ROLE OF SCIENCE IN ENHANCING NATIONAL COMPETITIVENESS: CASE OF LATVIA

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ABSTRACT

At the era of globalization everyone, is it a country, an enterprise or an individual, pays more attention to the competitiveness and seeks ways to enhance it. Historically the competitiveness was provided by offering low price, while nowadays in developed world a low price is not the only factor that indicates competitiveness; it comes along with other factors such as quality and uniqueness of products or services. To create a unique, high quality and competitive product there is a need for science and research development, especially within small economies with limited resources. Commercialisation of science in small countries is to be taken as bases for building up the state's competitiveness

KEYWORDS: *competitiveness, innovation, labour market, welfare*

JEL CLASSIFICATION: *J2, I23, I31*

1. UNCLEARNESS DEFINING THE COMPETITIVENESS

Exploring the term "competitiveness" in various ways of its use, the authors of this paper see ambiguity of the term; the problem of defining it is beyond setting strict measurement criteria; moreover the term is used in different levels: 1) macro, 2) micro, 3) individual (Ryans & Waheeduzzaman, 1996; Moon & Newman, 1995; Krugman, 1994; M. Porter, 1990, Marti & Rodriguez 2006). Still there is an indicator that covers all levels – that is raise of welfare – the higher competitiveness, the higher level of welfare in the country. To give competitiveness an in-depth analysis we have to distinguish two ways of doing it: 1) competitiveness is analysed considering how countries or enterprises use their competences to gain maximum profit; 2) competitiveness is a part of the economics theory which views the state's ability to create an attractive business environment for entrepreneurs to bring added economic value, which increases the standard of living of the population (Lanskoronskis et Ramoniene, 2011, pp.125). This paper is based on the second approach.

One of the welfare indicators is a low level of unemployment. This is grounded in a statement that a high economic activity facilitates increase of the tax income. Consequently people are financially self-sufficient; there is no need for social benefits. These conditions provide additional resources for national development as there are less social budget funds needed to support the unemployed and their families. Undoubtedly one of the main factors affecting the population employment factor is a level of education. Higher level of education enhances extension of the middle class, which strengthens the state welfare. Moreover, education provides continuity as educated parents would have educated children, thus welfare level would keep rising (Sismondi, 1847). So far the positive impact is analysed, but there is also a negative side.

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Analysing the term of competitiveness we can say that it is easier to indicate at the micro level in comparison with the state competitiveness – the profit indicators show a high or low competitiveness (Ryans et Waheeduzzaman 1996; Rosado, 2006; Ergazakis et al., 2005). High profit indicators also present the position of the enterprise in the market as well as its ability to raise the welfare of an employee; it also has a positive impact on the request competitiveness and facilitates the purchasing power of population (Fagerberg et al., 2007, pp. 1603). That is welfare provision based on the profit performance that contributes to reduction of profits in a long term. Nevertheless the authors don't regard profit as the only indicator of the competitiveness, as is also determined by the enterprise's ability to create innovations and sell them responding to the market and consumers' needs. According to B.Godin (Godin) competitiveness is not only a matter of profit showing balance, but also the entrepreneur's ability to bring in new technologies to ensure the effective use of resources (Godin, 2004, pp.1219). Undoubtedly introducing innovations and adapting them into market directly affects the profit indicator; meanwhile the main issue is an effective use of resources, which results in advantages comparing with the rivals. It follows that competitiveness is based on market share increase and ability to obtain advantage on the market. Therefore we can say that competitiveness describes the economic strength of a country, at its industrial or organizational level within the global market economy conditions where goods, services, labour force, skills and ideas freely cross the geographic boundaries (Lanskoronskis & Ramoniene 2011, pp.124). Moreover, we have to consider that competitiveness at an industrial level is enhanced if there is production redeployment probability.

Basing on the above analysis, we can conclude that the key of competitiveness is having advantages over the rivals. S.D. Cho gives the definition of the competitiveness: *"relative strength, which is necessary to gain an edge over competitors"* (Cho, 1998, pp.12) Although the authors of this paper agree with the statement, they indicate that it does not reveal the way how the edge has been gained and how it is put into practice. Gaining advantages and getting profit out of them is a complex process, which theoretically has to be organized in a way that resources from an industry with less advantage are moved to an industry with higher potential of advantage. (Ryans & Waheeduzzaman, 1996, pp.20). The authors point out the shortcoming of this statement regarding small economies without unique physical resources - investing all resources into one branch can be a short term solution as there is no future perspective guarantee of the advantage. Therefore we can say that the government has to implement research and innovation support policy, which results in increase of competitiveness in all the above mentioned levels. The steps are: 1) improve the education system; 2) stimulate research; 3) improve infrastructure; 4) introduce the tax incentives; 5) ensure access to and investment in human capital (Rosado, 2006, pp.97; Önsel et al., 2008., pp.222; Ülengin et al., 2010).

We hereby conclude that the base is human capital and its ability to create innovations, entrepreneur's ability to put those innovations into practice and the government policy providing coefficient conditions for entrepreneurship.

