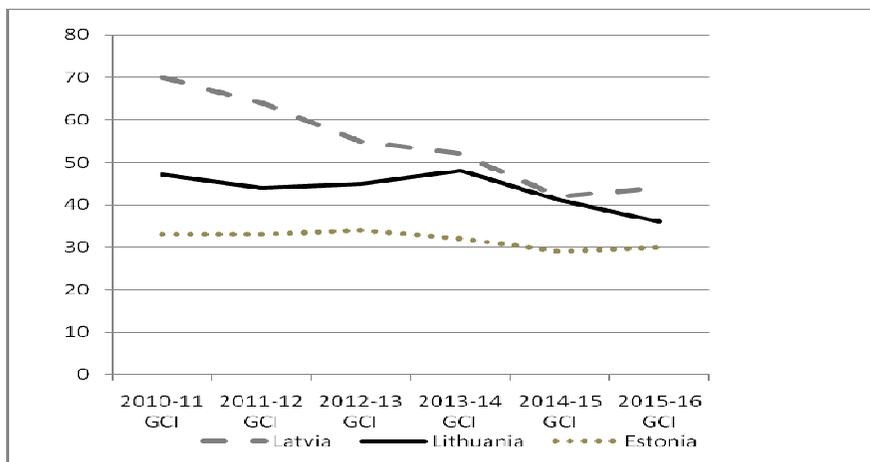
The research employed the qualitative and quantitative methods of economic analysis: monographic, logical construction, SWAT analysis, an expert survey and analysis and synthesis. The research analysed data of the Global Competitiveness Report, opinions of the members of the Latvian Association of Private Investors as well as published opinions and forecasts of several experts on venture capital investments and data of the European Central Bank.

### **Research results and discussion**

#### **1. Factors influencing and trends in Latvia's global competitiveness**

On the current globalisation conditions, the growth and stability of any country are determined by the capacity to support and finance innovation, including applied research and development. It is of great importance for industries associated with the wellbeing and life quality of individuals: medicine, manufacture of pharmaceuticals, biotechnology, manufacture of food products and telecommunication and information technologies. According to the Global Competitiveness Report 2015/2016, Latvia is ranked the 44<sup>th</sup> (a rise by 26 places). Latvia still

lags behind Estonia, which holds the 30<sup>th</sup> place,



Source: author's construction based on data of the Global Competitiveness Report

Fig. 1. Latvia's rank in the Global Competitiveness Index among the Baltic States

However, one can notice that Latvia has not maintained its achievement in 2014-2015 (the 42<sup>nd</sup> place) and start losing its development pace to the other Baltic States. To examine the causes, the author analysed a number of indicators: increase in investment in R&D and the introduction of innovations in production, support to enterprises for the development of innovations, attraction of private sector funds to finance R&D, information availability, venture capital availability and opportunities to attract venture capital investors, intellectual property protection etc.

It was important to examine the trends and the factors presenting progress and requiring considerable improvements.

Science, technology and innovation are a set of achievements to be used by industries of the national economy that make the basis for economic growth, orientating towards the production of higher value-added products (Cabinet of Ministers, 2013a).

As shown in Table 1, particularly the Baltic States could present the fastest growth in 2015 in terms of innovation. Both Estonia and Lithuania significantly increased their expenditure on research and development in the public and

business sectors. In contrast, Latvia was able to allocate more funds for research and development only in the public sector, whereas the expenditure considerably decreased in the business sector.

With regard to the European Strategy 2020 for a Clever, Sustainable and Integrated Development, there is an emphasis on the necessity to promote the results of R&D in manufacture and especially on promoting co-operation between businesses and scientific institutions. Taking into consideration the obstacles for businesses – foreign business cultural differences and the climate, legal framework specifics etc. –, the EU envisions a simplification of cross-border business transactions as well as the need to stimulate the introduction of research results in manufacture (Mezeniece M., 2013).

