

Research and innovation ecosystem of SR

Sources of economic growth and nature of competitive advantage

The Slovak Republic in the framework of the European Union belongs to the most rapidly growing economies. The gross domestic product per capita in purchasing power parity increased from 47 % of the EU27 average in 1995 to 73 % in 2012. The pace of convergence to the EU27 average in Slovakia was faster than in other new member states from the Central Europe. A rapid convergence in gross domestic product rates per capita in Slovakia has been conditioned by a rapid growth of labour productivity. While in 1995 the labour productivity per hour in purchasing power parity in Slovakia was only 47 % of the EU27 average, in 2011 it was 73.8 %. Approximately one half of the labour productivity growth has been ensured by the total factor productivity (TFP). The contribution of TFP to economic growth in Slovakia was considerably higher than in the EU27 and similar to those in the Czech Republic, Hungary and Romania. A great share of TFP in economic growth is associated with reducing technological gap through diffusion of knowledge from abroad. A great part of this diffusion has been made by foreign direct investments (FDI) of multinational companies. In 2011, the share of foreign direct investments in the total gross domestic product of the Slovak economy reached 57.4 %. This value was comparable to those in the Czech Republic (62.0 %) and Hungary (64.1 %). However, the foreign direct investments in Slovakia have not been accompanied by business investments in research and development. In the 2006-2011 period, the foreign companies invested in Slovakia annually on average EUR 2,071 million of foreign direct investments, but their investments in research and development in this period made only EUR 19.7 million annually, which is less than 1 % of foreign direct investments.

A relatively high level of GDP per capita in Slovakia in the framework of the region can be seen from a different point of view when decomposing the GDP according to incomes. In the European Union 49 % of GDP on average goes to compensation of labour power, 39 % is made by gross operating surplus and approximately 12 % by production taxes. In Slovakia the share of salaries in GDP in 1997 was 43 %, but in 2012 only 37.5 % which was the third lowest in Europe after Bulgaria and Romania. On the other hand, in 1997 the share of profits in GDP was only 48 %, achieving 55.4 % in 2012, which was the second highest value in Europe. The type of competitiveness selected by Slovakia was based on low taxes and salaries instead of investments in research and development. This competitiveness style is not sustainable from the long-term point of view. So far, the growth of labour productivity has been achieved mainly by transfers of technologies and organisational innovations in the framework of multinational companies (MNC).

A competitive ability of countries is assessed on annual basis by a Global Competitiveness Report which is published by the World Economic Forum (WEF). The report monitors 12 pillars of competitiveness in 144 countries. The Slovak economy achieves a strong position, both in comparison with the Central European economies and with the innovation leaders, only in the area of foreign direct investments and transfer of technologies. Increased arrival of foreign investments into the economy is demonstrated by the high level of a production process where the Slovak economy is ranked relatively well (34th position), when compared with the neighbouring countries. In the indicator of the nature of competitive advantage the position of Slovakia among the V4 countries is the worst (115th position). From the point of view of this indicator the Slovakia's competitive advantage still depends rather on factors of prices and costs (labour costs, low taxes, tax stimuli and others) than on quality factors (e.g. quality of institutions, education system or national innovation system). There is a risk that after gradual (and naturally expected) depletion of competitive advantages in terms of prices Slovakia will not have any adequate quality factors of economic growth. In innovation factors as a potential for innovations, quality of scientific and research institutions and expenditures for research and development or availability of scientists, Slovakia has a very poor position, occupying a ranking in the second half among 144 assessed countries. In these indicators Slovakia considerably lags behind even its neighbours.

A characteristic feature for the whole Central European region, including Slovakia, is considerable lagging behind in the indicator "governmental orders of technologically advanced products" (127th position). The public sector can stimulate development of domestic enterprise environment through demands for technologically advanced products. There is a relatively poor ranking of Slovakia also in the area of quality of education in mathematics and nature sciences (83rd position). This is an important factor of human capital which determined future innovation development of any country. When compared to reference countries of Central Europe there is a relative good availability of the risk capital in Slovakia (60th position). This indicator assesses availability of the risk capital instead of its use, which belongs to the poorest in Europe, as we had mentioned in the previous text above.