As shown in Figure 1, competitiveness is a continuous interaction between levels which results in welfare raise. Authors point out that it is difficult to separate the individual's level from the other levels as the individual is the one who, putting in action his skills provides the competitiveness both in micro and macro levels. From this follows that high education level enhances the competitiveness, therefore competitiveness in the science aspect can be defined as *"on scientific achievements obtained benefit realization in a knowledge-based society, which contributes to higher level of well-being."*

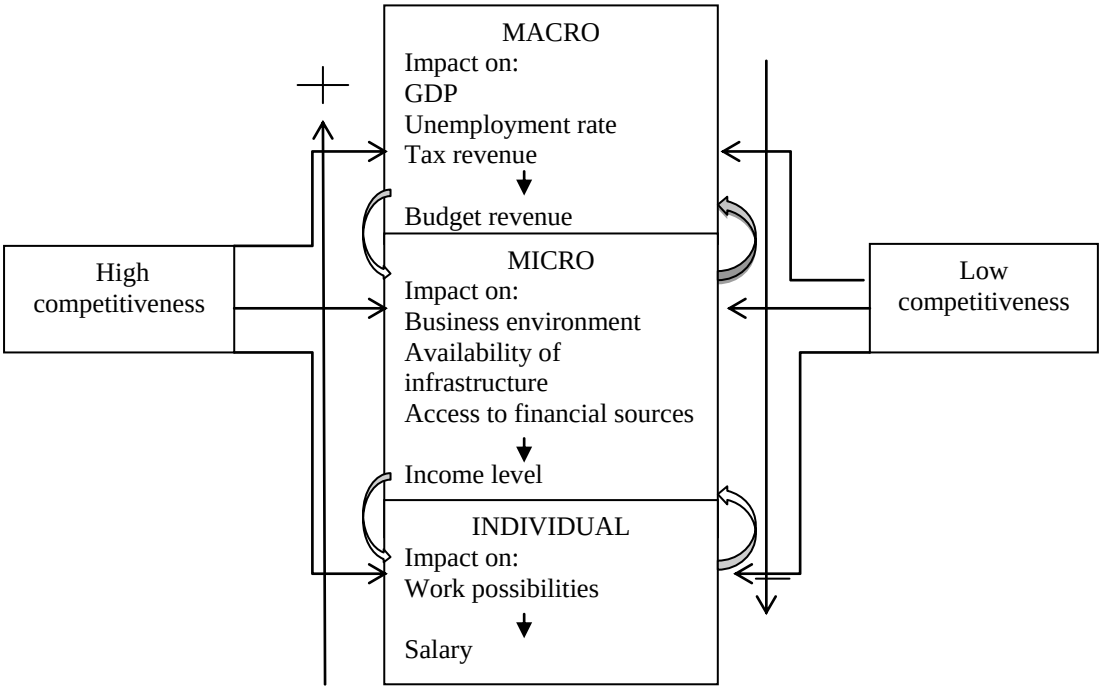

Figure 1. Impact of Competitiveness to All Levels and their Interaction
Source: Selected literature and authors' conclusions

Basing on the above proposed competitiveness definition and other authors' acknowledgements it can be said that science and research has a positive impact on the competitiveness as the research results in innovations.

2. ROLE OF SCIENCE IN ENHANCING COMPETITIVENESS

Implementation of innovations facilitates: 1) new market share acquisition and retention, 2) the employee's income increase, 3) creation of products with high added value (Godin, 2004, pp.1218). Innovation creating rather than taking them over is a boundary between developed and developing countries (Özçelik & Taymaz, 2004). Undoubtedly development of the science cannot be completed without development of the higher education sector (Lucia et al., 2012). This was confirmed when the authors interviewed and questioned the deans of the University of Latvia in a time period from 9 to 16 April, 2013. The paper analyses one of the hypotheses posed in the research.

H: *"Science and research is University of Latvia positive contribution to the state economics and increase of its competitiveness."*

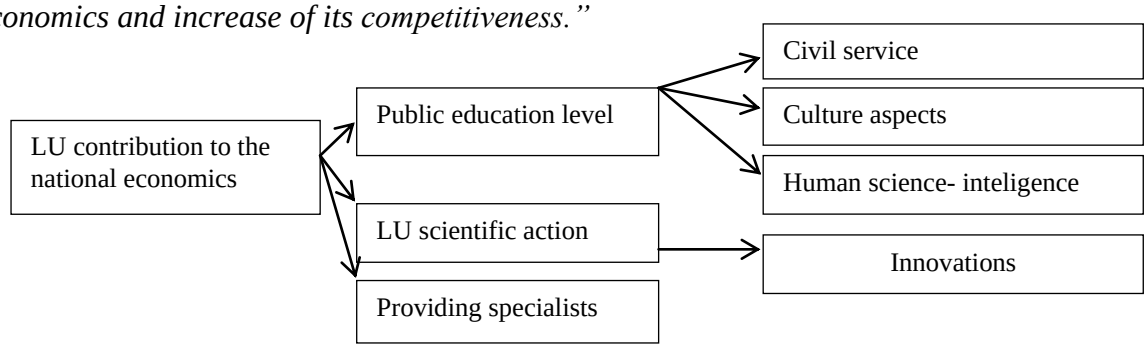

Figure 2. Analysis of LU Contribution to the National Economics
Source: created by Santa Sproģe-Rimša on the base of interview

Although the interview questions were posed particularly regarding the University of Latvia, which is the leading and traditional university in Latvia, therefore the answers can be applied for a general analysis. The hypothesis posed in the research cannot be denied because all the questioned people agreed that the competitiveness is determined by such factors as: 1) education, 2) science, 3) innovations, 4) introducing new products. Meanwhile some people pointed out other aspects: 1) educated citizen, 2) civil service improvement, 3) cultivation of national identity, 4) provision of specialists, 5) preserving cultural traditions. The humanities are considered as an essential aspect within the state economics as they form the public opinion. Meanwhile the contribution of this branch cannot be mathematically calculated.

