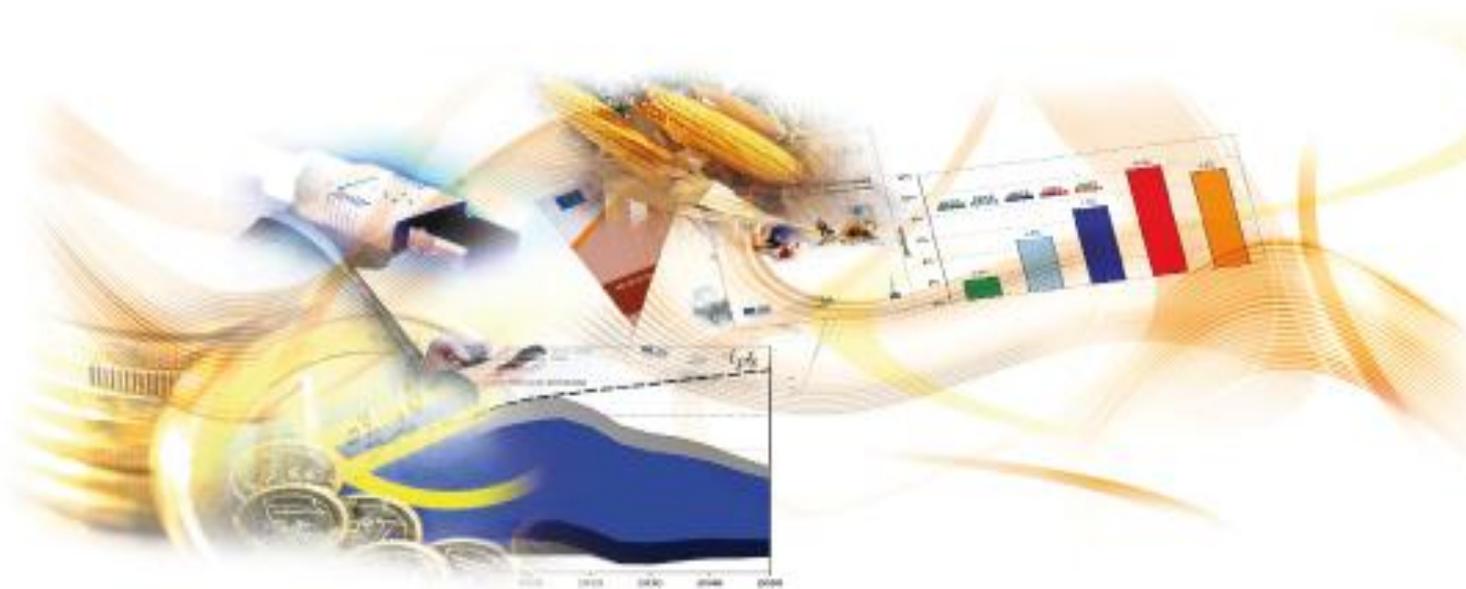


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The Country Report 2012 builds on and updates the 2011 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

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EXECUTIVE SUMMARY

Slovakia ranked to top economic performers in 2000s in the EU27. Slovakia's economy was hit by the economic crisis in 2008 and 2009. The economic growth restarted in 2010 - 2012, but accounted for lower growth rates. Progress towards developing an efficient system of research and development has been limited so far. Gross expenditure on research and development (GERD) as per cent of GDP was 0.68%, far below the EU27 average (2.03%) in 2011. Slovakia accounts for extremely low level of R&D inputs and outputs. Total Slovak GERD and BERD as per cent of GDP were respectively about three times and five times lower than those in the EU27 in 2011. Total Slovak GERD (€468.4m in 2011) was dominated by three major flows: (i) government to government sector (20.0%), (ii) government to higher education sector (25.8%) and (iii) business to business sector (29.2%). Industry – academia flows were quite unimportant. The flows from business to government, and business to higher education sector accounted for 3.5% and 1.2% total funding flows in 2011. Structure of flows points to the poor interconnection of the public and private sector.

Low levels of R&D inputs corresponded with low level of knowledge-intensive outputs by early 2010s. Major long-term trends in research funding in Slovakia included (a) decline of research funded by private sector and increase of relative importance of government finance, (b) decreasing importance of applied research and increasing importance of basic research, (c) falling shares of engineering and increasing shares of natural sciences (related to basic research), and (d) disappearing thematic focus and increase in non-oriented research and general University funds.

The key challenges in the national innovation system have been continuing for many years:

- Weak R&D system and poor co-operation between academia and industry sectors;
- Underdeveloped system of innovation governance;
- Dual economy;
- Low shares of domestic innovative enterprises limiting competitiveness of the country;
- Inadequate national research and innovation funding.

A common denominator for poor research and innovation performance was near defunct research and innovation system. Slovakia accounted for extremely low spending on R&D and poor performance by most indicators included in the Summary Innovation Index. Slovakia had no national innovation plan and/or national innovation council and the regional systems of research and innovation governance also were missing by 2012¹. Slovak research and innovation system has increasingly relied on the EU resources, while national funding decreased in importance since 2007. Slovak economy was largely dominated by branches of the multinational companies (MNCs). The MNCs were attracted by low cost of inputs (labour in particular), geographical location of Slovakia and favourable tax conditions. The MNCs did research in their headquarters and had limited interest in shifting their applied/industrial research to Slovak Universities and research institutes.

The three basic **innovation policy priorities** set in the 2007 Innovation Strategy included: (1) High-quality infrastructure and an efficient system for innovation development; (2) High-quality human resources; and (3) Efficient tools for innovation. The **research policy priorities and policy mix** were set in the [Long-term Objective of the State S&T Policy up to 2015](#) and referred to (1) Higher involvement of S&T in the development of Slovakia, and more intensive participation by S&T in solving economic and social problems in Slovakia; (2) Better conditions for S&T development inside Slovakia, and also for Slovakia's activities within the European Research Area; and (3) Setting targets for S&T development in terms of (a) S&T policy co-

¹ The Government Council of the Slovak Republic for Science, Technology and Innovation firstly met in March 2013.

ordination, (b) building and modernising R&D infrastructure, (c) institutional reform of public R&D, (d) reform of public financial support to R&D, (e) international co-operation, and (f) monitoring and evaluation of public R&D system. Policy documents and research and innovation policy measures adopted since 2007 responded to the weaknesses in the Slovak research and innovation systems, and tried to address the major challenges in research and innovation funding, capacity and infrastructure building, creating supply of human resources, and strengthening industry-academia linkages. The challenges, however, are considerable and progress towards building knowledge-based economy was slow so far.

The mix of research and innovation policy instruments applied in period 2007-2013 basically resemble those applied in planning period 2004-2006. The most significant difference is much higher assistance provided by the Structural Funds in 2007-2013. Two routes have dominated policies aimed at stimulation of R&D investment and innovation in Slovakia in last three years: (a) increasing R&D in public sector, and (b) stimulating greater R&D investment in R&D performing firms (SMEs in particular). Most financial assistance is provided via grants for technology transfers, building business and technology incubators, developing R&D, infrastructure, supporting R&D co-operation networks, financing applied research and creating risk capital schemes. The most recent innovation policies indicate a positive shift towards more sophisticated innovation policies in the near future in terms of new agendas (support to clusters), target groups (MNCs), and modes of funding (innovation vouchers).

The Slovak Ministry of Education, Science, Research and Sports (MESRS) organized a conference in the Regional Innovation Strategies on Smart Specialisation strategies (RIS3) in October 2012. The Regional Operational Programme launched a call aimed at development of regional development strategies (including RIS strategies) in February 2012. The Slovak NUTS III regions exploited the opportunity and applied for support for drafting the RIS3 strategies. The MESRS drafted first version of the National RIS3 strategy in January 2013. The final version of the national document should be ready by June 2013.

The Slovak Republic made some progress in implementing the ERA Communication objectives in 2012 (European Commission 2012). The Slovak Parliament, for example, adopted the Blue Card Directive. The EURAXESS service planned publishing job vacancies in Slovakia and other EU countries. The Structural Fund Agency of the MESRS launched large-scale infrastructure projects. Some long-term problems, however, were not tackled in 2012 (reform of academic degrees, inaccessibility of the national research programmes by foreigners, low national resources for research funding).

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1 INTRODUCTION

The Slovak Republic has area of 49,034 square kilometres and population of 5.4 million. It accounts for 1.17% of area and 1.08% of population of the EU27. Slovak GDP per capita (based on purchasing power parities) was €18,400 (73.0% of the EU27 average) in 2011.

Slovakia enjoyed period of moderate economic development. Data by the Eurostat indicate that the estimated average annual rate of growth in GDP was 3.4% in Slovakia, while 1.1% in EU27 in 2010-2012. Far less progress was done in developing an efficient system of research and development. Gross expenditure on research and development (GERD) as per cent of GDP was 0.68%, far below the EU27 average (2.03%) in 2011. Numbers of research personnel also were very low and decreasing over 1990s and 2000s, from 60,548 in 1989 to 28,596 in 2011 (Figure 2). Slovakia copes with underdeveloped research infrastructure. The Ministry of Education, Science, Research and Sports (MESRS), and the Slovak Academy of Sciences suggested concentrating major part of the Structural Funds spending to some ten large-scale infrastructure projects. Two mirror calls launched in June 2012 allocated €165m and supported building top-notch research centres in biology, new materials and energy resources.

Slovakia accounts for extremely low level of R&D inputs and outputs. Total Slovak GERD and BERD as per cent of GDP were respectively about three times and five times lower than those in the EU27 in 2011 (Table 1, chapter 2.2). Numbers of R&D personnel (in FTE) per million inhabitants was 1.5 times lower and number of business R&D personnel 4.5 times lower in Slovakia than in the EU27 in 2011. Low levels of R&D inputs corresponded with low level of knowledge-intensive outputs. Slovakia produced just some 6.04 patent applications to the EPO per million of inhabitants, while the EU27 accounted for 108.59 applications in 2010 (source: Eurostat). Rates of the knowledge-intensive services (KIS) exports as % total service exports were 23.1% in Slovakia and 48.1% in the EU27 in 2009. The license and patent revenues from abroad as per cent of GDP were 0.07% in Slovakia, but 0.51% in the EU27 in 2010. The employment rate in knowledge-intensive activities (manufacturing and services) as per cent of total employment was 10.1% in Slovakia, but 13.5% in the EU27 in 2010. Value of the 2011 Summary Innovation Index for Slovakia (0.305) was 56% of the EU27 average (source: the 2011 Innovation Union Scoreboard).

Slovakia has a small open economy and is strongly dependent on manufacturing exports. Manufacture of cars, car components and consumer electronics, and production of machinery, metals and metal products are major export-oriented Slovak industries. Influx of the foreign direct investment (FDI) was a major factor behind Slovakia's economic success. Arrival of the FDI was accompanied by massive transfers of top technologies and organisational innovations, but no MNCs shifted its research centres to Slovakia. The MNCs publish very little about their R&D expenditure in Slovakia. The Eurostat data on GERD by sectors source of funds indicate that foreign enterprises spent some €14.5m in Slovakia, i.e. 3.1% of the total Slovak GERD in 2011. Both absolute and relative spending on R&D by foreign companies was low, given high dependence of Slovak economy on foreign capital. Allocation of GBAORD to socio-economic objectives reflected neither the sector structure of the economy nor the knowledge demand. The [ERAWATCH report on country specialisation](#) found that 'Slovakia's economic specialisation spreads over a large number of sectors', but there are 'no strong correlation in terms of economic specialisation, BERD and technological specialisation.' Lack of thematic focus is confirmed also by data on total GBAORD by NABS 2007 socio-economic objectives. Three most important themes (industrial production, health and agriculture) accounted for some 20.9% of the total GBAORD in 2011 in Slovakia. Investment in general advancement of knowledge, on the other hand, accounted for some 57.8% of total GBAORD in the same year. No significant

R&D investment was reported for the key Slovak industries (manufacturing of cars, car components and consumer electronics).