Position of the most important sectors in the Slovak economy

Connection of the most important sectors to the domestic production, i.e. helping in development of domestic economic activities of major sub-suppliers, is an important parameter of development of the society showing their connection with the economic and social framework of the country. Only in the case of the sufficient rooting of export-intensive sectors in the structure of economy it is possible to use and develop this potential. In an ideal case

the sectors, to which the country is specialised in export, are (a) lucrative from the point of view of high added value, (b) well rooted in the production structure of economy and (c) linked to other sectors of the national economy. The main export sectors of the Slovak industry are characterised so far by a high rate of intermediate consumption and low rate of added value (production of motor vehicles 13.8 % in the 2007-2009 period, production of computer, electronic and optical products 13.2 %, production of metals 28.4 %, production of metal structures 38.5 %, production of coke and refined oil products 13.4 %, average level of added value in the Slovak economy 40.7 %). In the monitored period the share of added value in the total production did not grow significantly in any of monitored sectors. In services there was a positive trend in growing importance of export of computer and information services.

Linking the priority sectors to research and knowledge intensive services

Slovakia belonged in 2011 in the EU27 among the countries with the lowest share of the enterprise research and development in the gross domestic product – only 0.2 % of GDP (EU27: 1.9 % of GDP). Very low enterprise expenses were reflected in Slovakia in very low inputs of research and development in the production of key sectors, both in absolute and relative figures. In the largest Slovak sector – production of motor vehicles – the input of research and development was EUR 20.3 million annually (on average), which is approximately 0.2 % of total inputs in this sector. In absolute values, this input was roughly 10 times lower than in the main competitors of Slovakia in production of automobiles (Czech Republic and Hungary). A slightly better situation of Slovakia was in production of electric machinery and equipment. The average annual input of research and development in the 2007-2009 period was EUR 11.8 million which was the second highest in the region after Hungary. The total input intensity (0.2 % of total inputs) was, however, very low.

As regards inputs of the knowledge-intensive services (sectors NACE J62-63, M69-75), after deduction of research and development services, the input volume of knowledge-intensive services in Slovakia is comparable with the Czech Republic and Hungary. The classes M69 (legal and accounting activities), M70 (management consultancy activities) and M71 (architecture and design) are dominant in all countries compared in inputs into key sectors. When compared to other competitors, Slovakia has higher inputs of services in classes J62-63 (computer and information services). For Slovakia it will not be simple in a short time to get to the level of the Czech Republic and Hungary in expenditures to industrial development and research. However, Slovakia is relatively competitive in the area of inputs of the knowledge-intensive services for the key economic sectors, especially in the area of production of motor vehicles, consumer electronics, machinery and equipment and metals. The strengthening position of the sectors has to be supported by implementation of proper mechanisms, especially in the area of research, development and innovative activities.

Evaluation of innovation performance

From a long-term point of view, Slovakia according to the Innovation Union Scoreboard (IUS) international comparison belongs to the EU countries which lag behind the EU average considerably in the innovation performance. Of 27 EU countries, Slovakia occupied the 20th position in 2011 and still belongs to the group of so-called moderate innovators with the second lowest innovation performance in the group.

Quality of the system of science and research in Slovakia lags behind considerably according to the IUS assessment. As far as the number of PhD students from non-EU countries is concerned, Slovakia is on the 24th position within the EU, which reflects the education policy. However, the number of PhD students corresponds to the attractiveness of Slovakia as a “career destination of scientific growth”. Based on these two indicators we can mention that the Slovak science is considerably closed and its rate of involvement into the international research context is low. There is a low number of cited scientific publications in Slovakia. On the other hand, as regards the number of international scientific publications with at least one co-author from a non-EU country, Slovakia is above the EU average (379 publications in Slovakia versus 300 publications in the EU) which together with the number of PhD students offers opportunities for improvement.