The results of the research and the definition of the competitiveness show that science development has an important role in the process of increasing the well-being, therefore we are going to give this aspect a wider analysis. Science is elitist and to bring it into life we need a knowledge based society. This means that already at studies level must be drawn a line between elite study programmes and mass education. This opinion is confirmed by the participants of our research also emphasizing the educated society's ability to accept innovations as well as make responsible decisions. This can be justified with functions of the higher education: 1) function of transferring information – education delivers moral, cultural and scientific values from generation to generation, 2) function of enhancing the economic growth – education ensures the movement towards knowledge based economics, 3) function of raising the intellectual level of society – education system can change the value scale of society (Belyansky & Saginova, 2008., pp. 341-342). Considering all above mentioned we can say the system of education is a fundament for state's development as it covers all the areas crucial for development and can change the entrepreneurship according the global market tendencies. Moreover education affects human behaviour and individual's performance at the labour market (Agnello & Olanirm, 2008., pp.73). Individual's potential at the labour market is one of the aspects which show the educational institution's ability to prepare the student for a career; nevertheless we cannot neglect an individual's own abilities and interests. Consequently, to promote the science sector there is a need for skilful professionals, who are prepared at the higher education institutions. An individual's choice for a scientist's career is affected by several factors as shown in Figure 3. We also must take into consideration that in small countries with small number of people the science development is encumbered because of limited possibility of selection.

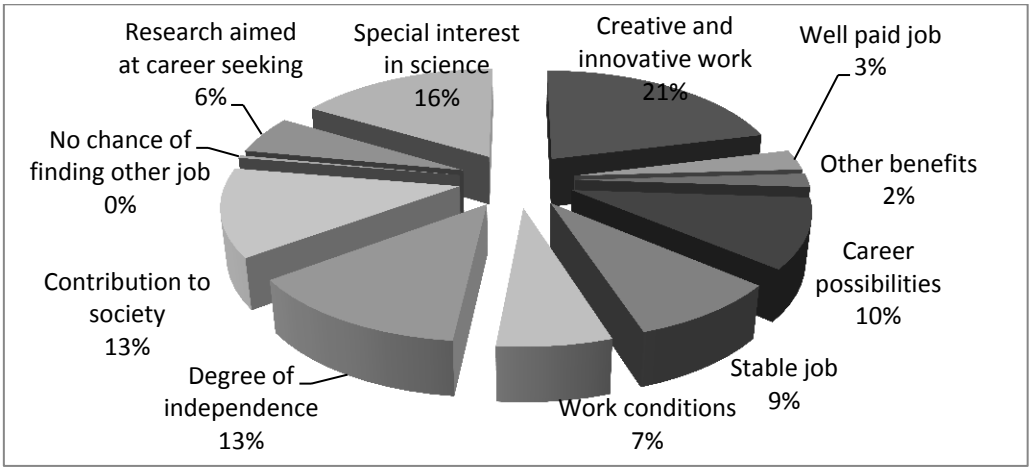

Figure 3. Conditions Affecting the Choice of a Scientific Career (%). Study made in 2009.
Source: made by the authors, data from Statistical Bureau of Latvia

Figure 3, analyses show that conditions affecting the choice of a scientific career are ambiguously interpreted as there are several determinants for such choice: 1) creative and innovative work 21%; 2) special interest in science 16%; 3) degree of independence 13%; 4) contribution to society 13%. This shows the importance of an individual's expectations when choosing the scientists career. We must consider that such factors as creative and innovative work and degree of independence are crucial determinants for an individual; therefore it is necessary to provide those factors at a national level. The above mentioned is confirmed by the valuation of Unregistered Employment, where it is stated that 2:56 with median value of 3 indicates motivation to perform unpaid overtime is based in interest in particular work (LU, Unregistered Employment score pp.81). The results of both surveys lead authors to look at models of financing education, because the source of funding have direct impact on degree of independence and creative and innovative work possibilities.

The idea that historically we can see 3 models of financing higher education is proposed by B.Dahlin (Dahlin, 2006): 1) directive model, 2) continental model and 3) Atlantic model. The directive model is showing a strong State control over higher education administration and content, the continental model is combining State supervision with academic liberty but the Atlantic model contains a system where the main regulator becomes the payment source. For the higher education in CEE countries and in Latvia in particular we can observe that during the 2 decades of transition period all three models have been consecutively implemented: directive model during Soviet system in the frame of centralized planned economy, continental model during the 90's and Atlantic model during the 2000s (Šavriņa, 2013). The authors of this paper consider about research that the consequence of only 2 models is observable: directive model under the previous system with a total State intervention and an Atlantic model where the research is completely dependent on the highest bidder. It should be pointed out that in both models the money attribute determines which kind of research will be done, the difference being that in the first model the State ensures the continuation of the research while in the second model the market relations are pushing the researchers to look for contacts with enterprises.

