European Commission

JRC SCIENCE FOR POLICY REPORT

RIO COUNTRY REPORT 2015: Slovenia

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2016

Joint Research Centre

EUR 27847 EN

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JRC101219

EUR 27847 EN

PDF ISBN 978-92-79-57766-6 ISSN 1831-9424 doi:10.2791/869835 LF-NA-27847-EN-N

How to cite: Boštjan Udovič, Maja Bučar, Hristo Hristov; RIO Country Report 2015: Slovenia; EUR 27847 EN; doi:10.2791/869835

Abstract
The 2015 series of RIO Country Reports analyse and assess the policy and the national research and innovation system developments in relation to national policy priorities and the EU policy agenda with special focus on ERA and Innovation Union. The executive summaries of these reports put forward the main challenges of the research and innovation systems.

Table of Contents

Foreword

The report offers an analysis of the R&I system in Slovenia for 2015, including relevant policies and funding, with particular focus on topics critical for EU policies. The report identifies the main challenges of the Slovenian research and innovation system and assesses the policy response. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites etc. The quantitative data is, whenever possible, comparable across all EU Member State reports. Unless specifically referenced all data used in this report are based on Eurostat statistics available in February 2016.
The report contents are partly based on the RIO country report, 2014 (Udovič, B. and Bučar, M. 2015).

Acknowledgments

The report draft has benefited from comments and suggestions of Meta Dobnikar from the Ministry of Education, Science and Sports, Ales GNAMUS and Nida Kamil ÖZBOLAT from JRC-IPTS.

Comments from DG RTD are also gratefully acknowledged.

Peter Fako, Lorenzo Isella and Athina Karvounaraki produced the statistics and the analytical assessments for sections 3.2 and 3.6 of the report.

We would like to thank Sophie Bodart, Martine Troonen and Françoise Gandrey for their assistance in preparing this report for publication.

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Executive summary

The report offers an analysis of the R&I system in Slovenia for 2015, including relevant policies and funding, taking into account the priorities of the European Research Area and the Innovation Union. The report was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites, etc. The quantitative and qualitative data is, whenever possible, comparable across all EU Member State reports. The report contents are partly based on Udovič, B. and Bučar, M. (2015), RIO Country Report Slovenia 2014.

Context

The 2008 economic crisis hit Slovenia very hard. In 2009 Slovenia's GDP decreased by almost 8 %, in 2010 and 2011 it stagnated, while in 2012 and 2013 Slovenia faced again a GDP drop. 2014 was the first year within the economic crisis cycle when Slovenia had a strong GDP growth of 3 % and another 2.6% forecasted for 2015 (IMAD, 2015).

RDI expenditures were partly determined by the austerity and fiscal consolidation measures. On one hand the state has decided to alleviate the investments in RDI by the tax relief, introduced in 2010 and expanded in 2012, while on the other hand the figures show that the public funding for RDI has been decreasing sharply and in 2014 stopped at the level of 0.55 % of GDP. From 2011 onwards most of the measures for innovation have been discontinued, while some programmes that were important in the field of R&D were minimised or partially-dismissed. The decrease in budget outlays for RDI has effected significantly also the conduction of RDI in public and private enterprises.

The lack of public funds was partially replaced by EU structural funds, yet by 2015 Slovenia was not able to draw any more on EU structural funds from financial perspective 2007–2013 for the R&D projects, and the new programmes for the financial perspective 2014-2020 were under preparation. In particular, the preparation of the RIS3 was a prolonged process, finalised by the end of the 2015. The document was approved by the EC in November 2015 and the implementation framework as well as specific support measures are under elaboration. First public calls in RDI area within the financial perspective 2014-2020 have been published in 2016.