In the area of funding the innovations, Slovakia from a long-term point of view can be characterised by insufficient use of risk capital. In 2010, the amount of invested risk capital made 0.03 % of GDP, while in the EU the investments of risk capital are six times higher (0.2 %).

The IUS measures the cooperation among enterprises and public research and development organisations through co-authorship of scientific publications. In this indicator Slovakia achieves only one-third performance of the EU (15.7 publications per a million of inhabitants in Slovakia and 52.8 publications per a million of inhabitants in the EU) and a half of performance in the Czech Republic and Hungary (but three times higher than Poland).

Funding of research and innovations

From the point of view of expenditures on research and innovations Slovakia permanently provides insufficient resources in this area. One of the reasons has been the selected form of privatisation of large companies when research and innovation departments have been separated and privatised which has led to their separation from practice. In the previous decade, the total expenditures for research and development were roughly 0.5 % of GDP, growing to 0.6% in recent years (in 2011 it was 0.68%). This growth has been made by growth of capital expenditures for appliances and equipment which can be caused by the use of the structural funds in research and development. In the 2010-2011, the resources for salaries were increased significantly. When comparing the total expenditures for research and innovations in other European economies (2.03% of GDP in 2011), Slovakia belongs to the countries with the lowest expenditures. An important part of public sources in research and innovations covers expenditures of basic research without connection to economic performance of the country.

The share of business expenditures in research and innovations is roughly 0.25% of GDP (2% of GDP in developed economies). In Finland this figure in 2011 was 2.67%, in Sweden 2.34%, in the Czech Republic 1.11% and in Hungary 0.75% (Eurostat, 2013). The reason of this reality is that the present multinational companies carry out research and innovation activities mostly in their home countries. However, the Slovak companies and medium enterprises intensively develop their research and innovation and intend to build research and innovation centres in Slovakia.

If we look at the structure of expenditure in research and development (in terms of resources), we can observe two main trends: the dominance of the public sector (in 2011 the Slovak public sector funded R & D expenditure of the amount of 0.34% of GDP) and increasing share of foreign sources; while there is the significant impact of EU structural funds, which in 2011 accounted for 60% of all foreign sources of R & D expenditure flowing to Slovakia. The following parameters in terms of SII development can be considered as critical:

- inappropriate structure of PhD graduates (insufficient share of technical and scientific fields,
- low number of excellent research teams,
- low amount of total R & D expenditure and orientation of the R & D ,
- insufficient innovation activity of SMEs,
- insufficient cooperation among innovation stakeholders (especially as regards companies; R & D departments),
- low representation of knowledge-intensive activities in the economy,
- low patent activity.

Tools of funding of research and development

Tools to support research and development under the existing legislation are as follows: National programmes are conducted pursuant to the Act 172/2005. Ten national research and development programs in accordance with the priorities of the state science and technology policy were approved by the Government. This instrument pursuant to the Act has been in force since 1 July 2005. Since 2009 program is non active

Slovak Research and Development Agency (SRDA) is the research and development grant agency in the Slovak Republic. It was established by the Act No.172/2005 in July 2005 and it is a successor of the previous agency functioning since 2001. SRDA is the instrument for distribution of public finances for research and development on the competitive basis in Slovakia. SRDA is responsible for research and development promotion in all research fields, including international research cooperation. At present a typical size of the project is 250 000 ER for 4 years, the succesrate was last year around 30%. It should be noted that the Agency often suffered on drastic lowering of budget and it happened also that for some years the calls were not opened. The statute of the Agency is attached.