Above mentioned highlights that in Latvia there are determined nine priority fields of science: 1) sourcing and sustainable use of energy and natural resources, 2) pharmaceutics and medicine, 3) information, communication and signal processing technologies, 4) Latvian language, cultural heritage and creative technologies, 5) forest and water resources, 6) nanostructured and multifunctional materials, design and technologies, 7) agricultural resources and food technology, 8) public health and clinical medicine, 9) socio-economic and public management ("Science and technological development in Latvia", 2011., pg.10). We must conclude that above mentioned covers a wide range of branches and still have affects the level of academic freedom.

Above mentioned confirms that availability of studies and research enhances the raise of competitiveness; meanwhile it is important to provide a cooperation between the private and science sector. The problem is that academically studied issues must be brought down to practice and used in a real life, responding to knowledge based society's demand for use of new technologies (Gera, 2012,; Agnello & Olanirm, 2008). The academic sector issues publications, manuals, creates patents, meanwhile economic growth can take place provided there is cooperation between the practical and science sector. The problem is that practical workers comparing to academics and researchers are more focused on short term solutions; this leads to forming conceptual models that are adaptable in real life situations (Gera, 2012). Regardless various conceptions and other factors affecting competitiveness, there is no doubt of cooperation necessity between entrepreneurs and academic sector, even if the research has been done for a specific sector, there is still a contribution to a general development of science as the research process can bring up new issues; moreover this is the way to attract private investments or project funds (Kantola & Kettunen, 2012,; Lanskoronskis & Ramoniene, 2011). The academic studies give society a

possibility to learn new issues, thus creating knowledge based society (Akhavan & Jafari, 2007, pp.103).

Although it has been considered that a cooperation between the practical workers and academics must be stimulated to raise students' qualifications (Arthur et al., 2012, pp.503), the authors cannot quite agree with that, because that would contribute to a narrow specialisation and inflexible thinking, which in a long run can give a negative impact both to an enterprise and country's competitiveness. Authors define cooperation problems between the practical workers and academics in a following way: 1) use of special terms; 2) distance in time; 3) comprehension of the study results; 4) using the study results when making a long or medium term decisions (Gera, 2012, pp.254.-264). The biggest problem in providing the cooperation is discordance of goals. The goal of an entrepreneur is gaining a profit, whereas the academic sectors goal is creating fundamental and long term concept, which is not a subject of particular entrepreneur's profit maximization.

3. PERSPECTIVE OF SCIENCE DEVELOPMENT FOR ENHANCING COUNTRY'S COMPETITIVENESS: SITUATION ANALYSIS IN LATVIA

Under the conditions of a centralized planned economy (economy of orders) which was present in the Central and Eastern European countries, welfare was ensured for all members of society but on a very modest level. The main advantage of such system in the eyes of the populace is the seeming appearance of all necessary being granted: an ensured living place (it might be only a sleeping place in a dormitory or one room for a whole family in the so-called "communal" apartments); an ensured workplace (work is an obligation); an ensured education (free of charge for all members of society, secondary education included, but a very selective higher education); guaranteed health services (large scale and free of charge but without comfort for patients and without sophisticated equipment). In such conditions the State priorities in planned research are given to the sectors related to political aspects: military and space sectors because of the Cold War armament race and the heavy industry related to it, especially the chemistry, to show the domination over the opposite socio-economic system – the market economy. Thus full financial support is ensured for all fields of science as one of the State duties. In such system, the research becomes a *causa sui*.

For this reason the changes of the system and the transition to market economy during the 90s were crucial for the development of science. The shock introduction of buying-selling relationship is established everywhere, research included: 1) the halt of fully State-financed researches; 2) the disappearance of research institutions because of the absence of financial means; 3) the necessity to look for a financial investor or grants and the following dependence on the interests of investors; 4) the changes in the system of education and students' choice priorities for the popular qualifications ensuring a job and fast career opportunities and consequently 5) changes in prestige of research as a job: doctoral degree is becoming a career element for the professionals but the choice of the research as an everyday professional activity is not the priority for young people. The phenomenon of mass education and elite research contains its contradictions. If we consider that the system of buying-selling is completely dependent on money then the researchers are obliged to regain the investments, commercializing the research. The results and side-discoveries unrelated to the financed project are rejected or dismissed and aren't further pursued. The system of education and the researchers in general are more universally oriented than specialized. At the same time the dependence on financial means is demanding and consecutively developing a narrow specialization which can be advantageous when the demand for such research is stable. The deeper development of narrow specialization promotes inflexibility which is an especially unfavorable factor when the demand for a specific type of research falls.

The authors' concept is testified with the science development statistics in Latvia. The position of science is being examined in several aspects: 1) innovation active enterprises out of the

total number of enterprises (%); 2) total expenditure on innovations (mil. LVL), *(1 LVL = 1.42 EUR)* 3) Number of science personnel employed in institutions, working on research; 4) Total finances for the scientific research work (mil. LVL).