The R&I system of Slovenia is characterised by high intensity, especially compared to other Central and Eastern European countries. Despite the budget cuts in the public R&D support in recent years, Slovenian gross R&D expenditure (GERD) reached €935m (2.59% of GDP) in 2013 (€928m and 2.58% of GDP in 2012). This is mainly due to the business R&D expenditure (BERD) which was increasing over the years, starting from €242.9m in 2005 to reach €715.5m in 2013. The share of the abroad funding was almost 9% in 2013. In spite of high investment in RDI by business sector, additionally stimulated by the R&D tax subsidy, the overall investment in R&D declined in 2014 to 2.39 % of GDP (all figures from Eurostat/SORS, respective years).

The economic crisis affected also the political situation in the country and Slovenia experienced several changes of the government, leading to shifts in the main ministries, responsible for RDI. These fluctuations resulted in slow implementation of the basic RDI policy document, passed by the Parliament in 2011: Research and Innovation Strategy of Slovenia (RISS), 2011-2020. The current Government is strongly committed to RISS 2011–2020, but catching up in the implementation process of RISS due to the lost years is likely to be difficult, especially because the situation in the field of RDI has changed with regard to the organisational structure as well as the funding trends. RISS was prepared under the Ministry of Higher Education, Science and Technology – in 2015, Slovenia had a Ministry of Education, Science and Sports, with technology policy moved under the Ministry of Economic Development and Technology. The concept of the strategy was based on close inter-relationship of scientific and innovation activity, with two implementing agencies in place: Slovenian Research Agency (responsible for public funding of basic and applied research) and Technology Agency (responsible for innovation and technology promotion measures primarily in business sector).

As of 2014, Technology Agency has been integrated in SPIRIT and all of its previous programmes and instruments abolished. RISS had also ambitious goals as far as the funding is concerned, since an increase of share of RDI was planned to 3.6% of GDP, with 1.2% coming from government. The government already revised this target to 3%, but in view of the on-going trends, the figure is rather optimistic.

Both public and private R&D institutions try to compensate for the lack of domestic funding with internationalisation of their activities, where especially increase in application to FP7 programme stands out. Slovenia tries to implement the ERA measures, where still some of the systemic characteristics hinder more dynamic introduction of novelties (like international recruitment of researchers, grant portability, etc.).

Key recent developments in the R&I system includes:

- Smart specialisation strategy was approved by the Government on 20th September 2015 and by the European Commission in November 2015.
- Drafting of the new Laws on Higher Education and on the Research and Development.
- Operational Programme 2014-2020 approved in December 2014.
- Due to several factors, most of the challenges to Slovenian RDI system remain unchanged, only more expressed. The identified challenges for Slovenia's R&I system are:
- Better coordination and streamlining of the R&D and innovation policy;
- Maintain the sustainability of the level of R&D financing;
- Improve the links between R&I investment and performance;

R&I Challenges

Challenge 1: **Better coordination and streamlining of the R&D and innovation policy**

Description

In 2014, the Council suggested the Slovenia should "Streamline priorities and ensure consistency between the 2011 Research and Innovation and the 2013 Industrial Policy Strategies with the upcoming strategies on Smart Specialisation and Transport, ensure their prompt implementation and assessment of effectiveness."

In its attempts to find the most efficient distribution of tasks among the different ministries in 2012, the Slovenian government decided to move the technology section from the Ministry of Higher Education, Science and Technology (now MESS – Ministry of Education, Science and Sport) to the Ministry of Economy, which became the Ministry of Economic Development and Technology (MEDT). Although in many countries with well-functioning R&I systems this separation being the case, the specific problem with moving the technology section is that it requires a certain period for adaptation and becoming fully operational.

The shifts in the structure of the R&I resulted also in delays in the implementation of the "Research and Innovation Strategy of Slovenia 2011-2020" (RISS). The document was partially dismissed after the 2011 early elections and revived again in 2013. One of the key priorities of the strategy was the "*establishment of an effective common governance system for the research and innovation system, involving all stakeholders*" (Resolution on RISS). RISS puts forward as a measure in this respect the "*[f]ormation of a uniform Government advisory body – the Council for Research and Innovation will replace the Council for Science and Technology and the Competitiveness Council*", which requires a change in the Law on R&D (see below), The RISS, the Industrial Policy Strategy (2013) and the National Programme on Higher Education (NPHE) were taken into account when drafting the Smart Specialisation Strategy, but the latter was submitted to the European Commission only in July 2015 and approved in November 2015, which has caused delays in making the planned measures operational and publishing new calls.