The governance structure of the Slovak research system changed little over last decade. The top governance body in the field of science and technology was the Ministry of Education. It was renamed to the [Ministry of Education, Science, Research and Sports](#) (MESRS) in 2010, but there were no significant changes in competences and/or budgets. The MESRS is responsible for policy- and decision-making in the field of science and technology (Figure 1). National science and technology policy is prepared and coordinated by the MESRS with co-operation of other ministries (the Ministry of Economy ME, in particular), the [Slovak Academy of Sciences](#) (SAS), higher education institutions (HEIs) and associations of employers, and industrial research organisations, respectively. The MESRS also administered the most important body for coordination of science and technology policies (S&T), the [Slovak Republic Government Board for Science and Technology](#) (SRGBST). The Slovak Government abolished the SRGBST in 2011 and no new body was established by end of 2012. Since 2007, responsibilities for the research and innovation policies are separated between the Ministry of Economy (ME) and the MESRS. Innovation policy measures are implemented by the ME and its agencies. The ME drafted the 2007 [Innovation Strategy](#) and [2008 Innovation Policy](#) and the [2011 Innovation Policy](#) documents. It also established the [Slovak Innovation and Energy Agency](#) (SIEA) in 2007. This organisational division was prompted by introduction of the Structural Fund programmes. The ME implements the Operational Programme of Competitiveness and Economic Growth (OPCEG). The MESRS implements the [Operational Programme Research and Development](#) (OPRD) and the Operational Programme Education (OPE). As to manage the OPRD and OPE, the MESRS established the [Agency of the MESRS for the Structural Funds of the European Union](#) (ASFEU).

Slovakia used to be a centralised country. The self-governing regions were created as late as in 2002 and got no legislative powers in higher education, research, development, and/or innovation policies. These activities have traditionally been considered matters of central government. There are no regional research or innovation councils. Bratislava is the major centre of R&D activities. It accounts for 8.5% of total population, but about half of the Slovak R&D personnel and spending. The R&D capacities in Bratislava mostly are supported by the central government and/or large enterprises.

The MESRS supports basic and applied research via state budget allocations and competitive grants given to a network of organisations and agencies important for development of science & technology (S&T) and higher education. The key research performers include:

- The [Slovak Academy of Sciences](#) (SAS) is a research body providing the bulk of basic research in Slovakia. The SAS had budget of €59.55m and employed 3281 people in full-time equivalent (1812 of which held a scientific degree and 419 were PhD students, the rest of employees are technical staff) in 2012. The 2013 State Budget Law set support to the SAS to €60.08m.
- **Higher Education Institutions.** There were 23 public and 13 private higher education institutions in Slovakia (as of 2013). Estimated share of public expenditure on the university system in GDP was 0.62% in 2011 and 0.60% in 2012².

The key funding agencies include:

² The 2012 State Budget Law set the SAS budget to €59.9m and the state support to higher education to €441.4m, some 0.62% of the estimated 2012 GDP. The 2013 State Budget Law set support to the SAS to €60.08m and to higher education €449.9m, some 0.60% of the estimated 2013 GDP (author's estimate).

- The [VEGA](#) is funding grant agency for the MESRS, and the SAS. The VEGA allocated €13.34m to 1803 research grants in 2012 (source: the VEGA [webpage](#)).
- The [Research and Development Agency](#) (RDA) provides mostly applied research grants for public and private bodies. The RDA budget increased from €0.15m in 2001 to €21.81m in 2012³.

Most research was performed in the business sector (42.1% of total expenditure in the R&D), public research facilities (30.0%) and higher education facilities (27.6%) in 2010. Private non-profit sector accounted for less than 0.3% of total outlays in the same year.

Data on research by businesses are quite scarce in Slovakia. The 2006-2010 EU Industrial R&D Investment Scoreboards included no Slovak company. Branches of MNCs, which dominate the Slovak economy, concentrate on production activities. The R&D activities are mostly performed in the MNCs' headquarters and/or research centres. The great majority of some 120 thousand Slovak firms are SMEs, which lack adequate R&D backing. Many of them have been able to import and adopt advanced technologies and know-how, but only few perform their own R&D activities. Lack of large private R&D spenders is a serious problem in Slovakia. The R&D investment by the Volkswagen group (€6,258m), for example, was 15 times higher than total Slovak GERD and 43 times higher than Slovak BERD in 2010 (source: the 2011 EU Industrial R&D Investment Scoreboard).

³ The RDA budget peaked with €39.83m in 2009 and dropped to the €32.19m in 2010. The 2011, 2012 and 2013 budgets allocated €20.51m, €21.84m and 29.97m respectively to the RDA budget (sources: the 2011-2013 State Budget Laws). The government explained cuts in the 2011-2012 RDA budgets via austerity measures and abundance of finance provided by the European programmes. National schemes supporting R&D, however, accounted for much higher flexibility, and lower level of corruption and administrative burden.

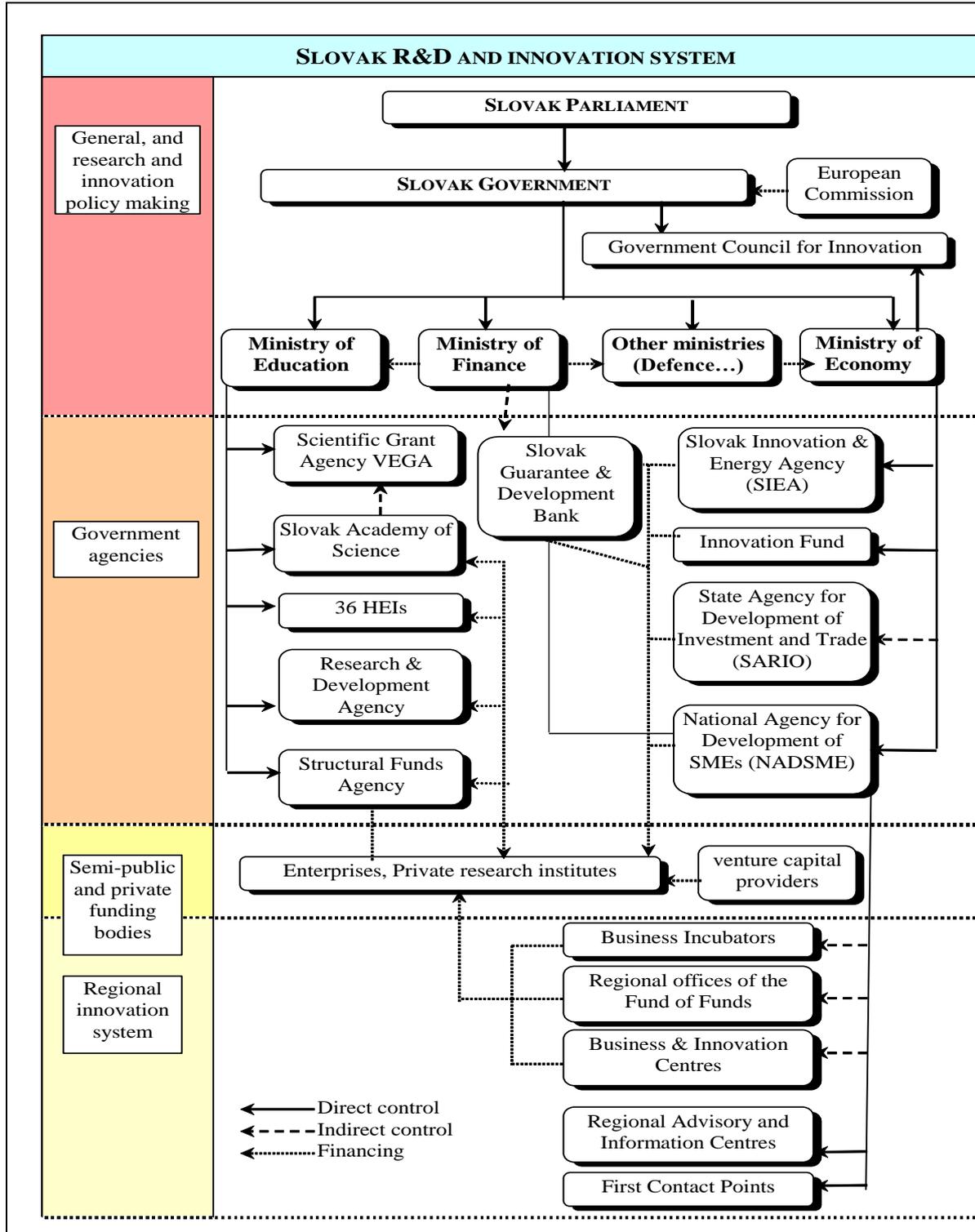


Figure 1: Structure of the Slovak research and innovation system

2 RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

2.1 National economic and political context

Slovakia ranked to top economic performers in 2000s in the EU27. The country enjoyed an economic boom driven by an influx of foreign direct investment, low wages and a liberal market environment. Most of positive developments in growth in innovation capacity referred to technology absorption and diffusion by the multinational companies (MNCs). Like many EU Member Countries, Slovakia was hit by the economic crisis in 2008 and 2009. Slovakia's economy heavily depends on export of cars and consumer electronics, and was negatively affected by falling consumption across the whole EU. The economic growth restarted in 2010, but accounted for lower growth rates. The GDP growth rate was 3.3% in 2011 and was estimated to slow down to 2.5% in 2012 and 2.1% in 2013. Lower growth rates transferred to persistently high unemployment rates (13.9% in 2012). Lower growth and high unemployment rates affected tax collection, and were behind increases in budget deficit and public debt. The budget deficit accounted for 4.8% GDP in 2011, and was estimated for 4.6% in 2012 and 2.9% in 2013⁴. As to achieve targets in fiscal consolidation, the Slovak Parliament approved proposal of the Slovak Government for the tax hikes in 2013. The personal income tax increases from 19% to 25% for the highest income groups. Many employees also will pay higher social security contributions. Increases in personal income tax and social security contributions would particularly affect high-tech, high-wage professions (IT specialists, doctors, experts, analysts, workers in creative industries, etc.). The corporate income tax increases from 19% to 23%. The increase is likely to affect domestic middle-sized firms. The MNCs have long benefited from tax breaks and tax optimization across their branches around the World. Changes in the tax legislative effectively (a) dismantled system of flat tax, and (b) increased labour costs in Slovakia.

Policies of the former Slovak governments supported competitiveness mode based on low-cost, low-tax and low-value added productions. These policies significantly boosted economic growth via internationalising Slovak economy, and creating favourable environment for business and investments. This type of competition, however, proved unsustainable. In the long term, economic growth is above all defined by technological progress and the accumulation of human capital, which determines the way and speed at which technological progress penetrates the economic texture. The most important issues in this context are the availability of research funding and the supply of highly skilled researchers. In this respect, Slovakia's progress toward a knowledge-based economy was slow.

2.2 Funding trends

Major long-term trends in research funding in Slovakia included (a) decline of research funded by private sector and increase of relative importance of government finance, (b) decreasing importance of applied research and increasing importance of basic research, (c) falling shares of engineering and increasing shares of natural sciences (related to basic research), and (d) disappearing thematic focus and increase in non-oriented research and general University funds (Figure 2). These trends relate to overall fall in research spending, and decline in the domestic

⁴ Macroeconomic indicators by the Institute for Financial Policy of the Slovak Ministry of Finance.

private research base in the 1990s in particular. Share of GERD in GDP was 3.88% by 1989, but 0.68% in 2011 (Table 1). Numbers of researchers were declining simultaneously with the GERD shares in GDP (Figure 2). The 2020 national targets for shares of GERD and BERD in GDP were 1.00% and 0.67% respectively (as of 2012). The GERD target may be realistic providing EU assistance to Slovak research system continues. The BERD target is more challenging, given extremely low R&D spending by Slovak firms⁵.

Table 1: Latest trends in R&I funding in Slovakia and EU27

	2009	2010	2011	2012 (estimate, if such data are available)	2020 national target	EU average 2011
GDP growth rate	-4.9	4.4	3.2	2.6	n.a.	-0.3
GERD as % of GDP	0.48	0.63	0.68	n.a.	1.00	2.03
GBAORD (€ million)	190.40	194.520	161.64	n.a.	n.a.	92,308.34
GBAORD as % of GDP	0.30	0.30	0.23	n.a.	n.a.	0.73
BERD (€ million)	124.38	175.25	174.18	n.a.	n.a.	160,088.14
BERD as % of GDP	0.20	0.27	0.25	n.a.	0.67	1.26
R&D performed by HEIs (% of GERD)	25.01	27.64	34.95	n.a.	n.a.	24.00
R&D performed by PROs (% of GERD)	33.89	29.96	27.66	n.a.	n.a.	12.68
R&D performed by Business Enterprise sector (% of GERD)	41.05	42.09	37.18	n.a.	n.a.	62.35

Sources: Eurostat and author's own computations.