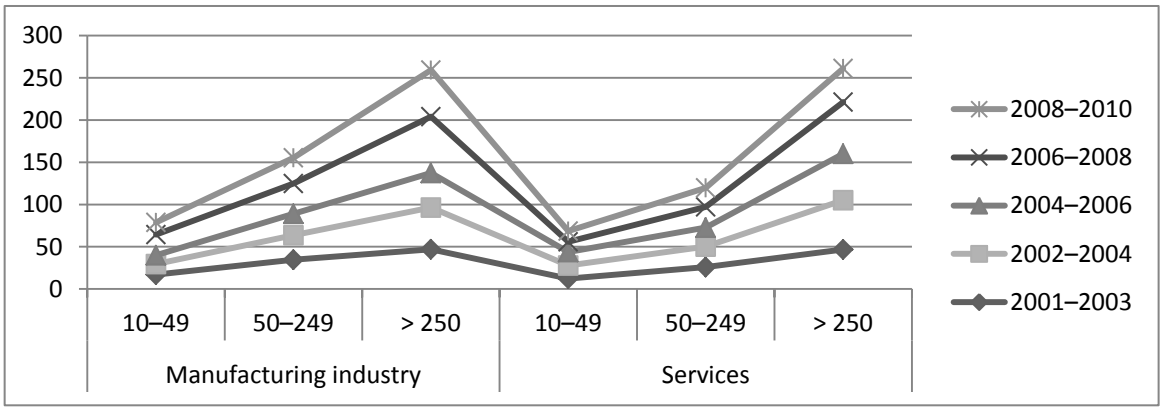

Figure 4. Innovation Active Enterprises out of the Total Number of Enterprises (%)
Source: made by the authors, data from Statistical Bureau of Latvia

Figure 4 analyses show that in the time period from 2001 – 2010 essential changes have been applied to service providing enterprises with a number of employees over 250 and manufacturing companies with a number of employees over 250; this proves that the enterprises creating and bringing into practice innovations raise their competitiveness and keep their market share. In addition larger enterprises have more resources for research.

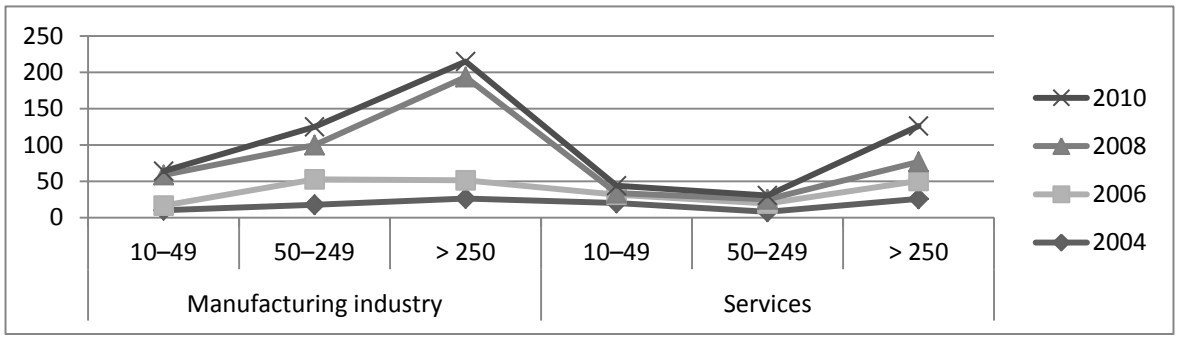

Figure 5. Total Expenditure on Innovations (mil. LVL);
Source: made by the authors, data from Statistical Bureau of Latvia

Analysing the total expenditure on innovations, which are created by scientific action, we see the biggest expenses in manufacturing companies with a number of employees over 250; we also see that the expenses tend to grow in all the survey period: 2004, 2006, 2008, 2010. The same tendency is observed in service providing enterprises with a number of employees over 250, which proves the entrepreneur's have understood the necessity for innovations to raise their competitiveness and use the resources effectively. Meanwhile comparing the expenditures of the service and manufacturing industry is not correct as the way of innovations in those branches differ significantly. Innovations in the manufacturing industry mean mostly introduction of new equipment whereas in the service industry innovations are not so palpable, therefore we consider the general positive tendency.

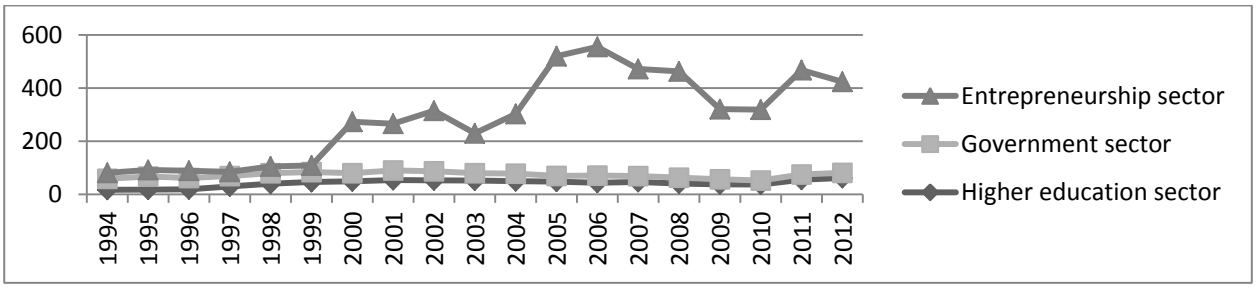

Figure 6. Number of Science Personnel Employed in Institutions and Enterprises, providing Research

Source: made by the authors, data from Statistical Bureau of Latvia

Having studied the science development in Latvia, we can allege that enterprises are orientated on perspective profit. The tendency, which implies the long term development, shows recognition of a particular region needs and distinction between scientifically capacious branches and branches that require a mass labour force.