Policy response

The establishment of a Council for Research and Innovation is somehow delayed if not left apart for the time being. The Government Office for Development and European Cohesion Policy (GODC) was re-established in March 2014, whose primary task is to speed up the preparation of the necessary national documentation for the EU structural and cohesion funds, including the preparation of the Smart Specialisation Strategy. After two unsuccessful drafting of RIS3 in November 2013 (prepared by MEDT) and August 2014, GODC published an open call to RDI communities to submit proposals for the entrepreneurial discovery process. The RIS3 draft received 170 proposals and was discussed in a specific conference with more than 400 participants. On the basis of the discussion and expressed interests, the GODC is planning to identify strategic partnerships, which would focus on priority areas. GODC is developing the implementation process as well as coordination mechanism in cooperation with other ministries and responsible agencies.

With regards to the coherence of the strategic documents, 2015 National Reform Programme (NRP) insists that "The Research and Innovation Strategy of Slovenia (RISS) from 2010 and Industrial Strategy Policy (SIP) from 2013 are mutually harmonised, while their objectives (introduction of excellence and competition at the international level) are completely included in the Smart Specialisation Strategy".

The proper implementation of the RISS and NPHE calls for two legal acts to be adopted: the Law on Research and Development (R&D) and the Law on Higher Education (HE). The initial idea was that they reflect the interconnectedness of research and innovation and deal with the financing of research at university level and suggests higher level of autonomy in internal distribution of research funding, especially of so-called institutional block-funding for research at HEIs. The two acts were drafted by the previous government, but in May 2015, the newly-appointed Minister of Education, Science and Sports stated that new drafts of the two key laws are to be prepared by late fall 2015 for public discussion. Apart from the preparation of these two laws, no major policy action was put in place since 2011. Each ministerial team had different views on the implementation of RISS and the content of the key legal documents, but fell short of adequately completing the policy changes (Bucar, M., 2015).

Assessment

Although the Slovenian R&I system seems to function rather well compared to other similar economies, the streamlining of its strategic priorities and better coordination between the actors in the governance system could further improve its functioning. As stated by the new government (Udovič, B, and Bučar, M., 2015), there is a policy commitment that would help push through the necessary steps to adopt the two laws and start implementing effectively existing and new strategies. Setting up widely agreed national R&I priorities would certainly better bring about policy continuity and guarantee succession of instruments and measures deemed valuable for the system. Indeed, what is important in the long run is to put in place sustainable governance mechanisms which will allow having predictable outcomes from the implementation of the strategic documents.

Challenge 2: **Maintain the sustainability of the level of R&D financing**

Description

In 2010, the government adopted a target of 3% of GDP for joint public and private sector investment in R&D by 2020. Through the adoption of the RISS 2011-2020 (2011) Slovenia set a more ambitious national target of 3.6% (of GDP) of R&D intensity to be achieved by 2020. Already higher than the European target (3%), it was re-considered and referred to as 3% in the National Reform Programmes (NRP) of Slovenia as of 2011 (including the NRP 2015) onwards to better reflect the economic and financial situation.

Even though the total R&D expenditure rapidly increased in the period 2008-2012 both in nominal values (2008: €616.9m; 2009: €656.9m; 2010: €745.9m; 2011: €894m; 2012: €928.3)[1] and as percentage of GDP (2008: 1.63%; 2009: 1.82%; 2010:2.06%; 2011: 2.42%; 2012: 2.58%) in 2013 GERD stalled at the level of the previous year €935m (2.6% of GDP) and provisional data reveal it decreased in 2014 – €890m (2.39% of GDP).