The Slovak research system increasingly relies on European resources. Support to knowledge-based economy accounts for impressive increases in period 2007-2013 (source: Slovak Government: the National Reference Framework for the Slovak Republic for period 2007-2013). Total assistance by Structural Funds to human resources, R&D and innovation was some €436m for the period 2004-2006. Assistance to these fields should increase to some €5b in between 2007-2013. The European assistance, however, ousts national funding. This trend has been pronounced since the outbreak of the economic crisis in 2008. The Slovak Government pointed to the availability of the European resources for R&D funding and cut national support to research and development. The 2012 State Budget Law envisaged total support of €501.41m, of which €404.41m (81%) comes from the [Operational Programme Research and Development](#) (OPRD). The 2013 State Budget Law set total support of €491.80m, of which €392.36m (79.5%) comes from the OPRD. The same law set the SAS budget to €60.08m (2012: €58.98m) and the budget of the RDA to €27.97m (2012: €21.81m).

Usual co-financing rate by the ERDF/ESF (for measures provided under the OPRD) is 85%-95%. Innovation policy measures almost completely rely on assistance provided by the

⁵ The Ministry of Education, Science, Research and Sports (MESRS) planned drafting new instruments to encourage higher business spending on R&D. Current levels of spending, however, are so low that plan for for two thirds of total spending being provided by businesses seems hardly realistic. Source: personal communication with staff of the Science and Technology Department of the MESRS.

Operational Programme Competitiveness and Economic Growth, and usual co-financing rate by the ERDF/ESF is 85%.

Slovak research funding relies almost exclusively on grants. In 2009 the tax stimuli were first time used though to a limited extent:

- **Institutional funding** supports basic research in HEIs and is provided directly (via block grants) from the state budget divisions (ministries and other central authorities). Total volume of institutional funding from state budget was €39.43m in 2010, €106.42m in 2011 and €145.02m in 2012. The leap in funding between 2010 and 2011/12 was due to change in accounting rules. Most personnel costs related to teaching were reshuffled to chapter on research.
- **Project finance** is provided from the national and European resources. The total volume of public support to project finance accounted for €253.73m in 2011. It increased by 7.5 times in the period 2007-2011. The increase is related to the financing of programmes through the Structural Funds.
- The Slovak Parliament passed the 185/2009 R&D Stimuli Law in April 2009. The law provides **tax breaks** for specific activities in applied research. Five firms were supported with €1.3m in 2009 and 15 ones with €1.2m in 2010. The R&D stimuli were provided mostly in form of direct subsidy in 2011. Tax breaks accounted only for 2.1% of total R&D stimuli awarded in 2011 (source: the 2007-2011 Annual Reports on R&D).

As for the structure of funding streams from funders to performers, particular sectors were poorly interconnected. Total Slovak GERD (€468.4m) was dominated by three major flows: (i) government to government sector (20.0%), government to higher education sector (25.8%) and business to business sector (29.2%) in 2011. Industry – academia flows were quite unimportant. The flows from business to government, and business to higher education sector accounted for 3.5% and 1.2% total funding flows in 2011.

Research and innovation traditionally were considered matters of central government in Slovakia. Slovak regions have no legislative powers in field of research and innovation. No explicit regional research and/or innovation programmes, and policy measures have been developed in Slovakia. All research and innovation policy measures are designed and implemented by agencies of central government.

Public-private partnerships have had rather limited role in leveraging additional funding so far. The State Budget supported six horizontal and three thematic State Research and Development Programmes (SRDPs) in period 2003-2010. The SRDPs should (among other goals) promote co-operation by private and public sector in research and development. Total support by the state budget was €91.36m and the private sector provided €20.94m in the abovementioned period. No SRDP was launched in 2010 - 2012.

Role of inter-regional funding is quite unimportant for research and innovation in Slovakia. The Operational Programme INTERREG IVC supported seven Slovak firms with €2.9m in period 2008-2009. Transnational funding, however, increased in importance since 2008. The share of foreign funding in total funding increased from 2.3% in 2000 to 14.2% in 2011. The European Commission and other international organisations generated about 76.8% of total foreign funding (10.9% of the total GERD) and the business enterprise sector 21.8% of total foreign funding for Slovak research system (3.1% of the total GERD) in 2011.

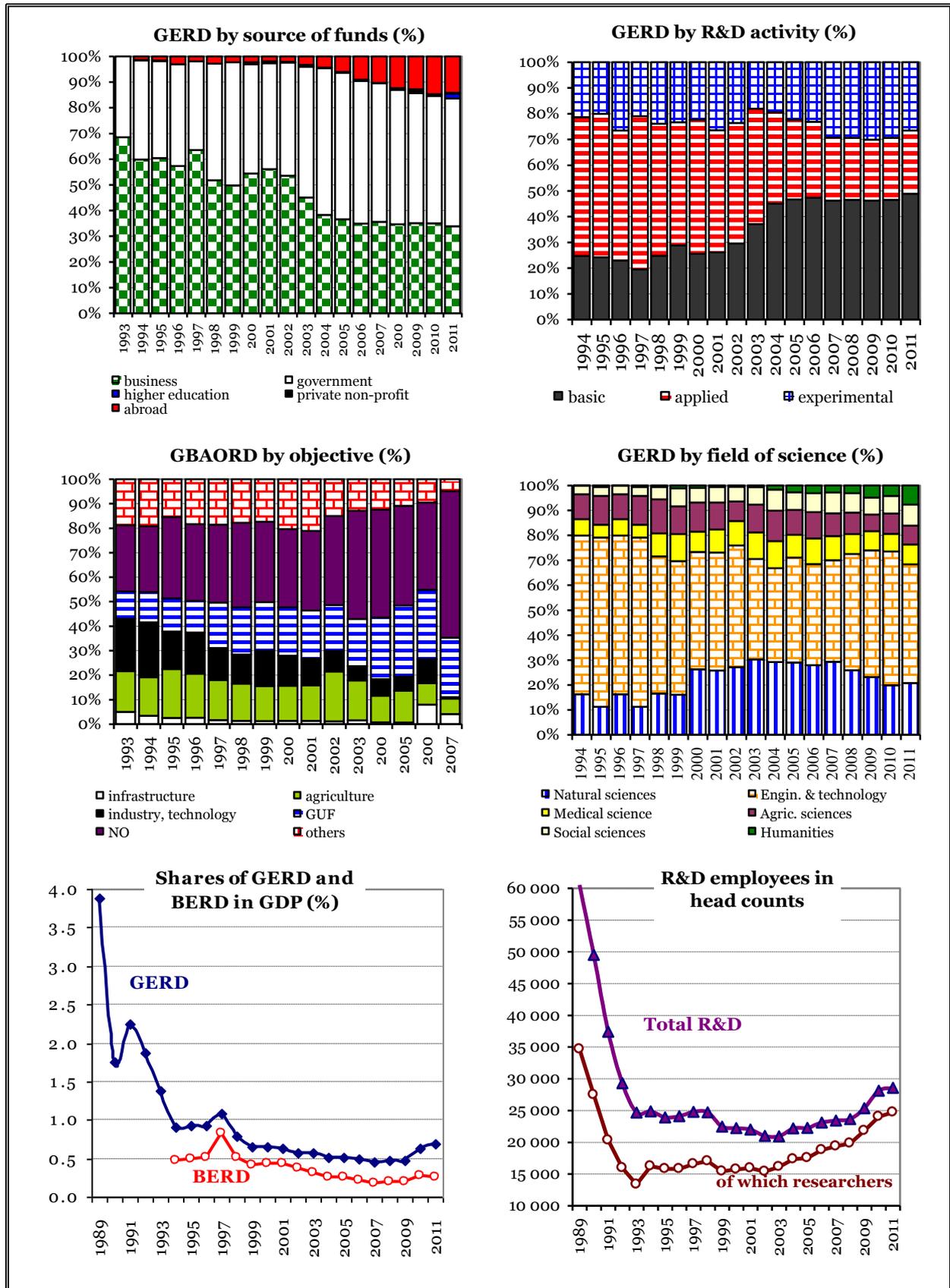


Figure 2: Trends in research funding in Slovakia. Sources: Eurostat and the Statistical Office of the Slovak Republic.

2.3 New policy measures

The [2011 Innovation Policy](#) suggested several new policy measures (the ‘National motivation project for improving innovation performance’, the ‘Innovation voucher’ project’, the ‘Intellectual property rights’ project). None of these projects were launched by end of 2012 due to financial constraints. The Ministry of Economy finally was able to get €100,000 for the innovation voucher scheme, but found that the 181/2011 Law on Subsidies does not include innovation in list of supported activities⁶. The Ministry drafted an amendment of the 181/2011 Law as to include innovation, research and development to the list⁷.

The Ministry also hoped to implement the ‘Support to the Industrial Cluster Organisations’ scheme. The 2011 Innovation Policy envisaged budget €4m for this scheme in period 2011-2013. The Ministry of Finance considered targets in fiscal consolidation more important and did not approve the scheme budget. The Slovak Government later decided to transfer €250,000 from the [Minerva 2.0](#) strategy budget to support of clusters. The Ministry of Education Research and Sports launched a ‘tailor-made’ call supporting five incumbent clusters in October 2012. Support is designed for the five most important clusters in following areas: industrial production lines (€80,000), information technologies (€60,000), robotics and automation systems (€60,000), biodegradable plastics (€30,000), and construction, mining and wood processing machinery (€20,000). The applicants have to prove co-operation with the Slovak Universities and the Slovak Academy of Sciences. The support is provided under the 185/2009 R&D Stimuli Law. Sector-oriented support is a novelty in Slovakia.

2.4 Recent policy documents

Policy-making in research and innovation was affected by changes in the government composition. The government of Ms Iveta Radičová started in June 2010 and resigned in October 2011. Elections were held in March 2012 and new government of Mr Robert Fico commenced its work in April 2012. The government of Ms Iveta Radičová prepared the [Fenix](#) and [Minerva 2.0](#) strategies in July and August 2011. The documents tried to integrate research and innovation policies, and suggest a range of institutional reforms for increasing quality of higher education and research, notably: (i) implementing more efficient and transparent evaluation techniques, (ii) reforming some key research performer institutions (the Research and Development Agency and the Slovak Academy of Sciences), (iii) re-allocating finance provided by the [Operational Programme Research and Development](#) towards large-scale projects with strategic importance, (iv) creating a national system for technology transfers, (v) introducing new programmes supporting new technology-based firms and innovation-oriented research, and (vi) starting co-operation with branches of multinational companies in Slovakia (e.g. establishing top-notch infrastructure for elite research). The both documents remained in force after the government changed, albeit with limited financial resources.

Slovakia accounted for rather poor performance in higher education. The best Slovak HEIs have been lagging behind those in Austria, Czech Republic and Hungary for many years⁸. The government of Mr Fico concentrated on amendments of laws concerning secondary and higher education. The Ministry of Education, Science, Research and Sports (MESRS) pointed to problems with low quality of mass education and lack of graduates in science and engineering. It

⁶ Source: personal communication with the Industry and Innovation Unit of the Ministry of Economy.

⁷ The Slovak Government approved the draft via its resolution no 643/2012 of 28.11.2012 and earmarked some €300,000 for support to innovation and R&D.

⁸ The [Webometrics Ranking of World Universities](#) contained only three Slovak Universities in list of top 1000 World Universities by July 2012 (the Comenius University in Bratislava no. 475, the Slovak University of Technology no. 567, and the Technical University of Košice no 823).

presented plans for limiting numbers of students applying for (a) ‘gymnasium’-type secondary education (providing full general secondary education) and (b) tertiary education in social sciences and humanities (SSH). The MESRS suggested that only the best primary education graduates could apply for the ‘gymnasium’-type schools, while the rest should be channelled to vocational schools. As for the tertiary education, the government planned decreasing support to public SSH Universities and enhancing science and engineering studies. These plans sometimes clashed with incumbent legislative. The Goethe University (Germany) applied for the licence of the higher education institution (HEI) in ‘tourism’ and ‘mass media studies’ in December 2011 in Slovakia. The MESRS was rather reluctant to support the licence. It pointed to (a) high numbers of HEIs in Slovakia, (b) excessive focus of all private HEIs on SSH topics, and (c) high numbers of unemployed graduates with the SSH degrees. The Goethe University, however, passed all legal requirements, including acknowledgement of the Accreditation Commission. The Slovak Government had to approve establishment of the Goethe University in Slovakia in August 2012. The MESRS also drafted amendment of Law on Qualification Degree Documents in October 2012. The amendment implements relevant European directives and applies to five levels of middle and higher education. It makes mutual recognition of degrees easier for citizens of Slovakia, and European and third country nationals.