Incentives for research and development are provided to entrepreneurs in accordance with the Act 185/2009 on incentives for research and development as amended to deal with R & D projects with the aim to base their development and business plans on the results of research, development and innovation, to extend the staff capacity of R & D, as well as to increase investment in research and development. Totally, 16 subjects were supported with the amount of EUR 7,500 thousand. In the 2014-2020 period, expenditures on R & D incentives in total amount of EUR 108 million are planned.

Grants for scientific and technical services are provided in accordance with the Act 172/2000 on the organization of state support for research and development. Grants may be provided from the state budget for activities of **legal persons and natural persons - entrepreneurs** to support research and development. Providers may be central state administration bodies or the Slovak Academy of Sciences. The grant is state aid. In the 2014-2020 period, the budget for scientific and technical services is planned in total sum of EUR 73 million

RESEARCH AND DEVELOPMENT POTENTIAL OF THE SLOVAK REPUBLIC

The R & D potential in Slovakia is concentrated in the public sector (two thirds of expenditure on research and development is realized in the public sector). In abroad the R & D funded by the public financial funds is traditionally realized by the universities or other research organizations of the public sector. Slovakia is among the OECD countries which has a relatively low proportion of universities in the public research and development (48% share). As in other Central European Economies the National Academies of Sciences (and the departmental research institutes in the limited extent) play an important role. The main benchmark of the R&D potential of the country is the total number of employees in R & D which are available in the country. The share of employees of R&D was only 0.77% at the total employment in Slovakia in 2011 which was below the EU average and the innovatively developed economies and neighbouring countries. The structure of employees of the R&D sector is following: 16% of the corporate sector, 67% of the universities and colleges (together academics and researchers) and 17% of the governmental sector (Slovak Academy of Science and departmental research institutes). In 2011, the average registered number of employees of the public universities was 21 538. Of the number 53.5% are academics and/or researchers and 46.5% is other staff (administration, operational services, etc.). 11 522 teachers and researchers were employed in the public universities and colleges. In 2011, 1 813 researchers were employed in the Slovak Academy of Science and 350 researchers in agricultural research institutes. 2 700 researchers are employed in the research institutes of the business sector what is almost 16% of the total number of researchers.

Universities

Legislative rules for universities are approved by Act no. 131/2002 Z. z. of higher education as amended. According to the act there are universities: the state (3), public (20) and private (13). State and public universities are established by the law and the Government gives an authorization for the private universities. The large number of universities operating in the Slovak Republic has been the reason of the devaluation of the educational process, but established universities with the long tradition maintained the good quality and reputation. The result of these trends and the fragmentation of funds is a low quality of the universities according to the international ranking comparing their quality. Universities have been transformed into public institutions by law in 2002 which allowed developing of the multi-source financing. The basis is the state budget subsidy to which are added other sources on the base of standard contract. According to the law the public universities are defined as well as businesses, so they can benefit of its intellectual property. The most successful ones are able to obtain about 40% supplementary resources from the state budget in the form of grants or contracts for work. In the area of R & D there is active only a few public universities and one state university. Public universities are funded from the state budget in the form of subsidies, which depends on the performance of a particular school in the previous period. Public universities are financed from the state budget of approximately EUR 440 million (2013). This amount includes expenses to cover the cost of education, the needs for research (institutional research funding), the social scholarships, housing allowances for students and support sports and cultural activities. Public universities are self-governing organizations legally divided into faculties. If a public university is divided into faculties the faculty has the strong position in determining the curriculum, conditions of admission of students to study but also in economic or personnel area. This makes it difficult to manage the entire organization as the approval by a majority of representatives in the Academic Senate of the school is necessary for the important decisions.

Activities of public universities are regularly quantitatively assessed each year. These data are used to calculate the amount of the subsidy by calculation formula calculated on the basis of "methodology of sharing subsidies to public universities."

The five largest schools provide the vast majority of research performance and most educational performance.

There are Comenius University Bratislava, Slovak University of Technology Bratislava, Technical University of Kosice, Pavol Jozef Safarik University in Kosice, University of Zilina in Zilina.