Meanwhile the authors point out a worrying tendency in Latvia – a decrease in number of personnel employed in the higher education sector since 2008. This can be explained with following factors: 1) the personnel in this sector grow old; 2) to work in academic sector a PhD is required, whereas in private sector it is not required. The authors looked through job vacancy advertisements published from 17 to 25 July, 2014 on internet site CV-online, State Employment Agency and Working day. They examined 700 up-to-date offers, from which chose 378 responding the criteria: higher education required. Only six vacancies in innovative branches (i.e., directly or indirectly related to the research) require higher education with Bachelor's degree, which indicates a possibility to do the enterprise level research without Master's or PhD.

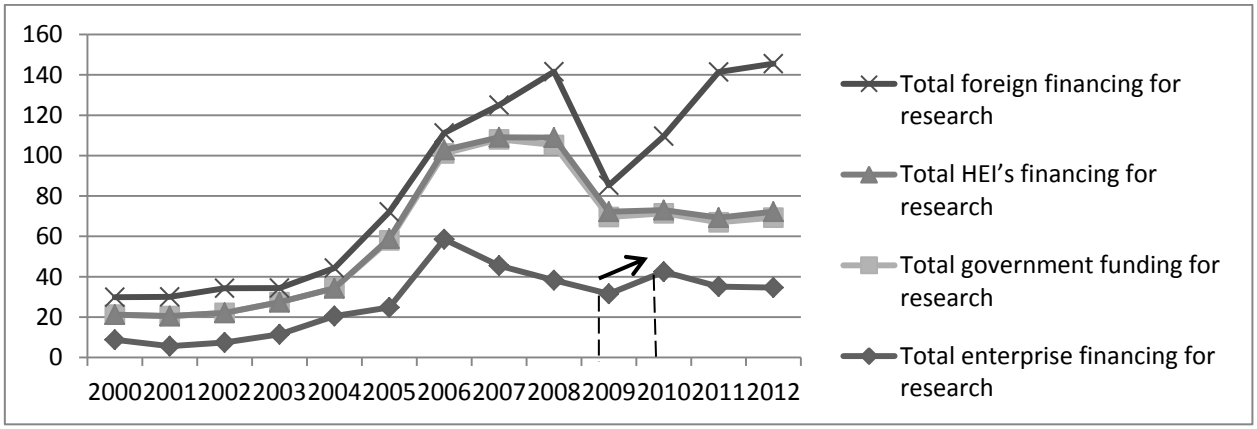

Figure 7. Total Finances for the Scientific Research (mil. LVL)

Source: made by the authors, data from Statistical Bureau of Latvia

Basing on literature studies we can allege that development of science has a positive impact on the country's competitiveness; therefore science must be the state priority. Spending on R&D positively affects the competitiveness (Lucia et al., 2012, pp.16). Analysing the total financing for research, we see that foreign investment has increased substantially since 2002 with a dramatic fall in 2009, when the financial crisis negatively affected the economics and short term priorities were set. Meanwhile a positive tendency in a time period from 2009 to 2010 can be taken as a positive signal for long term development and increase of competitiveness. Foreign financing increase can be explained by: 1) accession to the EU in 2004, thus availability of funds; 2) nationality of large business owners. As analysed in Figures 4 and 5 the large enterprises experienced the most

substantial changes, which is explainable by: 1) use of the accumulated capital, 2) access to financial resources.

To determine the science impact to Latvia's competitiveness, we must also consider other aspects.