Support measures for science, technological development and innovation in the period 2009-2013, implemented by the Ministry of Education and Science and the Ministry of Economics and funded by the EU Structural Funds, were very important, as investments by the public and private sectors in research, science and innovation were very small in this period.

**Investment elements included in the Innovation Union Scoreboard in 2011 and 2015**

<b>Current performance</b>	<b>2011</b>					
ENABLERS	EU27	EE	LV	LT	FI	SE
<b>Finance and Support</b>						
R&D expenditure in the public sector	0.76	0.79	0.38	0.56	1.10	1.07
Venture capital	0.095	N/A	N/A	N/A	0.145	0.212
<b>FIRM INVESTMENTS</b>						
R&D expenditure in the business sector	1.23	0.81	0.22	0.23	2.35	2.35
Non-R&D innovation expenditure	0.71	1.77	1.20	0.76	0.57	0.74
Current performance	<b>2015</b>					
ENABLERS	EU28	EE	LV	LT	FI	SE
<b>Finance and Support</b>						
R&D expenditure in the public sector	0.72	<b>0.9</b>	<b>0.43</b>	<b>0.71</b>	1.01	1.01
Venture capital	0.062	N/A	N/A	N/A	0.083	0.078
<b>FIRM INVESTMENTS</b>						
R&D expenditure in the business sector	<b>1.29</b>	<b>0.83</b>	0.17	<b>0.24</b>	2.29	2.19
Non-R&D innovation expenditure	0.69	1.55	<b>1.38</b>	<b>1.1</b>	0.37	<b>0.79</b>
	<b>Rank</b>	<b>15</b>	<b>30</b>	<b>29</b>	<b>4</b>	<b>2</b>

Factors that presented positive increase in 2015 compared with 2011

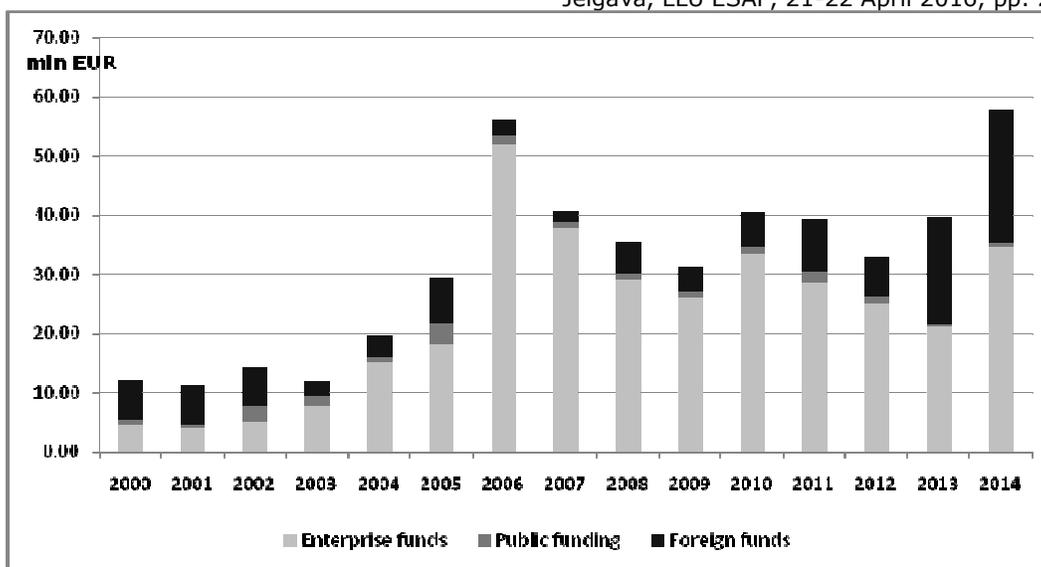
**Source: author's construction based on data of the Innovation Union Scoreboard 2011 (IUS 2011) and Innovation Union Scoreboard 2015 (IUS 2015)**

Investment by the private sector in research and development in Latvia (0.2% of GDP) was much smaller than in the EU-27 (1.2% of GDP), including Estonia (1.5% of GDP), which could be explained, to a certain extent, by the high proportion of small enterprises (approximately 18%) that operated in the field of high and medium technologies (Cabinet of Ministers, 2013a).