The current support for higher education has systemic distortions that are reflected both in reducing the quality of higher education, but also reducing their scientific excellence. In 2006 and 2007 the European University Association realized an audit of all public high schools and the system as a whole. Final recommendations have not been implemented yet. At present, a report on higher education was presented, which should be the basis for changes and adjustments in the future.

It is necessary to redesign the support system so that high-quality universities benefit from the financing with regard to:

- increase the quality of higher education,
- increase the quality of higher education research and development,
- selection the best universities with global reputations,
- support the cooperation with practice,
- commercialization the results of R & D activities.

Sectoral research organizations

The Ministry of Agriculture and Rural Development (hereinafter "MPRV SR") is the founder of 6 subsidized organizations (research institutes and research centers), whose principal activity is to perform basic and applied research, development and related innovations for the agricultural practice, based on research strategies, development and innovation in the agricultural sector by 2020 compatible with the Europe 2020 Strategy and the EU Framework Programme for R & I Horizon.

In 2012, 810 employees (including 345 scientists and R&D) were working in research institutes and centers of the MPRV Slovak Republic.

The Ministry of Environment is the founder of these research institutions:

- Slovak Hydrometeorological Institute,
- Research Institute of Water Management,
- State Geological Institute of Dionýz Štúr

The Ministry of Culture is the founder of many Institutes, some are listed below:

- Theatre Institute,
- The Centre for Information on Literature
- Slovak Monument Board of the Slovak Republic,
- The Slovak National Gallery,
- The Slovak National Library,
- Slovak Center of Design,
- Slovak Film Institute,
- The Slovak National Museum
- Music Centre Slovakia

The Ministry of Health: University Hospitals.

Business R & I institutions

After a long-term transformation of research organizations of business sector (privatization), the current number of entities actively involved in the R&D in this sector is about 240 companies. These companies are established according to the Commercial Code and do their business in the field of R&D in the open competition market economy.

Over 4,500 employees are employed in the research organizations of the business sector. Of this number 2,700 are the researchers and the rest (1,800) are the employees of technical and implementation departments. The business sector represents 16% of employees of R&D in comparison to the total number of R&D employees.

Scientific performance of research institutions

The result of the insufficient inputs is below-average outputs as measured by biblioanalysis, as evidenced by the low values of the relative number of the scientific publications and citations and the below-average citation index. The scientific performance of universities and SAS by publishing performance ranking Institutional research organizations - SCIMAGO Institutions Ranking World Report 2012 can be regarded as unsatisfactory. Ranking compares institutions that published at least 100 scientific documents of any type in the world database Scopus from Elsevier.

Only 6 of the institutions are mentioned in the reviews, one of which is the SAS as a whole and 5 universities: Comenius University in Bratislava, Slovak University of Technology in Bratislava, University of P. J. Safarik in Kosice, Technical University of Kosice and University of Zilina. This means that no other institution, university, research institute or enterprise published even 100 works in 2010 in international scientific journals in SCOPUS. The performance, which was published from these institutions in the territory of the Bratislava region is approximately 75% and it indicates a significant asymmetry of publishing among scientific institutions in the Slovak Republic. There is currently allocated more than 50% of personnel and technical research capacities in Bratislava. Based on the analysis it can be suggested that the quality of publications of those institutions is good, but there is no world-class R & D and the performance in the basic research is low in international comparison.

Nevertheless, it can be concluded relatively high efficiency of expenditures in terms of the average amount of spending and the number of publications in peer-reviewed journals database in 2005-2009. The publication in sciences was financed in Slovakia less than half of what in Denmark and fifth of what in Germany. Similar ratios of prices and quantities were reported in other fields. Similarly, the cost per citation is lower than the European average. Overall effectiveness of outputs, compared with the inputs, is not bad in Slovakia. The aim is to get selected prospective fields with the supercritical number of inputs among the world's elite. Currently in Slovakia there are high quality teams with international reputations.