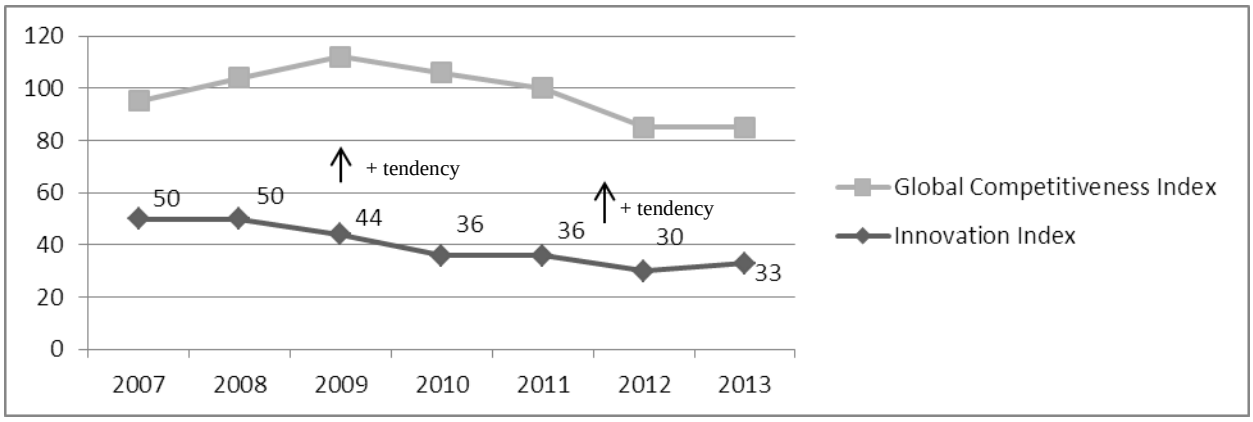

Figure 8. Dynamics of Latvia's position in the Global Competitiveness Index in 2007-2013 and Innovation Index in 2007-2013

Source: made by the authors, data from Global Competitiveness Reports, 2004-2013, Innovation Index)

As shows Figure 8, the positive tendency of innovation investments and increasing number of enterprises providing a research as well as the total financing positive dynamics since 2002 – all those positive tendencies still do not prove unambiguous raise of competitiveness. The use of the index has its restrictions as a term "state competitiveness" raises discussions between the scientists (Krugman, 1994; Porter, 1990; Ülengin et al., 2010). They show the tendency though, which is clear to practitioners. Paradoxically, regardless the negative tendency of Latvia at the Global Competitiveness Index in time period from 2007 to 2010, this is the time when Latvia's Innovation Index rate is positive and the country moves from the 50th position to 36th. Although both indexes have their restrictions, this paradox situation indicates that regardless positive tendency in private sector's research and innovation financing; so it possible that Latvia's scientific potential is still not fully put into effect.

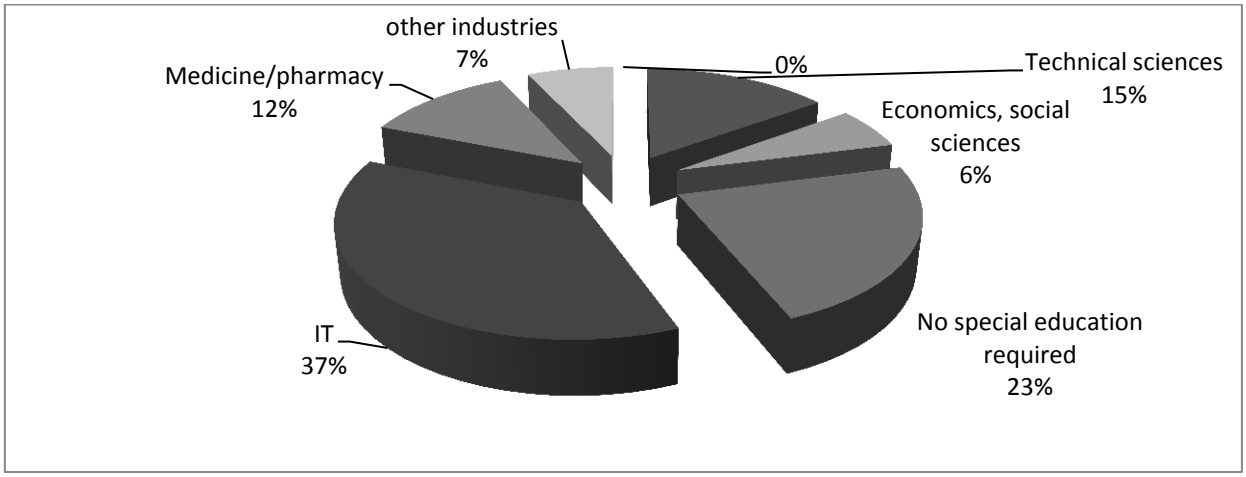

Figure 9. Structure of the Labour Market Demand and Requirement for a Scientific Degree in innovation field

Source: Actual job vacancy survey from 17/07/2014 to 25/07/2014

The structure of the demand shows a potential of cooperation between academic and private sector; meanwhile the study shows an essential drawback – lack of scientific degree in the innovation industry enterprises. Job vacancy survey in a time period from 17/07/2014 to 25/07/2014 shows that 29.8 % of the vacancies are within innovative industry sector and demand implementing of innovations. If we analyze demand for the degree, we see that in 23.8% cases an adequate education is demanded; mostly a higher education is demanded for upper level management positions; whereas no specific training is required for lower position vacancies.

Assuming that the development of innovation provides new product development or improvement of existing product, it may be concluded that the innovation process must go on at a commercial enterprise level, thereby ensuring effective implementation of the innovation potential in the market (Bjornali & Storen, 2012, pg.404). Meanwhile the statement is a subject to critics – analyzing situation in Latvia no unambiguous confirmation has been received about the positive impact of innovations on Latvia's competitiveness in general. There is no indisputable proof that increase of the number of innovative enterprises brought to competitiveness increase in a state level; this draws to following conclusions that there are two possibilities: 1) the innovations have not been implemented enough effectively; 2) the innovations are not as competitive as could be. Therefore the authors indicate that the fundamental research must be a field of universities' and academic sector's work, thus providing a wide range science development. The job vacancy survey carried out by the authors is not a proper proof, though, as it was carried out in summer when a full complementation of staff has been already done for the next study year.