However, according to the Central Statistical Bureau of Latvia, a positive trend may be observed – the amount of foreign funds spent on scientific and research work in the business sector increased, particularly in 2013 and 2014 (Figure 2).

The number of enterprises of Latvia that made significant investments in research and development increased, as reported in the

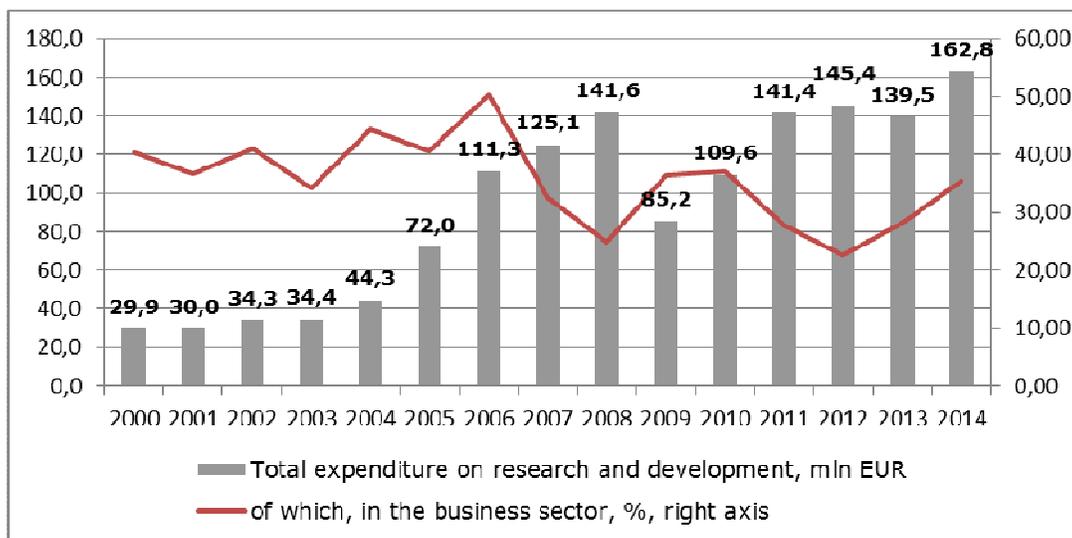
Research, Technological Development and Innovation (RTDI) Framework 2014–2020. According to the Central Statistical Bureau of Latvia, 264 enterprises made investments in research and development in 2009; in 2010 their number equaled 267, while in 2011 the number of such enterprises rose to 393. Nevertheless, efforts have to be made in order that the private sector invests in research and development more than half of total investment, which is typical of the EU-27 and some innovative economies (approximately 65% in Finland and 57% in Sweden), thereby making the national economies of the countries competitive in the global market (Cabinet of Ministers, 2013a).



Source: author's construction based on data of the CSB, 2015

Fig. 2. Expenditure on research and development in the business sector in Latvia in 2000-2014, mln EUR