The MESRS and the Ministry of Economy started preparatory works on the respective R&D and Innovation Strategies for planning period 2014-2020. The strategies should be ready in 2013.

2.5 Research and innovation system changes

The only important change in the Slovak research and innovation system was the abolishment of the Slovak Government Council for Science and Technology. The Slovak Government passed the Government Resolution No. 620/2011 on 28 September 2011 and made the body obsolete. The resolution also approved statute of the new top body for co-ordinating central government agencies involved in development of the knowledge-based economy - the Government Council of the Slovak Republic for Science, Technology and Innovation (GCSRST). The Council is chaired by the Prime Minister. It discussed first draft of the National RIS3 strategy National RIS3 strategy on its first meeting in March 2013

2.6 Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)

The Slovak Ministry of Education, Science, Research and Sports organized a conference in the Regional Innovation Strategies on Smart Specialisation strategies (RIS3) in October 2012. The conference was attended by Mr Robert-Jan Smits, Director General of the DG Research and Innovation, Slovak political elites, rectors of Slovak HEIs and business representatives. Drafting RIS3 strategies is important for tapping the Structural Funds resources in field of research and innovation in planning period 2014-2020. The Regional Operational Programme launched a call aimed at development of regional development strategies (including RIS strategies) in February 2012. The Slovak NUTS III regions exploited the opportunity and applied for support for drafting the RIS3 strategies⁹.

The Bratislava Region made most progress in drafting RIS3 strategy in Slovakia. It co-operates with the Business Innovation Centre in Bratislava (BIC Bratislava). The BIC Bratislava drafted also the 2004 RIS for the Bratislava Region¹⁰. Draft of the RIS3 strategy for the Bratislava

⁹ The minimal support for the regional planning documents was set to €30,000 the maximal one to €300,000. The Žilina Region (NUTS III level), for example, applied for €47,750.

¹⁰ Regional governments operate on the NUTS III level in Slovakia (except for the Bratislava Region, which is both the NUTS II and NUTS III region). All regional innovation strategies are drafted on the NUTS III level.

Region was presented on the Open Days – the 10th European Week of Regions and Cities in Brussels in October 2012. The Bratislava Region plans to concentrate on support to technology firms, science and technology parks, creation of jobs in high-tech sectors, and increases of exports in high-tech industries. The BIC Bratislava identified some 900 technology-based businesses and conducted interviews in key firms in the region. Working groups for the Bratislava RIS3 strategy also included representatives of the Bratislava-based Universities and the Slovak Academy of Sciences, business and industry associations, and regional and local governments.

The RIS3 strategy for the Bratislava Region was a pilot project in Slovakia. The first draft of the National RIS3 strategy was prepared by the Ministry of Education, Science, Research and Sports in January 2013. The BIC Bratislava was one of the key stakeholders involved in preparation of the national document and provided many valuable insights. Key regional stakeholders (Universities, research centers and businesses) were represented in six working groups for thematic priorities. Regional governments would step in later phases. As for the regional priorities, most discussions concentrated on dominant shares of the Bratislava Region in total research capacities and outputs. Key Slovak Universities and the Slovak Academy of Sciences argued for persevering Bratislava's derogation in funding for advanced regions in period 2014-2020. The final version of the national document should be ready by June 2013.

2.7 Evaluations, consultations

Public bodies and support schemes in research and innovation are subject to regular evaluation in Slovakia. The evaluation culture, however, is rather underdeveloped.

Since 2006 the Slovak Government published Annual Reports on R&D. The reports provide a concise summary of state financial support to R&D activities and bodies rather than strengths/weakness of the Slovak R&D system. The latest 2011 R&D report repeated facts on 'long-term under-investment in R&D in Slovakia'. Support by the Structural Funds enabled for some modest improvement. The annual reports on R&D and annual reports by the [Research and Development Agency](#) use to list numbers of projects and volume of assistance provided by the state budget, but do not provide for impact evaluation.

Since 2009 the Slovak Government published annual evaluation reports on the 2007 Innovation Strategy and the 2008 and 2011 Innovation Policy initiatives¹¹. The latest [2011 Evaluation Report](#) found that 'innovation policy priorities and measures were set correctly and are implemented by respective (policy) bodies', but 'inadequate financial resources and innovation environment disable achieving notable positive results'. The report, for example, pointed to failure of the Regional Innovation Centres measure – flagship initiative of the 2008 Innovation Policy (see the 2011 Country report for more details). The report listed plans for (a) the 2013 Innovation Strategy for period 2014-2020 and respective 2014 and 2016 Innovation Policies; (b) amend the 185/2009 R&D Stimuli Law and the 595/2003 Income Tax Law. The R&D stimuli should be accessible for broader classes of enterprises, including small and micro-enterprises. The Income Tax Law should enable for more generous deduction of costs related to research and development. The report also mentioned (a) extremely low public and private spending on R&D, (b) poor co-operation by the industry and academia sectors, (c) low numbers of innovative enterprises, and (d) low shares of high-value added production in the Slovak economy. The report recognised needs for (a) defining thematic and sectoral priorities in industrial R&D, (b)

¹¹ Four evaluation reports were approved by the Slovak Government and published on the Government Office webpage: the [2008 Evaluation Report](#) (Government Resolution no. 810/2009 of 18 November 2009); the [2009 Evaluation Report](#) (Government Resolution no. 212/2010 of 9 June 2010), the [2010 Evaluation Report](#) (Government Resolution no. 51/2011 of 22 June 2011) and the [2011 Evaluation Report](#) (Government Resolution no. 455/2012 of 12 September 2012).

restructuring activities of centres of excellence established with Slovak Universities (and heavily subsidised with the Structural Funds).

The Structural Funds schemes are evaluated on continuous and periodical basis. The monitoring reports (related to individual calls) and the annual reports for particular Operational programmes tend to be formal and concentrate on numbers of applicants, volumes of support required, and awarded and compliance with formal procedures. Impact assessment techniques are underdeveloped.

The main evaluation body for Universities is the Accreditation Commission of the Slovak Ministry of Education, Science, Research and Sports. It evaluated 20 public, four private and three state HEIs in 2009-2010. The HEIs were allocated to three categories: (i) Universities, (ii) Higher Education Institutions and (iii) Professional Higher Education Institutions. The Ministry of Education, Science, Research and Sports deemed there are too many HEIs. It rejected proposals for establishing several new private HEIs in 2010 and approved one in 2011 and one in 2012. Public system of higher education is heavily underfunded. Results of evaluation have little impact on improvements in performance of the HEIs.

The [Slovak Academy of Sciences](#) (SAS) evaluated its institutes in 2012. The scientometric indicators prepared by the independent Academic Ranking and Rating Agency were used to assist work of the Accreditation Commission for the first time. Some institutes obtained better, some worse ranking than in the last round of evaluation in 2007. The overall financial support to the SAS from the state budget did not change in nominal and decreased in real times in last three years. There is limited link between evaluation results and support to particular institutes of the SAS. The overall 2013 wage budget for the SAS is fixed and must reflect worker entitlements related to qualification and length of service. The SAS may re-distribute only 5% of total wage budget based on the evaluation result.

Emerging topics in the R&I policy discussion include re-evaluation of thematic priorities and investment targets. The 2007 [Long-term Objective of the State S&T Policy up to 2015](#) contained 12 thematic priorities, which may have been too many for country with low R&D spending. The 2011 [Fenix](#) Strategy went into another extreme, and cancelled thematic priorities at all. The thematic and sectoral priorities probably should be set via the technology foresight exercise, but no such support measure was planned for 2013¹².

¹² In autumn 2012 six working groups were established to specify thematic research priorities for the national RIS3 document. Seven broad thematic priorities were suggested by March 2013. Final number of priorities and their detailed specification would depend on calculation of critical mass for each priority.

3 STRUCTURAL CHALLENGES FACING THE NATIONAL SYSTEM

The Innovation Union Scoreboard data indicates that Slovakia has made a quite modest progress towards developing knowledge-based economy since 2007. The absolute value of the Summary Innovation Index (SII) changed little in period 2007-2011 (0.295 versus 0.305). The gap against the EU-27 SII value (0.517 versus 0.539) widened. Slovakia's position against its main competitors in the region (the Czech Republic, Hungary and Poland) worsened in the above-mentioned period (Figure 3). Analysis of the SII components indicates that Slovakia matches/surpasses European standard in few indicators (Figure 4). Some of these indicators (new doctoral students and/or youth with upper secondary level of education) point to mass rather than high-quality education. The shares of medium- and high tech exports in total exports refer to Slovakia's dependency on two key industries (automotive and consumer electronic) introduced by the multinational companies, rather than country's own effort to develop high-value added production.

Table 2: Innovation Union Indicators for the Slovak Republic

HUMAN RESOURCES	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	2.1
Percentage population aged 25-64 having completed tertiary education	22.1
Open, excellent and attractive research systems	
International scientific co-publications per million population	348.0
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	376.0
Finance and support	
R&D expenditure in the public sector as % of GDP	0.36
FIRM ACTIVITIES	
R&D expenditure in the business sector as % of GDP	0.25
Linkages & entrepreneurship	
Public-private co-publications per million population	10.3
Intellectual assets	
PCT patents applications per billion GDP (in PPS€)	0.33
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	0.07
OUTPUTS	
Economic effects	
Medium and high-tech product exports as % total product exports	62.3
Knowledge-intensive services exports as % total service exports	23.1
License and patent revenues from abroad as % of GDP	0.07

The SII data indicate that Slovakia will have to address following challenges in its research and innovation system:

- extremely low R&D investment, in private sector in particular;
- low innovation activity by Slovak SMEs and their low ability to co-operate, with other SMEs;
- inadequate linkages between Slovak firms and research institutions.

The key challenges in the national innovation system have been continuing for many years and identified in the key government documents on innovation policies (the [2007 Innovation Strategy](#), and the [2008](#) and [2011 Innovation Policy](#) and research policies (the 2007 [Long-term Objective of the State S&T Policy up to 2015](#))¹³:

- Challenge 1: Weak R&D system disables co-operation between academia and industry sectors.** A common denominator for poor research and innovation performance was near defunct research system. The share of gross expenditure on research and development (GERD) in the gross domestic product (GDP) fell from 3.88% in 1989 to 0.68% in 2011¹⁴. Slovak R&D spending was one of the lowest in Europe (EU27 average = 2.00% in 2010), and also very low against the reference group countries (CZ+IT+HU+SI+SK = 1.27%)¹⁵. Fall in business spending on R&D (BERD) was a striking feature in comparison with the reference group countries in 1990s and 2000s. The share of business expenditure on research and development (BERD) in GDP was 0.25% in Slovakia while 1.27% in 2011 in the EU27 (see chapter 2.2 for more details). Slovakia accounted for a relatively educated labour force, but failed to move to an R&D-intensive employment structure. The country was unable to shift from a blue collar structure to structure of employment based on tertiary education and high numbers of R&D workers. Low numbers of R&D workers also reflected limited interest by Slovak companies in R&D intensive production (see challenge 4). The challenge is addressed by a numbers of schemes under the 2007-2013 innovation policy mix¹⁶. The measures may help founding sound R&D system, if the policy mix is implemented in consistent way.
- Challenge 2: Underdeveloped system of innovation governance.** The history of modern innovation policy in Slovakia is quite short. Innovation was not considered a priority till 2005 when the Competitiveness Strategy (the Lisbon Strategy for Slovakia) was passed. The [2007 Innovation Strategy](#) referred to an 'absence of strategic policies supporting innovations, low numbers and a fragmented system of explicit innovation policy measures, and poor innovation management, coordination and monitoring'. The Slovak Innovation and Energy Agency was created as late as 2007. Research bodies and policies used to be under aegis of the MESRS, while most innovation-related initiatives and agencies are managed by the ME. Co-ordination of the research and innovation policies was poor. Slovakia had no national innovation plan and/or national innovation council by 2012. The regional systems of research and innovation governance also were missing. The regional governments account for very limited financial resources and have no legislative powers in field of research and innovation. The flagship initiative of the 2007 Innovation Strategy, the 'Regional Innovation Centres' (RICs), proved too complex to implement and was cancelled by the Slovak Government in 2011¹⁷. Challenges in building efficient system of innovation governance concern also system of higher education institutions (HEIs) and public research bodies (PROs). Implementing more efficient and transparent evaluation techniques and reforming some key research

¹³ For comprehensive list and details of key policy documents on research and innovations see the 2010 Mini Country Report for the Slovak Republic.