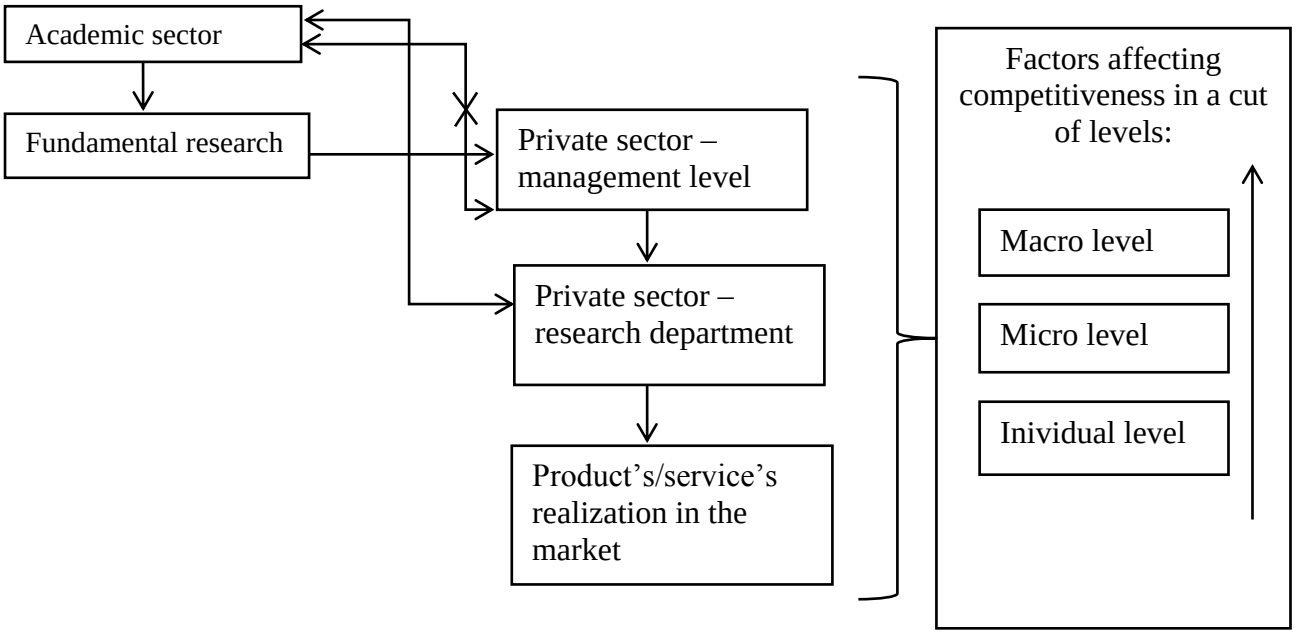

Figure 10. Private and Academic Sector Cooperation Model in the Science Commercialisation Aspect

Source: graphic made by the authors, basing on selected literature and personal study results

The private and academic sector cooperation model shown in Figure 10 indicates the necessity for cooperation in all levels; meanwhile some authors describe problems of cooperation between those sectors mentioning a lack of comprehension in technical solutions (Lucia et al., 2012, Gera, 2012, Kantola & Kettunen, 2012, Lanskoronskis & Ramoniene, 2011, Akhavan & Jafari, 2007, Arthur et al., 2012); therefore a cooperation should be carried out between specialists, who have relevant knowledge and skills to implement a project, and a corresponding private sector's

department. The management level of the private sector make decisions/draw guidelines, but do not directly intrude into the process of commercialisation – direct cooperation in private sector is not a long term and successful strategy. Successful commercialisation of science also means a time economy – the more effective is the process of commercialisation, the less time it will take; that will result in: 1) faster implementation of the product/service (enterprise level); 2) more time for carrying out new fundamental research (academic level). All summed up it will contribute to increase of competitiveness.

4. CONCLUSIONS

1) In literature and in surveys gained results lead to conclude that the main indicators of national competitiveness are: 1) education, 2) science, 3) innovations, 4) introduction of new products. In the case of Latvia it results in: 1) educated citizens, 2) improvement of civil services, 3) maintenance of national identity, 4) provision of professionals, 5) saving cultural traditions, thus enhancing prosperity which is base for Latvia's development. It can be assured that the competitiveness in such way can be analyzed in market economy.
2) The private and academic sectors' cooperation problem is discordance of goals. The goal of an entrepreneur is gaining a profit, is it a short, medium or long term solution; whereas the academic sectors goal is creating fundamental and long term concept, which is not a subject of particular entrepreneur's profit maximization.
3) Actual job vacancy analyses shows a successful cooperation potential between academic and private sector, meanwhile we have to draw a boundary in private sector between people who make decisions and implementation of innovations, thus enhancing an effective commercialisation of science. Cooperation must be carried out between specialists, who have relevant knowledge and skills, and a corresponding private sector's department. The management level of the private sector make decisions/draw guidelines, but do not directly intrude into the process of commercialisation.

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