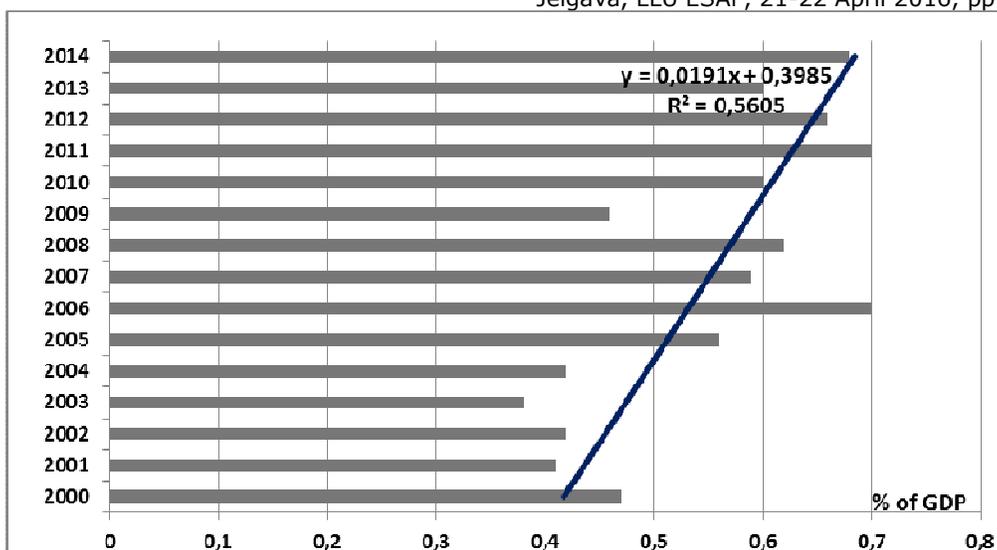
However, expenditures on scientific and research work in the business sector, as a percentage of the total expenditure on R&D, ranged within 25-35% in the post-crisis period (2012-2014) (Figure 3).



Source: author's construction based on data of the CSB, 2015

Fig.3. Expenditure on research and development in the business sector in Latvia, as a % of the total expenditure on R&D

Latvia has succeeded in having a positive trend with regard to increase in expenditure on R&D if measured as a percentage of GDP (Figure 4).



Source: author's construction based on data of the CSB, 2015

Fig. 4. Expenditure on research and development in Latvia, as a percentage of GDP

However, the level achieved is not sufficient to tackle a number of long-accumulated problems that mainly relate to government policies on science and innovation. In Latvia, for example, the aging of human resources is observed in the science industry – 42% of researchers were aged 50 and older in 2013. The largest problem of aging was reported in the science of mathematics, as 77% of researchers were aged 50 and older and in the sciences of physics, chemistry and biology where 44-47% were aged 50 and older. The highest proportions of young scientists and researchers were reported for computer sciences and informatics as well as land and environmental sciences (Cabinet of Ministers, 2013a).

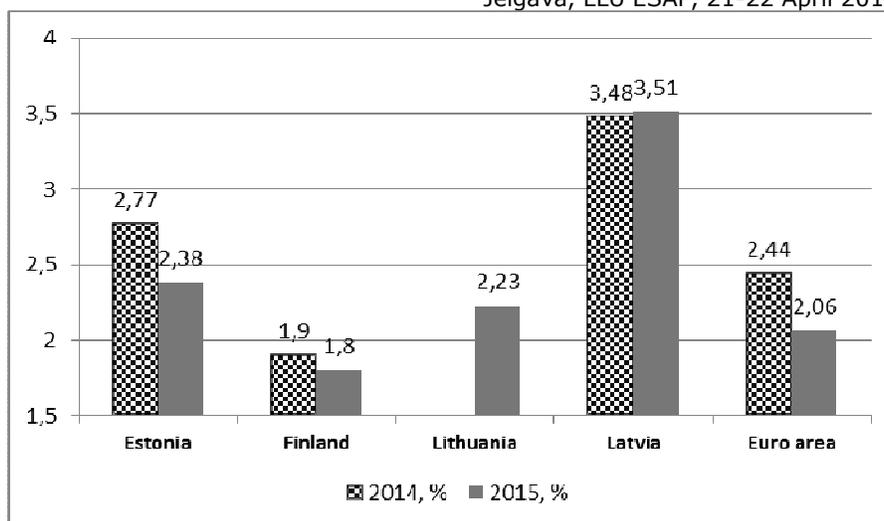
Poorly developed cooperation between research institutions and enterprises as well as limited opportunities and motivations of research institutions to provide services to the private sector and the insufficiently developed system of commercialisation of created knowledge may be mentioned as the next hindering factor. In the public sector, too, returns on investments through the licensing of inventions, the provision of research consultancy services, the introduction of new products and technologies in production and the foundation of new innovative and knowledge-based enterprises are insufficient.