¹⁴ The 2009 share of GERD in GDP was 0.48%. Increase in intensity of R&D spending to 0.63% GDP in 2010 and 0.68% GDP 2011 reflects higher spending by the Operational Programmes 'Research and Development' and 'Competitiveness and Economic Growth' in 2010. The European resources provided some 55.0% total project finance in 2009, but 79.9% in 2010 and 89.7 in 2011. Source: Eurostat.

¹⁵ For country grouping see the [Innovation Union Competitiveness \(IUC\) report](#).

¹⁶ Majority of the policy measures target building R&D infrastructure, building linkages between the academia and industry sectors and support to technology transfer. See chapter 4.2 for more details.

¹⁷ For details of failure of the RIC scheme see the 2011 Mini Country Report for Slovak Republic under Specific Contract for the Integration of INNO Policy TrendChart with ERAWATCH (2011-2012)

performer institutions (RDA and SAS in particular) should push HEIs and PROs from quantitative targets towards to qualitative ones, and promote efficient use of public spending on education and research.

- **Challenge 3: Dual economy.** Dual economy probably is the most important barrier for developing strong private R&D sector and promoting innovations in Slovakia. Slovak economy is largely foreign-owned, and branches of the multinational companies (MNCs) provide for significant part of Slovak industrial output and exports (Samsung, Volkswagen, Siemens, Hyundai-Kia, Peugeot-Citroen, US Steel). No MNC had its headquarters in Slovakia. The MNC were attracted by low cost of inputs (labour in particular), geographical location of Slovakia and favourable tax conditions. The MNCs did research in their headquarters and had limited interest in shifting their applied/industrial research to Slovak Universities and research institutes. The 2010 EU Industrial R&D Investment Scoreboard contains no Slovak company. Lack of strong Slovak-based MNC (like Nokia or Volkswagen) significantly affected private spending on R&D. The R&D investment by the Volkswagen group (€6,258m), for example, was 15 times higher than total Slovak GERD and 43 times higher than Slovak BERD in 2010 (source: the 2011 EU Industrial R&D Investment Scoreboard). Some 120 thousands of Slovak small and medium sized enterprises (SMEs) compete with low costs of inputs. A rather excessive focus on SMEs has been a potential weakness of Slovak innovation policies. Branches of MNCs accounted for the bulk of high and medium-tech exports¹⁸ and high rates of technology transfer and diffusion, but were not targeted by any innovation policy measures in Slovakia.
- **Challenge 4: Low shares of domestic innovative enterprises limit competitiveness of the country.** Dual structure of national economy is reflected in low intensity of BERD, low shares of SMEs innovating in-house and low numbers of patents, industrial designs and other commercial results of research and innovations. Most Slovak SMEs considered investment in research and innovation risky and with uncertain result, and bet on low costs of labour and good price/quality ratio. Average monthly labour costs in industry, construction and services were €1,135 in Slovakia, but €4,008 in Austria, €3,954 in Germany, €4,932 in Denmark and €4,426 in Belgium in 2010 (source: Eurostat). Some 15.0% Slovak enterprises innovated in-house, while 40.2% of enterprises were engaged into such innovation activities in Belgium, 34.4% in Austria, 34.1% in Italy and 29.6% in the Czech Republic in 2008 (source: the 2011 Innovation Union Scoreboard). Lack of strong domestic R&D-intensive companies may be partly alleviated by introduction of demand-side innovation and R&D policies. Public procurement of research and innovation, however, is scarce in Slovakia. The former State Research and Development orders were abolished in 2006. Unfortunately, none Slovak innovation and/or research policy document mentions public procurement of innovative technologies¹⁹.
- **Challenge 5: Inadequate national innovation funding.** The national innovation funding earmarked by the [2011 Innovation Policy](#) for the period 2011-2013 (€5.05m) is a fraction of the European one (€90.55m). The 2011 Innovation Policy acknowledged 'disproportional reliance by innovation policies on the European and international

¹⁸ The medium and high-tech product exports accounted for 62.3% of total exports of goods in Slovakia, while 48.2% in the EU27 in 2010. Two industries (manufacture of car and car components, and consumer electronics) accounted for major part of total Slovak exports of goods.

¹⁹ The State Research and Development Orders (SRDO) were one-off contracts with research institutions for innovative and R&D solutions of some ad-hoc issues (e.g. construction of water works). The SRDO programme was affected by the budget cuts. R&D projects commissioned by the Ministry of Defence were closest thing to public procurement of innovative technologies. None of these projects accounted for commercial success. For more details see the 2011 MiniCountry Report for the Slovak Republic.

financial assistance’ and called for increased national funding for innovation. It however is unclear from where the national support to innovation should come from. The key support measures (no. 9 ‘The national motivation project for increasing efficiency of innovations in Slovakia’, no. 10 ‘[Supporting innovative activities in enterprises](#)’ and no. 11 the ‘[JEREMIE](#)’) are assisted by the Operational Programme Competitiveness and Economic Growth. The national innovation funding also accounts for limited portfolio of funding forms and lack of clear thematic focus. Slovak businesses would benefit from higher national funding, as the national schemes used to account for much lower administrative and higher flexibility as schemes supported by the Structural Funds.

Slovak economy enjoyed spectacular growth in 2000s. Economic growth was driven by a massive influx of the foreign direct investment (FDI), by the multinational companies (MNCs) in particular. The MNCs benefited from low costs of inputs and favourable business environment. The influx of the FDI, paradoxically, was accompanied by relative decrease in private investment in R&D. Transfer of technologies and organisational innovation proved more important than (domestic) investment in research and innovations. A mode of competition based on low-cost, low-value added production, however, clearly had its limits. Slovak governments realised the dangers of the low-cost trap and tried to design and implement policies fostering the development of a knowledge-based economy. Progress towards this goal had limited success so far.

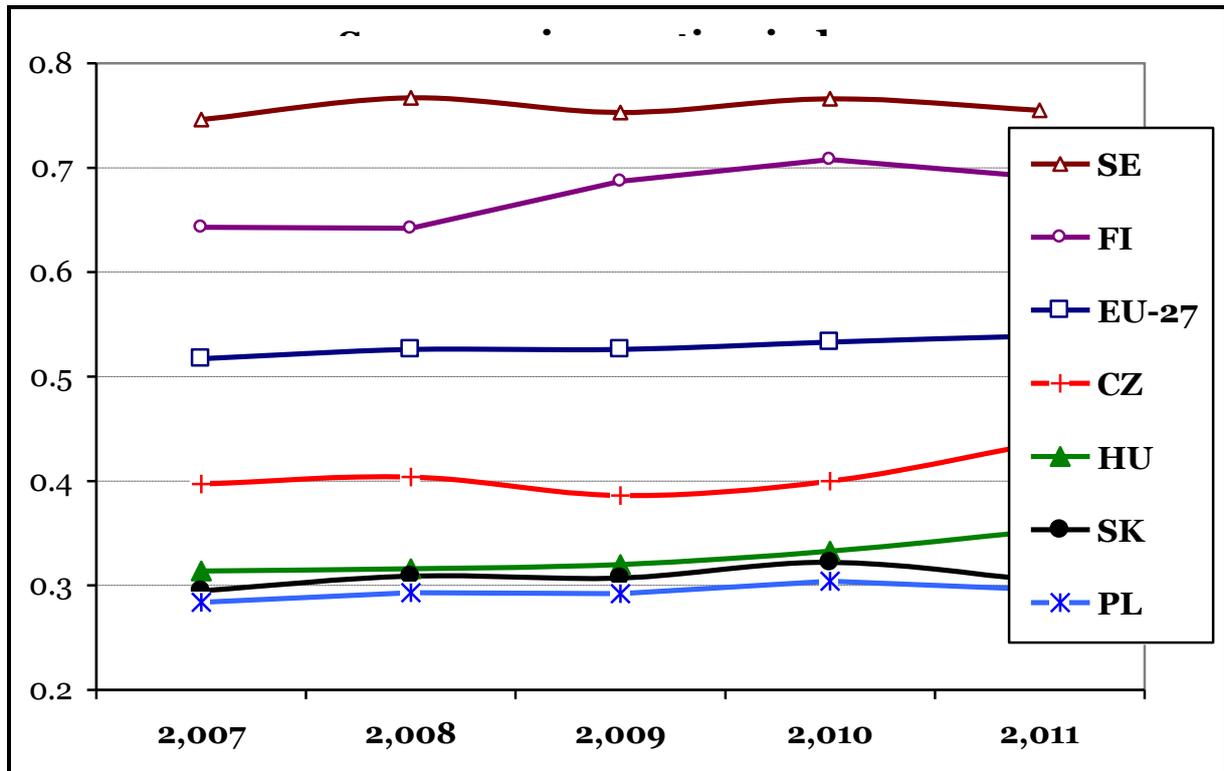


Figure 3: Development of the Summary Innovation Index for selected countries in period 2007-2011. Source: Innovation Union Scoreboard

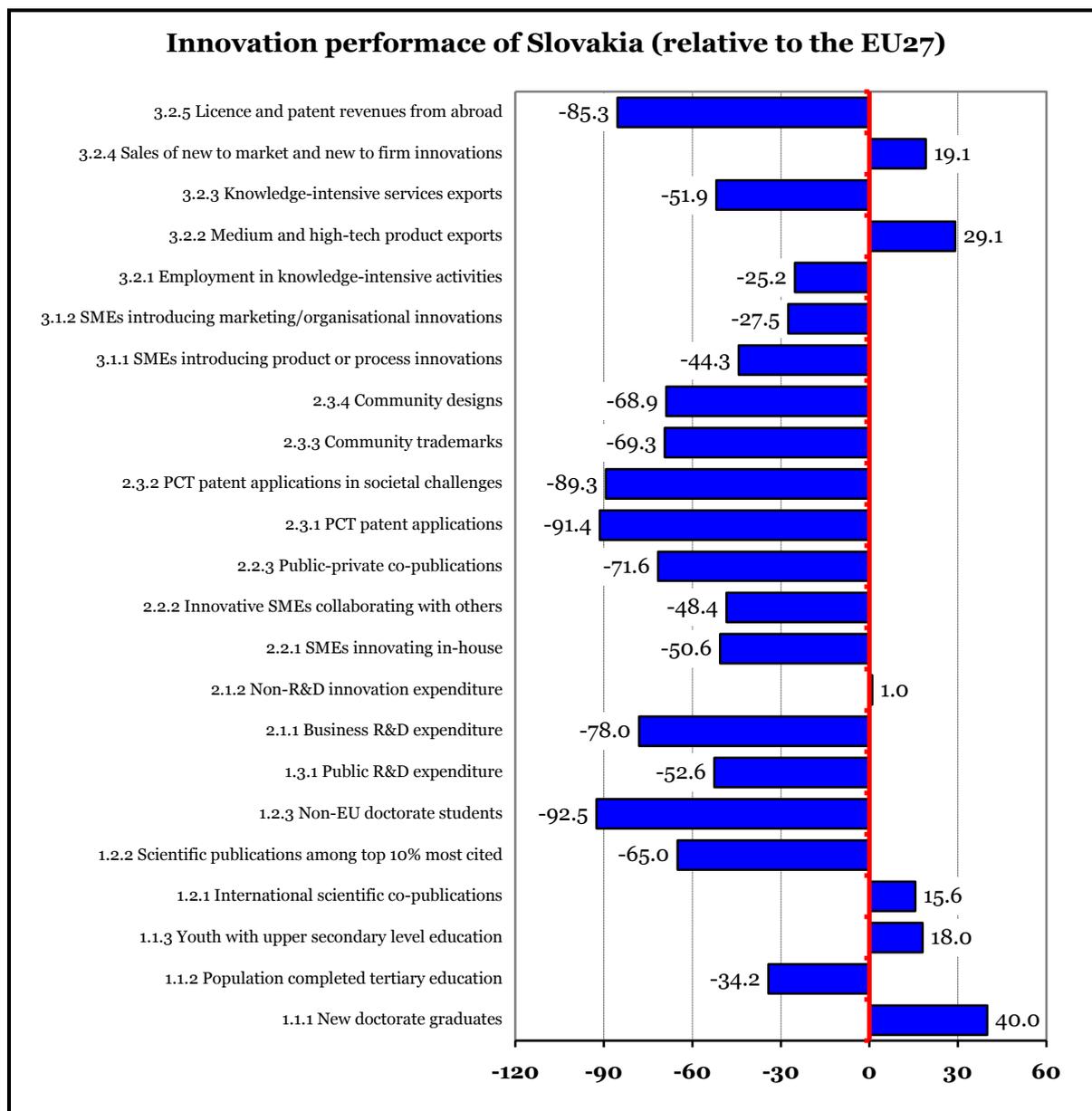


Figure 4: Components of the Summary Innovation Index for the Slovak Republic in 2011. The EU27 = 0. Source: Innovation Union Scoreboard

4 ASSESSMENT OF THE NATIONAL INNOVATION STRATEGY

4.1 National research and innovation priorities

Slovak research and innovation policies (R&I) are rather young and immature. Attention to R&I paid by policy makers was minimal in 1990s and 2000s. Till 2004 innovations and R&I had not even been recognised development priorities. Since 2004 Slovak Government adopted a new position on importance of R&D and innovations for long-term development of the country and prepared several documents on building knowledge-based economy. Change in priorities ranking has been related to Slovakia's membership in the EU and opportunity to tap the European financial assistance. About one third of assistance (€3.5b) provided under the Structural Funds should go into the education, innovations and R&D in period 2007-2013. Building knowledge-based economy and switch to high value-added production is a leitmotif of the Slovak research and innovation policies.