The current average salary for the scientists and researchers (6,42 EUR per hour) does not create adequate motivation conditions comparing with the competitive fields (ICT services and the finance sector), even the conditions offered by foreign firms for the top experts. It is necessary to amend the current legislation in the field of financing of the research to allow a competitive and non-discriminatory salary for the R&D activities.

Participation of the Slovak Republic in the European research area

FP7 programme: Overall participation was recorded of 2 086 project applications, in which the project participation developed in 362 designed projects and the contracted EC contribution of 49,92 mil. €. That ranks us up to 25th place among EU countries in recalculation per capita. The better situation concerns the relation to the amount of GDP where we are placed on the 22nd place. The EC contribution per project is relatively small in Slovakia because of the role of Slovak organizations in projects (we coordinated just 28 projects only 4 of which were research), but also the salaries of scientists, which form a significant part of the project budget. An important factor is our participation in projects in which there is a higher number of participants. At the same time a large number of our participation consists of projects primarily focused on their support, but not on the research itself (CSA projects).

The success of the SR in getting projects is 17.39% (19th place), however, the success according to the level of the EC contribution decreases to 10.63 %. The University sector is the most active in the number of participations in the applications (717), as well as in obtaining projects (114). However, firms are more successful in the amount of financial contribution and gained in 108 participations 17.36 million €. Research organizations (SAS and sector institutes) participated in 87 projects with a total EC contribution of 12.73 million €. Universities dominate in entire FP7 to a much greater extent than in our country, and at the expense of the business sector. However, it is positive in our country that we have a relatively high participation of small and medium sized enterprises (participated in 71 projects).

In total, 14 universities, 37 Institutes of SAS and other departmental institutes, 70 companies, 19 organizations of public and state administration and 13 non-profit organizations participated in at least one project FP7. It is the absolute number of 153 institutions and companies. In terms of thematic areas we engage to the greatest extent in ICT projects (51 participations and 9.34 mil. €), nano-science and Materials (30 participations and 6.52 mil. €) and to projects aimed at Security (17 participations and 5.16 mil. €).

The activities of SAS in ERA are summarized in the Annual Report 2015 <http://www.sav.sk/?lang=en&doc=docs-ann>

Structural funds of EU

In Slovakia in 2007-2013 OP Research and Development was the dominant source of competitive funding not only from the structural funds, but globally. This operational program supported the implementation of research and development in the newly established R & D centers. This tool generally supported 419 projects in which 782 participants participated.

In terms of support for the research infrastructure the projects can be divided into 8 types:

- Centers of Excellence (support excellent fundamental research)
- R & D centers (industry - academia)
- Competence Centers (relatively large clusters of academic institutions and industry)
- The applied research and technology transfer in the context of established research centers
- Projects for modernisation of the universities infrastructure
- Modernization of equipment
- National projects
- University science parks and research centers - I. stages.

It was funded a total of 67 centers of excellence. These were projects of EUR 2-3 million focused primarily on materials research, nanotechnology, environmental protection and biotechnology and biomedicine. These projects represented the first step to a greater funding for the research infrastructure. At the same time they began to create cooperation between partners and within the organizations of research and development. An important limit of the CE usability is ineligible activities with the entrepreneurs. R & D centers (RDC) represent the first major projects of cooperation between academic institutions and firms, while firms co-specified the topic of research for the project. The positive aspect of these projects is mainly the establishment of closer cooperation between institutions from different sectors. RDC were financed mainly in the field of materials research and nanotechnology, energy and sustainable energy and biomedicine and biotechnology. Most of these projects were solved in Bratislava and Trnava region.