The availability of bank loans and interest rates on loans are also a factor for innovation development and competitiveness. In the post-crisis period, the average interest rates on loans significantly decreased in the Euro-area Member States, including the Baltic States (Figure 5). In Estonia and Finland, the average interest rates on loans granted to the non-bank sector continued decreasing in 2014 and 2015. An exception was the commercial banks in Latvia that were very precautionary in granting new loans to the business sector and the interest rates remained at a considerably higher level than in the neighbouring EU Member States and in the Euro-area on the whole.

In addition to bank loans, it is necessary to attract venture capital and provide its efficiency in order to promote the commercialisation of research results and their introduction in production.

## 2. Attraction of venture capital and the factors hindering it

Attraction and efficiency of private capital, particularly venture capital, are important in the business sector.



Source: author's construction based on data of the European Central Bank, 2016

Fig. 5. Composite cost-of-borrowing indicator for non-financial corporations, % (December 2014-2015)

For various enterprises, the basic principles of venture capital mainly differ in investment size, source of finance and investor engagement in the enterprise's management. The earlier the stage of development of an enterprise, the smaller any individual investment is required and, accordingly, the greater engagement of the venture capital partner in the enterprise's management (Groh A. et al., 2011.).

It is important to mention the quantitative and qualitative indicators that characterise the development of private venture capital, for instance, the number of private venture capital funds, the number of PVC companies and the number of business angels which have a certain activity strategy in Latvia's market; active operation of intermediaries and support to them provided by national institutions as well as availability of information on their activity and specialisation and opportunities for implementing projects; availability of start-up managers and professionals in the field of private venture capital investments; a developed business culture and the introduction of "good practices" in entrepreneurship, which would make potential investors confident to invest in enterprises without acquiring the control package of their shares; lack of information and practice regarding the opportunities for attracting services

of managers and lawyers for new growing enterprises (the services are free of charge for a certain period, yet, the enterprise's shares are granted to them), for successful structuring of projects and for attracting investors; the overall investment climate in the country, Europe and the world; openness of the economy and internationalisation of innovations, which allows attracting start-up investors from other countries; insufficient activity of the associations uniting private venture capital market participants; the small number of projects appropriate for private venture capital investments; insufficient knowledge of professionals of new growing enterprises on the operational principles of private venture capital and the process of financing (Prohorovs A., Jakusonoka I., 2012).

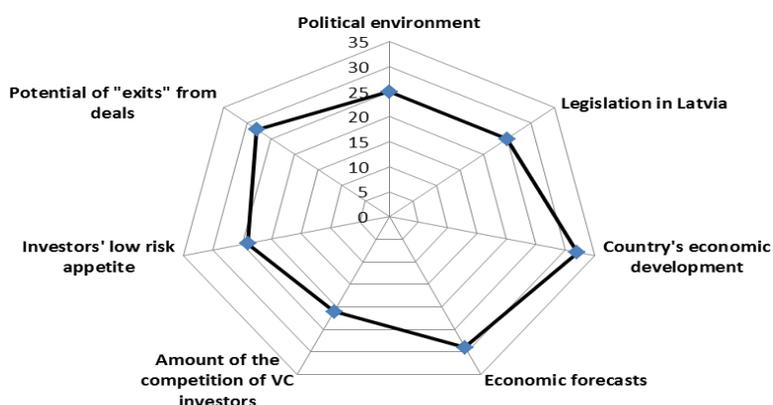
In 2012, the author conducted a survey of experts, which involved venture capital investors, financial experts, experts in education, entrepreneurs and professionals from business incubators. The survey aimed to identify obstacles that hinder the development of new innovative enterprises. In total, 20 experts were questioned and their opinions are presented in Figure 6.