The research policy priorities and policy mix were set in the [Long-term Objective of the State S&T Policy up to 2015](#):

- 1) Higher involvement of S&T in the development of Slovakia, and more intensive participation by S&T in solving economic and social problems in Slovakia;
- 2) Better conditions for S&T development inside Slovakia, and also for Slovakia's activities within the European Research Area;
- 3) Setting targets for S&T development fields of (a) S&T policy co-ordination, (b) building and modernising R&D infrastructure, (c) institutional reform of public R&D, (d) reform of public financial support to R&D, (e) international co-operation, and (f) monitoring and evaluation of public R&D system.

The three basic innovation policy priorities set in the [2007 Innovation Strategy](#) are:

- 1) High-quality infrastructure and an efficient system for innovation development;
- 2) High-quality human resources;
- 3) Efficient tools for innovation.

Most important specific targets (in terms of financial and regulation support) include: (a) innovation governance (drafting and implementing strategic policy documents and research and innovation policies plus building institutional capacities); (b) support to research infrastructure; (c) support to applied research; (d) support to networking and co-operation by academia and industry sectors; and (e) support to SMEs via technology transfers and risk capital schemes.

Major changes in the R&I policies in the last three years refer to

- Increasing reliance on the EU financial resources and decreasing national public funding (see chapter 5); This trend also is related to efforts by the Slovak Government to decrease budget deficit and create sustainable system of public finance;
- Introduction of new types of the support measures, such as tax breaks and financial engineering tools (albeit on relatively small scale, see chapter 2.7);
- efforts to improve evaluation procedures and techniques for public R&I institutions and support measures (publishing annual reports R&D by the MESRS and evaluation reports on innovation policies by the ME, chapter 2.7).

Emerging topics in the R&I policy discussion include re-evaluation of thematic priorities and investment targets. The 2007 ‘Objective’ contained 12 thematic priorities, which may have been too many for country with low R&D spending. The 2011 [Fenix](#) Strategy went into another extreme, and cancelled thematic priorities at all. In fact, over 57.8% of public support was channelled to non-oriented research and general University funds in 2011 (source: Eurostat data on Total GBAORD by NABS 2007 socio-economic objectives). Shares of government budget appropriations or outlays on research and development (GBAORD) in GDP (0.23%) accounted for about third of the EU27 average in 2011 and decreased in period 2009-2011. The [Fenix](#) and [Minerva 2.0](#) strategies suggested re-allocating finance provided by the Operational Programme Research and Development towards large-scale projects with strategic importance, (iv) creating national system for technology transfers, (v) introducing new programmes supporting new technology-based firms and innovation-oriented research, and (vi) starting co-operation with branches of multinational companies in Slovakia (e.g. establishing top-notch infrastructure for elite research). These documents, however, do not specify investment targets in terms of share of R&D spending in GDP and/or thematic funding. They contain references to major societal challenges such as energy/climate change, health, ageing and sustainable development, but do not specify targets and/or budgets related to these issues.

The most important changes in policy mix refer to volume of financial support and systemic changes in support to R&D:

- Public support to R&D increased from €166.7m to €284.7m in period 2009-2011. Significant increases in support have been related to spending by the Structural Fund programmes
- Systemic changes in support to R&D were detailed in the 2010 [New Model of Financing Science and Technology in the Slovak Republic](#). The support primarily is channelled to infrastructure building, applied research, and international scientific-technical cooperation.

Priorities in R&D and innovation policies overlap in fields of capacity and infrastructure building, reform of public support to R&D and innovation policy tools, and (rather excessive) reliance on Structural Funds. Priorities set in main research and innovation policy documents are consistent with the structural challenges faced by Slovak economy and society. They in particular address challenges related to the capacity and infrastructure building, improving systems of research and innovation governance, and public financial support to R&D and innovation. As for the challenges related to dual economy, these are outside the remit of research and innovation policies. These policies, however, may support creating framework conducive for building a knowledge-based economy.

4.2 Evolution and analysis of the policy mixes

Slovak R&D and innovation policies have been fairly generic and did not favour specific sectors. Most policies concentrated directly in the R&D and Innovation domains²⁰, while interactions with the Finance and Human Resource domains were relatively weak in period 2007-2012:

- Public sector policies on R&D and Innovation domains targeted (a) institutional funding for R&D projects; (b) reconstruction and modernisation of R&D infrastructure; (c)

²⁰ For taxonomy of the policy type models see: Ken Guy, Patries Boekholt, Paul Cunningham, Reinhold Hofer, Claire Nauwelaers, and Christian Rammer. 2009. Designing Policy Mixes: Enhancing Innovation System Performance and R&D Investment Levels. Methodology Deliverable, Task 3. The “Policy Mix” Project. European Commission, DG Research.

selective support for centres of excellence in basic research and industry-academia co-operation in applied research; and (d) institutional building and structural reforms of the public research system.

- There were some R&D specific human capital policies (the ‘Support to Human Potential and Popularisation of Science’ programme by the Research and Development Agency);
- The R&D specific financial policies were limited either by considerations of the fiscal stability (tax stimuli) or administrative complexity and evidence on mismanagement of public resources (risk capital schemes).

Research policy priorities and policy mix were set in the [Long-term Objective of the State S&T Policy up to 2015](#) and remained relatively stable till 2011, when they were cancelled by the Fenix Strategy. Targets related to (a) building high-quality R&D infrastructure and supporting development human resources; (b) improving co-ordination of R&D, innovation, and human resource policies, (c) enhancing academia-industry co-operation and (d) reforming system of public support to R&D accounted for majority of attention by policy makers. Institutional support to the higher education institutions and the Slovak Academy of Sciences, and project finance channelled via the State R&D programmes, Research and Development Agency grants and horizontal programmes remained major forms for direct assistance to R&D in Slovakia in 2007- 2010.

Two routes have dominated policies aimed at stimulation of R&D investment in Slovakia in 2000s²¹: (a) increasing R&D in public sector and (b) stimulating greater R&D investment in R&D performing firms (SMEs in particular). This policy mix was derived from some historical developments. In 2000s the applied research system deteriorated and public sector became major research performer. The government decided to improve R&D infrastructure and support human resources in public sector. The bulk of national assistance to R&D investment was channelled via the [Research and Development Agency](#) and [VEGA](#) grant agency, and aimed at supporting young researchers and basic research on Slovak Universities and the [Slovak Academy of Sciences](#). Assistance provided by Structural Funds was channelled to (privatised) industry research institutes and research units of (few) large domestic firms. Maintaining remnants of the pre-1989 network of some 40 (domestic) industry research institutes was preferred to promoting new indigenous R&D firms and/or stimulating firms that do not perform R&D yet.

The **innovation policy** mix has short history in Slovakia. The mix was set in the [2007 Innovation Strategy](#) (first coherent document on innovation development in Slovakia) for period 2007-2013 and specified for the 2008-2010 and 2011-2013 periods in the [2008 Innovation Policy](#) and the [2011 Innovation Policy](#). The policy priorities and mix of policy instruments applied in period 2007-2013 basically resemble those applied in planning period 2004-2006. The most significant difference is much higher assistance provided to research, development and innovation policy measures in 2007-2013.

Most financial assistance is provided via grants for technology transfers, building business and technology incubators, developing R&D infrastructure, supporting R&D co-operation networks, financing applied research and creating risk capital schemes. The state budget and the Community means are the main sources of the innovation financing. Private sector, foreign donors, non-profit bodies, and own resources by R&D centres and universities provide modest contribution to innovation finance. The Slovak innovation policy mix heavily relies on direct

²¹ The 2009 Erawatch country reports identified six ‘routes’ to stimulate investment to R&D: (1) stimulating greater R&D investment in R&D performing firms; (2) promoting the establishment of new indigenous R&D performing firms; (3) stimulating firms that do not perform R&D yet; (4) attracting R&D-performing firms from abroad; (5) increasing extramural R&D carried out in cooperation with the public sector and (6); increasing R&D in the public sector.

financial measures. Risk capital measures, equity and loan guarantees, and indirect incentives (tax stimuli) are provided to a limited extent²².

The most recent innovation policies indicate a positive shift towards more sophisticated innovation policies in the near future in terms of new target groups, agendas, and modes of funding:

- The government recognises the significant deficit in innovation governance in Slovakia (no national innovation plan, no national and regional innovation councils). A new agenda emerging in innovation policies is related to clusters. There had been no cluster policy launched by the central government, but several regional governments and local authorities signed up agreements on institutional support to clusters (in manufacturing, electronics and ICT industries in particular). Establishment of clusters was an example of a bottom-up initiative. The [2011 Innovation Policy](#) introduces now policy measure the ‘Support to innovative industrial clusters’. The measure should be ready by end of 2012. The pro-active cluster policies are introduced with help of the regional governments and allocate €4m.
- Slovak innovation policies are rather pre-occupied with support to small and medium enterprises (SMEs). The SMEs are major target group and beneficiaries of most innovation policy measures in Slovakia. Slovakia has a small open economy. Branches of the multinational companies (MNCs) (Samsung, Hyundai-Kia, Volkswagen, Peugeot-Citroen, Siemens, etc.) apply world-class technologies and management systems, and generate most Slovak manufacturing exports. There are no policy measures, however, aimed at co-operation with the MNCs. The [2010](#) and the [2011 Evaluation Report](#) on implementation of the 2007 Innovation Strategy recognised that ‘the MNCs should be motivated to enter the Slovak research system’.
- Several new policy measures promoted by the [2011 Innovation Policy](#) (the ‘National motivation project for improving innovation performance’, the ‘Innovation voucher’ project, the ‘Intellectual property rights’ project) aimed at commercialisation of research and getting ideas to the market. Launch of the policy measures was expected in 2012, but halted by the austerity measures.

Significant increase in overall support to research and innovation was the major strength of the Slovak R&I policies in period 2007-2013. Structure of the support was the main weakness of the above-mentioned policies, as the Structural Funds provide an overwhelming majority of funding. There is question on sustainability of R&I policies once support from the Structural Funds decreases. The European assistance mostly was used for one-off support to infrastructure building, centres of research excellence, industry research projects and technology transfers. System of national research and innovation funding shrank in the above-mentioned period. The [2011 Innovation Policy](#) found ‘disproportional reliance by innovation policies on the European and international financial assistance’ and called for increased national funding for innovation. Lack of clear thematic and sectoral targets was another major weakness. There is a threat of spending European assistance on non-oriented research initiatives. Slovakia is a small open

²² The 2011 amendment of the 185/2009 R&D Stimuli Law defined stimuli as the direct subsidy from the state budget and/or tax allowance. Some 15 firms obtained stimuli, of which €6.998m in form of subsidy and €0.151 in form of tax allowance in 2011. Total amount of the tax allowance for R&D has been limited by considerations of fiscal stability. The [JEREMIE](#) initiative should provide risk capital for small and medium enterprises. The scheme should start in 2008, but was delayed several times for administrative complexity. The first call under the scheme titled the ‘First Loss Portfolio Guarantee Financial Instrument’ was launched in October 2011 and allocated €38m. The second call was launched in January 2012 and allocated €31m, of which €3.3m comes from the [Operational Programme Bratislava Region](#) and €27.7m from the [Operational Programme Research & Development](#) (OPRD). The former programme supports the Seed Fund and the latter the Venture Capital Fund or Co-Investment Fund

economy and has to specialise in the World product markets. There is an opportunity to developed competitive automotive and IT industries. Slovakia also may re-consider structure of R&I support measures and allow for higher importance of indirect tools of support, tax stimuli in particular. Direct support measures account for higher complexity and risk of corruption. Finally, the Slovak R&I policy mix should recognise importance of high-quality innovation governance, and establish central and regional innovation governance bodies.