Competence centers (CC) are the first major step towards building large projects integrating several partners from different sectors. They create linkage between collaborative public research institutions and entrepreneurs. Slovakia

established eight centers of excellence in the four regions (3 in Bratislava region, 2 in Košice and Zilina region and one in Banska Bystrica region) with project partners from all other self-governing region. Evaluation of submitted the creation of centers of excellence projects was on the basis of scientific excellence and interest from business partners, as well as assessing the potential economic benefits. The average support was at approx. EUR 8 million per project. Overall, 74 organizations from all sectors are involved in the projects. The support was given to the following centers:

- Competence center for research and development in the field of molecular medicine
- Competence center for new materials, advanced technologies and energy
- Competence center of smart technology for computerization and informatisation of systems and services
- Competence center for industrial research and development in the field of light metals and composites
- Brokerage center of aviation technology for transfer of technology and knowledge in transport and transport infrastructure
- Competence center for research and development of diagnostics and therapy of cancer
- Competence center for biomodulators and nutritional supplements (Probiotech)
- Competence Center of knowledge technology for innovation of production systems in industry and services

Competence Centers represent a grouping of partners implementing the research and development activities with an aim to its commercialization and there was built an adequate infrastructure for the implementation of the tasks. RDC and CC are collaborative projects between academia and industry. There was relatively high demand on the participation in research and development projects from the industry side. Nowadays there is an implementation of projects of building university science parks in the amount of about EUR 300 million. To realize one park there will be allocated approx. EUR 40 million. This is the last phase of the OP R & D in the programming period 2007 - 2013. By 31 May 2013 there was approved a total of 11 projects of RDP in Slovakia. In the framework of the built science parks there have been supported scientific elite teams with the potential of the further cooperation so that the outputs could be commercialized in practice at the maximum level. Science parks are the complementary capacities of centers of excellence. Science parks with competence centers are the umbrella of the field of scientific specialization with possible economic outcomes. They present the scientific field of specialization with economic potential. To make their operations more effective there will be needed to create mechanisms for the efficient combining of the innovation actors.

Overall, the Slovak science is still underfunded and EU structural funds do not change this fact. International comparisons show that the Slovak Republic should increase the amount of resources invested. Financial investment in research and development in Slovakia have long been underfunded and are far behind the EU average. Within the EU, Slovakia is placed on the last 3 places together with Bulgaria and Romania for long term. For example, among the countries of the Danube Region, Slovak Republic invests in research and development even less, such as Croatia, Serbia and Ukraine.

Details of the SAS activities are summarized in <http://www.sav.sk/?lang=en&doc=docs-ann>

Priorities of research and development

- **Material research and nanotechnology**
- **Information and communication technologies**
- **Biomedicine and Biotechnology**

2.6.2. Technological priorities

- **Industrial technologies**
- **Effective usable energy sources** (Slovakia has 350 researchers in the field).
- **Environment, Agriculture, Food security**

2.6.3. Societal priorities

- **The aging population and quality of life**
- **Multietnicity, social inclusion and poverty problems of some groups**
- **Employment of young people in the changing conditions.**

Universities

As of 31 December 2012 Slovakia had 36 universities with 132 faculties with 131 306 students at I. and II. level and 5 810 internal students at III. level and 58 035 students at I. and II. level and 4 925 students at III. level of the external study. 10 825 teachers taught at all universities. 42 493 students at I. and II. level and 1 343 students at III. level completed university studies in the school year 2011-2012. In 2012 most candidates applied for economic sciences (13 007), pedagogical sciences (8 454) and teaching professions (5 513). 3 658 candidates applied for the Informatics and

computing and 3 435 candidates applied for engineering and other metal processing production. The first five places in the number of applications for study programs and branches were: Teaching (7 336), Business management (6 422), General medicine (5078), Law (4 710) and Social work (4 243).

The social sciences are leading in the number of university students (about 58 % of the total number of university students during the monitored period). Engineering students are placed on the second place, but they do not form even one half of the number of students of social sciences. The number of students of the natural science is about 5 % of the total number of university students.

Source: Research and Innovation Strategy for Smart Specialisation of the Slovak Republic, 2013