Many factors hinder the development of the venture capital industry in Latvia: sizes of the

economy and the market, the historical background, an imperfect tax system, bureaucracy and others. At the same time, many opportunities could be implemented: development of the research and innovation basis, build up of competences, improvement of the legislation, availability of support of the Latvian Guarantee Agency, education reforms and others.

The development of the venture capital industry depends on demand and supply – the demand creates the supply and vice versa.

Jelgava, LLU ESAF, 21-22 April 2016, pp. 248-254  
 Additional support is necessary for the foundation of small and medium enterprises that specialise in developing innovative goods or services with high value-added. More funding is needed for science and research. Supporting this industry would result in greater interest in exact sciences and in developing innovative solutions and goods or services with high value-added. By attracting venture capital investments, such projects would lead to establishing successful enterprises (Jakusonoka I., Liepnieks K., 2014).



Source: author's construction based on data of the survey of experts, 2012

Fig. 6. Expert opinions on the factors hindering the emergence of new innovative enterprises

Taking into consideration the achievements made in the previous years and the problems to be tackled in future as well as the National Development Plan of Latvia for 2014-2020, it was envisaged that in 2015 total expenditure on research and development had to reach EUR 240.7 mln (LVL 169.2 mln) or 1% of GDP (Figure 7). Also, the National Development Plan of Latvia for 2014-2020 envisages that total expenditure on science, including private investments, will increase until 2020, reaching 1.5% of GDP. Achieving this target requires a balanced structure of financing the area of science and technology, which is composed of a broad range of institutional and financial instruments aimed at raising competitiveness. Given the fact that the strategic goal is to significantly increase the

proportion of the private sector's contribution in total expenditure on science and technology, it is necessary to design financial instruments that contribute to the attraction of investments into the private sector (Cabinet of Ministers, 2013a).