4.3 Assessment of the policy mix

The key challenges in the national research and innovation system have been continuing for many years and identified in the key government documents on innovation policies (the [2007 Innovation Strategy](#), and the [2008](#) and [2011 Innovation Policy](#)). Policy documents and research and innovation policy measures adopted since 2007 responded to the weaknesses in the Slovak research and innovation systems, and tried to address the major challenges in research and innovation funding, capacity and infrastructure building, creating supply of human resources, and strengthening industry-academia linkages.

So far the greatest improvements were achieved in capacity building (creating governance systems and infrastructure), and financing research and innovation.

- The Slovak Government drafted and implemented key strategies and policy documents, and started to publish evaluation reports on R&D and innovation performance. The annual reports provide basic overview on major developments in Slovak research and innovation systems. The government also created or reformed agencies implementing the Structural Funds assistance. The capacity building, however, was not without flaws. The flagship initiative of the 2007 Innovation Strategy, the ‘Regional Innovation Centres’, proved too complex to implement and was cancelled by the Slovak Government in 2011. Regional innovation governance structures are almost missing. There are no regional innovation councils and/or regional innovation plans.
- Financial support to the Slovak research and innovation systems by public and business sectors decreased considerably in 1990s and 2000s. The Structural Funds provide impressive amount of funding and seem to replace the (admittedly inadequate) national policy initiatives. The massive spending for the demand-oriented projects from the Structural Funds (some €174m in 2011) helped to push share of GERD in GDP from 0.48% in 2009 to 0.68% in 2011 (level not seen since 1997). Whether these initiatives are sufficient to improve quality of research in Slovakia remains to be seen. Implementation of three key operational programmes aimed at building knowledge-based economy has been lagging behind the schedule. The Ministry of Finance reported following spending rates for the most important operational programmes by end of October 2012:
 - The [Operational Programme Research & Development](#) (OPRD) disbursed €365.0m, only 30.1% of the total EU assistance €1209.4m envisaged in planning period 2007-2013;
 - The Operational Programme Education (OPE) disbursed €121.4m, 20.9% of the total EU assistance €617.8m;
 - The Operational Programme Competitiveness and Economic Growth (OPCEG) disbursed €377.3m, 38.9% of the total EU assistance €777.0m;

The abovementioned operational programmes disbursed about one third their combined value and relatively few projects were completed by 2012. There are potential problems with the absorption capacity, and mismatches between supply and demand for knowledge in academia and industry sectors. Creation of efficient links between public research and the private sector

research institutes may take years. Efficient use of European support requires improvements in evaluation practices and broader use of the international benchmarking and quality standards. The latest evaluation reports on R&I policies (the 2011 Evaluation report on the 2007 Innovation Strategy and the 2011 Annual Report on R&D) found slow improvements in performance of the Slovak national system of research and innovation.

The main objectives of research and innovation policies applied in period 2007-2013 refer to building capacity and a framework conducive for development of knowledge-based economy. Major synergies are likely to originate from large numbers of projects on research infrastructure (supported by the OPRD) and applied research (supported by the OPCEG). More sophisticated innovation and R&D policies, such as targeting specific R&D fields, and/or supporting research-based spin-offs may come in next planning period.

Challenges	Policy measures/ actions addressing the challenge ²³	Assessment in terms of appropriateness, efficiency and effectiveness
Weak R&D system	<p>Infrastructure of Research and Development</p> <p>Infrastructure for research and development - Data centre for research and development</p> <p>National information system supporting research and development in Slovakia</p> <p>Transfer of knowledge and technology from research and development into practice</p> <p>Supporting innovative activities in enterprises</p> <p>Innovation and technology transfers</p> <p>JEREMIE Financial engineering tools for innovations</p>	<p>Capacity building.</p> <p>(+) Policies implemented under the 2010 ‘New Model of Financing Science and Technology in the Slovak Republic’, and the Fenix and Minerva 2.0 strategies may improve excellence and efficiency of the public research system. New set of performance indicators may increase role of socio-economic impacts of research.</p> <p>(-) Limited commitment by successive government to policies drafted by the former government.</p> <p>Financial resources</p> <p>(+) The Operational Programmes ‘Research and Development’, ‘Competitiveness and Economic Growth’ and Education’ provide great volume of R&D funding.</p> <p>(-) Significant increases in public support to R&D need not necessarily be reflected in corresponding investment by private sector.</p> <p>(-) Schemes funded from Structural Funds replace national funding. European finance is much more generous, but also rather bureaucratic, difficult to get and accounts for slow implementation.</p> <p>Research infrastructure and human resources</p> <p>(+) Higher support to R&D from the Structural Funds positively impacts inputs to R&D sector.</p> <p>(+) National projects on data centres, information infrastructure and knowledge transfer in place. New R&D infrastructure may improve linkages between industry and academia sectors, and between Slovakia and other ERA members.</p> <p>(-) Increased public investment in human resources and R&D infrastructure may prove unsustainable, once Structural Funds assistance stops.</p> <p>(-) Incumbent stock of human capital is low and ageing, and may not generate a critical mass needed for transition towards a knowledge-based economy. Brain-drain by young researchers remains a threat for development of highly skilled human resources in Slovakia.</p> <p>Support to applied research and academia-industry co-operation</p> <p>(+) Links between science & technology and innovation policies (including co-operation between public and private sectors) may be strengthened</p>
Underdeveloped system of innovation governance	<p>Policy documents and strategies:</p> <p>Long-term Objective of the State S&T Policy up to 2015</p> <p>The Innovation Strategy for the Slovak Republic for years 2007-2013</p> <p>The Innovation Policy of the Slovak Republic for 2011 to</p>	<p>Improvements in innovation governance.</p> <p>(+) Long-term Innovation Strategy and medium-term Innovation Policies in place.</p> <p>(+) The government drafts new Innovation Strategy and Innovation Policies for 2014-2020.</p> <p>(+) The government publishes regular reports on implementation of innovation and research policy measures.</p>

²³ Changes in the legislation and other initiatives not necessarily related with funding are also included.

	2013 New Model of Financing Science and Technology in the Slovak Republic	<p>(+) The Slovak Innovation and Energy Agency was created; it implements majority of the Structural Fund measures.</p> <p>(-) Underdeveloped evaluation culture.</p> <p>(-) Scheme implementing Regional Innovation Centres failed.</p>
<p>Dual economy and low wages generate low supply of and low demand for R&D solutions.</p>		<p>(-) Tackling this problem is outside of scope of explicit R&D policies. Barriers are likely to be removed by market forces and framework supportive policies. These developments can take years to materialise.</p>
<p>Low shares of domestic innovative enterprises</p>	Supporting innovative activities in enterprises Innovation and technology transfers JEREMIE Financial engineering tools for innovations	<p>(+) Structural Fund schemes are implemented. Significant increase in investment by innovation policy schemes.</p> <p>(+) Large-scale policy measures supporting innovation in SMEs in place.</p> <p>(-) Underdeveloped demand-side policies. Missing public procurement of innovative and research-intensive goods and services.</p>
<p>Inadequate national innovation funding</p>	<p>R&D Stimuli</p> <p>Support to clusters</p> <p>Innovation voucher scheme (not operational yet)</p>	<p>(+) Some national funding for innovation in place.</p> <p>(+) Indirect tools for support to innovation developed (R&D stimuli, risk capital schemes)</p> <p>(-) National funding is extremely low. EU funding ousts national one.</p> <p>(-) There is low absorption capacity for innovative solutions by SMEs.</p> <p>(-) Risk capital schemes account for slow progress.</p>

5 NATIONAL POLICY AND THE EUROPEAN PERSPECTIVE

The Slovak Republic made some progress in implementing the ERA Communication objectives in 2012 (European Commission 2012). The Slovak Parliament, for example, adopted the Blue Card Directive. The EURAXESS service planned publishing job vacancies in Slovakia and other EU countries. The Structural Fund Agency of the Ministry of Education, Science, Research and Sports launched large-scale infrastructure projects. Some long-term problems, however, were not tackled in 2012 (reform of academic degrees, inaccessibility of the national research programmes by foreigners, low national resources for research funding).

ERA priority 1: More effective national research systems.

An open national-level competition is crucial to deriving maximum value from public money invested in research (European Commission 2012). More effective national research system benefits from allocating funding through open calls for proposals, evaluated by panels of leading independent domestic and non-domestic experts.

The Slovak Republic gradually reforms its system of research and higher education. The government declares its support to peer reviews and participation of foreign experts in panels of evaluators. The 2012 National Reform Programme of the Slovak Republic contains a chapter 3.2.1.2 on reforms in funding R&D. The chapter states that ‘the new system, based on a competitive principle, will ensure concentration of funds into demanding, high-quality projects, and mandatory engagement of high-quality foreign evaluators in a decision-making process regarding these projects. For the HEIs accreditation the decisive factor will be that members of the guaranteeing team are internationally recognised scholars’. The government also wants to increase share of competitive funding in total government funding for research and higher education. Public HEIs could apply for three types of national research grants provided by the [VEGA](#) Grant Agency, [KEGA](#) Grant Agency and the [Research and Development Agency](#) (RDA) in 2012. The VEGA grants supporting basic research in HEIs and the [Slovak Academy of Sciences](#) (SAS) were considered institutional funding, but allocated on competitive basis. The KEGA grants supported pedagogic innovations in HEIs. The RDA grants funded competitive grants in basic and applied research in all HEIs, SAS and private research bodies. Competitive funding by the abovementioned agencies provided some 17.5% of the total government allocation to research performed by HEIs in 2011.

Projects distributed by the VEGA, KEGA and RDA agencies are peer-reviewed and at least one expert should be foreign. International peer review sometimes is difficult to implement in Slovakia. Most HEIs accounted for below-average quality (there were only three Slovak Universities in list of top 1000 World Universities by the [Webometrics](#) by January 2013: the Comenius University in Bratislava no. 658, the Slovak University of Technology no. 719, and the Technical University of Košice no. 1221). It is difficult to find good quality foreign evaluators. The grant agencies and accreditation commissions mostly engage experts from the Czech Republic (for reason of language and cultural proximity) or Slovak citizens employed with foreign HEIs and research institutions.

ERA priority 2: Optimal transnational co-operation and competition.

The Slovak Republic accounts for underdeveloped research infrastructure. It is in interest of Slovakia to build a modern research infrastructure for R&D and promote co-operation under the ESFRI projects.

The [Research and Development Agency](#) (RDA) managed bilateral exchange and multilateral co-operation schemes in science and technology. The bilateral schemes supported 159 projects (€0.31m) with eight ERA countries (Austria, Romania, the Czech Republic, France, Poland, Italy, Portugal and Slovenia) and 43 projects (€0.12m) with three other countries (China, Ukraine, Serbia) in 2011. The mobility schemes covered costs of travel, accommodation and subsistence. The 14 multilateral schemes supported joint research agendas both with the ERA countries and outside the ERA. The multilateral agreements in the European Research Area (European Science Foundation, Eureka, Framework Programmes, etc.) were supported with €9.7m in 2011. The most important agreements outside the ERA referred to Slovakia's participation in the Joint Institute for Nuclear Research in Dubna (Russia).

National research programmes (outside bilateral and multilateral schemes) were closed to foreign participants. Slovak nationals and/or research bodies established in Slovakia only may apply for national research funding. Joint programming also is limited by low financial and human resources and underdeveloped research infrastructure in Slovakia

The Ministry of Education, Science, Research and Sports (MESRS) submitted draft of the 'National Research Infrastructures Roadmap' (NRIR) in 2010. The European Strategy Forum on Research Infrastructures (ESFRI) roadmap should be approved in 2013 and related to the national RIS3 Strategy. The MESRS and its agencies, however, participate in several ESFRI initiatives (e.g. Council of European Social Science Data Archives, The European Social Survey, Research Infrastructures Network for Research in Biodiversity, etc.). Access to Slovak research infrastructure by foreign researchers is provided under bilateral and multilateral schemes in S&T co-operation.