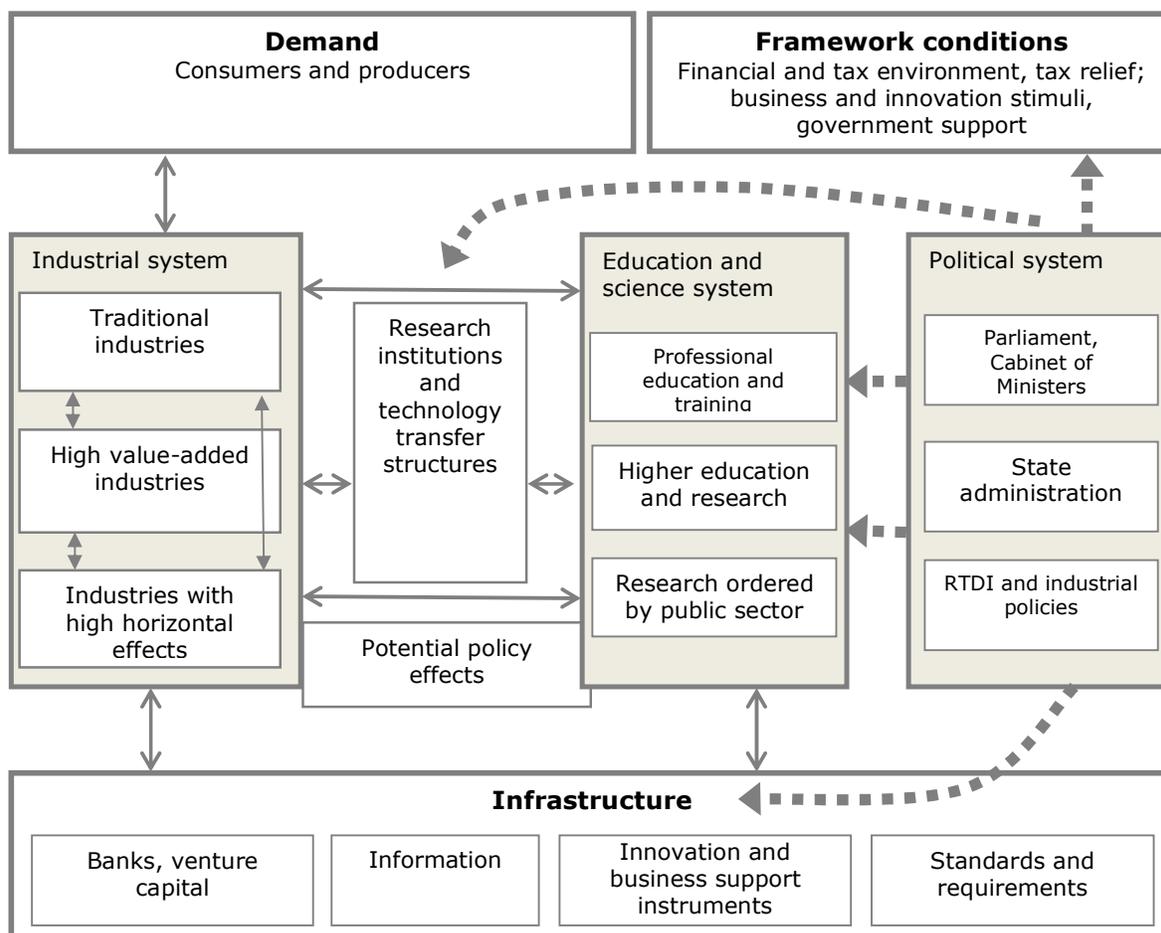
An important task is to develop interaction among all participants of the national investment system – universities, research institutions and technology transfer centres and state administration institutions – or the so-called Triple Helix Model.

In Latvia, research institutions lack capacity to promote and market products. There is a lack of financial instruments supporting product promotion and marketing activities. The innovation infrastructure needed for science is not funded and provided, which does not allow

creating new prototypes of products and technologies that could be promoted in the market. No forecast studies on products to be promoted in the market in future have been conducted, as research institutions have no

Jelgava, LLU ESAF, 21-22 April 2016, pp. 248-255 professionals competent in this field and such specialists are not prepared as well.

A lot of work has been done on developing a model for the RTDI system to activate the intensive use of scientific and technological potential in Latvia (Figure 7).



Source: *Research, Technological Development and Innovation Framework 2014 – 2020*

Fig. 7. **Conceptual model for the national science, technology transfer and innovation system**

The model for the science, technology transfer and innovation system can considerably contribute to the activation of scientific, technology transfer and commercialisation processes; yet, at the same time, adequate investments in research and development have to be made both by private investors and the government to make it a reality.

**Conclusions, proposals, recommendations**

1) It is necessary to establish an innovation system that promotes and supports technological progress in the national

economy and also contributes to inter-industry cooperation at national and international levels, which is orientated towards the transfer and commercialisation of creativity, newly created knowledge and technologies, through developing new services and goods in order to increase the innovative capacity of Latvia.

2) Sufficient human capital of high quality, an appropriate infrastructure, including an infrastructure for technological development and innovation, and closer cooperation are the

prerequisites for efficient investments in research and innovation, given the other favourable circumstances as well. The proportion of investments in R&D by foreign investors, the national government and the private sector has to be changed taking into consideration the experience of the most developed EU member States.

3) It is also necessary to attract foreign investments into the areas having a

Jelgava, LLU ESAF, 21-22 April 2016, pp. 248-256 component of research and technology development but lacking developed industries. The current range of financial instruments has to be expanded for this purpose, and new financial instruments have to be designed, which would focus on the reproduction of human capital for science and the formation of capacity for industrial innovation and knowledge absorption.

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