Slovakia copes with underdeveloped research infrastructure. The MESRS and the Slovak Academy of Sciences suggested concentrating major part of the Structural Funds spending to some ten large-scale infrastructure projects aimed at building top-notch research centres in biology, new materials and energy resources²⁴.

ERA priority 3: An open labour market for researchers

The HEI teachers and research workers are considered civil servants. Civil servant status determines salary levels for all senior academic and administrative staff. Salaries of all academic staff members are fixed or negotiated nationally due to their civil or public servant status, although the rector or dean may increase prescribed salary levels by as much as 100% (which is very rare). Basic salaries are computed via formulas based on academic degree and length of service.

In the 2012 National Reform Programme the Slovak Government stated that it would 'primarily concentrate on reforming the accreditation procedure for tertiary schools and enhance the quality of top academic establishments. Guarantees for a particular study programme will no longer be linked to a single person but rather to a team of academic staff who comply with the set criteria. The aim is to stabilise the situation and avoid such cases when a loss of a single person (guarantor) may make an excellent study programme non-functional'.

²⁴ The proposal was accepted and the MESRS launched two mirror calls for the 'University Science Parks' and 'Research Centres' for the Bratislava Region (€142m) and the rest of Slovakia (€231m) in June 2012. The calls set minimal/maximal support €20m/€40m per one University Science Park and €15m/€25m per one Research Centre. The calls closed in January 2013.

The Government also intends reform of the academic degrees. Applicants wishing titles of professor and assistant professor would have to meet more stringent (bibliometric) criteria. Excellent scholars who comply with the said criteria should encounter as little obstacles as possible when applying for positions of a professor or assistant professor.

As for the opening labour market, Slovakia continuously adopts standard European legislative, but accounts for very low numbers of foreign researchers and PhD students. The 404/2001 Law on Residence by Aliens entered into force on 1st January 2012 and replaced the outdated 48/2002 Law on Residence by Aliens. The law incorporated regulations of two Council Directives²⁵ and enabled for easier access to Slovak labour markets by researchers from third countries. The law recognized nine types of temporary residence and work permits for the third country nationals, including the ‘research and development permit’. The permit covers research workers and staff in R&D institutions. It is given for a maximum of two years, and the applicant has to produce confirmation on contract and financial arrangements by the host institution. Foreign researchers in principle may apply for permanent jobs (including managerial) with Slovak HEIs and public research institutions. Such cases are rare. Many institutions require candidate to prove fluent Slovak language (which few foreigners master). There is anecdotal evidence on foreign nationals holding permanent and/or managerial positions. One of the 36 rectors of Slovak HEIs was a Polish citizen (and polyglot) in 2012.

The [Fenix](#) strategy includes Measure 3.8: ‘Internationalisation in the area of R&D’. The measure supports attracting prominent foreign scientists and foreign research institutions to Slovakia. Arrival of prominent foreign scientists with a view to long-term intense work at a university or in other research organisation will necessitate a comprehensive solution of their pay. It will also be necessary to address the potential problem of different remuneration of high-quality domestic scientists, compared with a prominent foreign expert that would come to Slovakia to work.

The Slovak Academic and Information Agency manages Slovak version of the [EURAXESS webpage](#). The EURAXESS help researchers and their family to plan and organise their move to a foreign country, providing assistance in all matters related to mobility. Job vacancies in HEIs and the SAS have been published only in Slovakia so far. The Slovak public authorities plan to publish job vacancies in Slovakia and other countries on relevant Europe-wide online platforms (including EURAXESS).

ERA priority 4: Gender equality and gender mainstreaming in research.

Slovakia adopted a number of legislative measures to ensure gender equality. Gender equality is pronounced in the Slovak Constitution (2001), Labour Code Law (2011) and the 365/2004 Antidiscrimination Law. By 2011 Slovakia accounted for relatively good gender balance in R&D in terms of total employment and researcher numbers. Shares of female R&D personnel (in head counts) in total R&D personnel were 44.4% in 2003 and 43.6% in 2011 in Slovakia, while 34.1% in 2003 and 35.4% in 2009 the EU27. There are no regulations on equal gender representation in academic and research committees, boards and governing bodies. In fact, women are rather underrepresented in top managerial posts. There, for example, were only 5 female rectors on 36 Slovak higher education institutions in 2012. The latest available data on proportion of female academic staff indicated share of 20% for Grade A and 35% for Grade B in 2007 in Slovakia (respective shares for the EU27 were 19% and 36%) (Eurostat 2009).

There are no legal and other barriers to the recruitment, retention and career progression of female researchers in Slovakia. All women in Slovakia are entitled to the 3 years maternity leave. The only exception from this rule is the fixed-term contract.

²⁵ The 2009/50/EC Directive of 25 May 2009 (‘The Blue Card Directive’), and the 2009/52/EC Directive of 18 June 2009 on sanctioning illegal employment by the third country nationals.

ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including via digital ERA.

The Slovak Government invests considerable means from the Structural Funds for building modern infrastructure for access to and preservation of scientific information, knowledge and technology transfer and promotion of digital research services. Two national projects ([National information system supporting research and development in Slovakia](#) and [Infrastructure for research and development - Data centre for research and development](#)) invest some €53.1m in period 2008-2014 to ICT infrastructure in Slovakia. Two national projects (Transfer of knowledge and technology from research and development into practice and National infrastructure supporting technology transfer in Slovakia) invest €235.1m in period 2008-2014. They support science parks, applied research projects, R&D co-operation projects and technology transfer centres in Slovak HEIs and public research organisations.

The policies for research and education-related public e-infrastructures and for associated digital research services are implemented by the Slovak Academic Network (SANET). The [SANET](#) is an independent civil association and supports education roaming services, building high-speed (100 gigabyte) network for Slovak academic community, issuing TERENA certificates, and extending infrastructure of the e-services from higher education and academic institutions to public authorities and secondary schools in 77 Slovak cities

Table 2: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

	ERA dimension	Main challenges at national level	Recent policy changes
1	Labour Market for Researchers	<p>Improving working conditions for researchers and PhD students</p> <p>(+, -) Moderate supply of human resources for science & engineering, to a high extent matching the market demand</p> <p>(-) Overall highly unattractive working conditions for researchers.</p> <p>(-) Stopping or slowing down brain-drain by tertiary students and young researchers.</p>	<p>The Decree of the Government of the Slovak Republic No. 391/2004 enables access to Slovak labour market to citizens of all EU member states without any restrictions.</p> <p>Female researchers have right to return to the same position after maternal leave.</p> <p>The 404/2011 Law on Residence by Aliens enabled for easier access by highly skilled third-country nationals to Slovak labour market. The 'Blue Card' directive implemented.</p>
2	Cross-border cooperation	<p>Exploiting benefits of joint programming, and jointly funded activities</p> <p>Opening national programmes to foreign participants</p> <p>(-) Slovak national programmes are closed to foreign participants.</p> <p>(-) Joint programming receives relatively low attention by policy-makers (in terms of policy measures and budgets).</p>	<p>No changes in design of national programmes; these remain closed for foreign participants.</p>

	ERA dimension	Main challenges at national level	Recent policy changes
3	World class research infrastructures	<p>Drafting national ESFRI roadmap</p> <p>Building and modernising research infrastructure.</p> <p>(-) Lack of absorption capacity in regions outside Bratislava.</p>	<p>(+) Massive spending from Structural funds provided significant boost to building and modernising R&D infrastructure in Slovakia.</p> <p>(-) National Research Infrastructures Roadmap lacking by end of 2012.</p>
4	Research institutions	<p>Building high-quality public research organisation and higher education institutions</p> <p>(+) European money makes strengthening PROs and HEIs feasible.</p> <p>(-) High numbers of HEIs, but no HEI accounts for World class research</p> <p>(-) University ranking and evaluation procedures have to take into account generally low quality of research and are subject to lobbyist pressures.</p>	<p>The Operational Programme Research and Development invests some €1.4b in total to Slovak PROs and HEIs in 2007-2013.</p> <p>The government tries to improve quality of research in Slovak PROs and HEIs. University ranking and the SAS institute evaluation procedure should be reflected in amount of support.</p>
5	Public-private partnerships	<p>Weak links between the academia and industry</p> <p>Low interest by Slovak SMEs in research and innovation</p> <p>(+) Structural Funds provide considerable resources for building institutions facilitating knowledge transfer between industry and academia sectors.</p> <p>(+) New R&D infrastructure may improve linkages between industry and academia sectors, and between Slovakia and advanced EU members.</p> <p>(-) Potential problems with low demand and absorption capacity.</p>	<p>The Operational Programme Research and Development allocates some €689m to projects supporting innovation culture in Slovak firms and transfer of knowledge in period 2007-2013.</p>
6	Knowledge circulation across Europe	<p>Low participation in knowledge circulation</p> <p>(-) Slovakia accounts for one of the lowest participation rates in European research initiatives.</p>	<p>Slovak government continues supporting limited numbers of projects within the FP, ESF, COST and EUREKA programmes.</p>
7	International Co-operation	<p>Low participation in international co-operation</p> <p>(+) Increased interest by Slovak government and research institutions in participation in European and international research initiatives.</p> <p>(-) Overall, very low resources provided for international co-operation in science and technology.</p>	<p>Slovak government continues supporting limited numbers of bilateral and multilateral projects with the EU and third countries. Some 159 projects (€0.31m) with eight ERA countries, and 43 projects (€0.12m) with three other countries were supported in 2011.</p>

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LIST OF ABBREVIATIONS

ASFEU	Agency for Structural Funds of the Ministry of Education, Science, Research and Sports (Agentúra pre štrukturálne fondy Ministerstva školstva, vedy a výskumu SR)
BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
ERA	European Research Area
COST	European Cooperation in Science and Technology
ERA-NET	European Research Area Network
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
FP	European Framework Programme for Research and Technology Development
EU	European Union
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP	Framework Programme
FP7	7th Framework Programme
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HEIs	Higher education institutions
HES	Higher education sector
IP	Intellectual Property
KEGA	KEGA Grant Agency (Grantová agentúra KEGA)
NADSME	National Agency for Small and Medium Enterprises (Národná agentúra pre malé a stredné podniky)
NRIR	National Research Infrastructures Roadmap
PRO	Public Research Organisations
OECD	Organisation for Economic Co-operation and Development
OPCEG	Operational Programme ‘Competitiveness and Economic Growth’ (Operačný program Konkurencieschopnosť a hospodársky rast)
OPE	Operational Programme ‘Education’ (Operačný program Vzdelávanie)
OPRD	Operational Programme ‘Research and Development’ (Operačný program Výskum a vývoj)
R&D	Research and development
RDA	Research and Development Agency (Agentúra pre výskum a vývoj)
RI	Research Infrastructures
RNP	Research Networking Programmes
RTDI	Research Technological Development and Innovation
SAS	Slovak Academy of Sciences (Slovenská akadémia vied)
SF	Structural Funds
SIEA	Slovak Innovation and Energy Agency (Slovenská inovačná a energetická agentúra)
SME	Small and Medium Sized Enterprise
SOSMT	Slovak Office of Standards, Metrology and Testing (Úrad pre normalizáciu,

	metrológiu a skúšobníctvo)
SRGBST	Slovak Republic Government Board for Science and Technology (Rada vlády SR pre vedu a techniku)
SRDP	State Research and Development Programmes (Štátne programy výskumu a vývoja)
S&T	Science and technology
VEGA	VEGA grant agency (Grantová agentúra VEGA)
VC	Venture Capital

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Abstract

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). The main objective of the ERAWATCH Annual Country Reports is to characterise and assess the performance of national research systems and related policies in a structured manner that is comparable across countries.

The Country Report 2012 builds on and updates the 2011 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context. They further analyse and assess the ability of the policy mix in place to consistently and efficiently tackle these challenges. These reports were originally produced in December 2012, focusing on policy developments over the previous twelve months.

The reports were produced by independent experts under direct contract with IPTS. The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) and Directorate General for Research and Innovation with contributions from external experts.

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new standards, methods and tools, and sharing and transferring its know-how to the Member States and international community.

Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.