Despite the fact that R&D investment by business sector indicates an increase in 2013, its rate of growth slowed down compared to previous period. On the other side provisional Eurostat data clearly show that public efforts in R&D funding are somehow left apart: government budget for R&D (GBAORD) was even less in 2014 (€182.7m) compared to 2008 (€189.6)[2]. Taking into account budget revisions the government reduced considerably the funding for research, which is even more noticeable in the GBAORD expressed as a share of the total government budget. In fact, Slovenian GERD funded by the government had been increasing both in nominal values and percentage until 2011 when it reached its peak (0.76% of GDP; €281.8m) and then started to decline (2014: 0.52% of GDP; €193.9m). A minimal increase is planned for the MESS budget for research in 2016/17 (MESS, 2016).

The budget adjustment will lower the level of financial support to R&D in PROs and HEIs. They adapt to the situation "*by cutting the investments in research infrastructure and to certain extend also in labour force*" (Udovič, B., and Bučar, M., 2015). This could entail risks like lower level of public-private[3] cooperation and competitiveness capacities. It is likely also to affect the business sector, although the latter could compensate by the use of indirect support from the government (R&D tax incentives). Slovenian R&D tax incentive system is considered very generous: since 2012, 100% of the amount invested in internal R&D activities and purchase of R&D services and 40% of the amount invested in equipment and intangibles (Ministry of Finance). According to OECD, direct government subsidies to business in Slovenia accounted for 0.27% GDP and R&D tax incentives for 0.09% in 2012, which amounts to €32m[4] (1/4 of the total governmental support to the business sector). Other sources mention even greater use of the indirect support scheme by the business (IMAD's Development Report 2014 states that the amount of the R&D tax relief claimed in 2012 was €184m).

Although business R&D expenditure nominally slightly increased in 2014, BERD intensity decreased for the first time in years. Innovative SMEs are supported by two national funding instruments: the programmes of the Slovenian Enterprise Fund (SEF) and the credit line of the Slovenian Export and Investment Bank SID[5]. SID provides financing of and guarantees for bank credits to SMEs' investments in R&D&I. Venture capital (VC) companies are starting to be more active in Slovenia, but the VC per GDP is at the bottom of the OECD middle range (OECD, 2014). On the other hand, the government does not provide any more favourable treatment of VC and/or business angels.

Policy response

There were several financial instruments for SMEs, many of which co-funded by EUSF 2007-2013, but both main public fundings (MEDT and MESS) reduced their R&I budgets and only few remained active due to the end of the programming period and budget austerity measures.

[1] Eurostat data (accessed 21/01/2016)
[2] Ibid.
[3] Relating mainly to the opportunity for the private companies to access top research equipment, which was seen as a major advantage for business sector to join the Centres of Excellence (Udovič, B. and Bučar, M. (2015), RIO Country Report Slovenia 2014.).
[4] Own calculations
[5] More at http://www.sid.si/financing/financial-services-for-development-research-technology-education-employment (1st October 2015).

In the current budget constraints the funding from abroad started playing a bigger role in the funding mix. More than 9% (2014: €83.3m; 2013: €82.5m; 2012: €79.5m; 2011: €62.8m; 2010: €44.8m; 2009: €39.7m; 2008: €34.5m) of the total GERD in 2014 (provisional data, last available year in Eurostat) came from abroad with the inflow of European funding (EUSF and FPs) accounting to more than 46% (2013: €38.7m; 2012: €36.3m; 2011: €30.2m; 2010: €24.9m; 2009: €20m; 2008: €17.3m) of the whole international R&D financing. The government acknowledges the importance of the European Structural and Investment (ESI) Funds and made efforts for the Smart Specialisation Strategy and operational programmes to be adopted, so that NIS can start using the available amounts for 2014-2020 period. According to the NRP 2015 "*In 2015 and 2016, attention will be paid to connecting and seeking synergies between structural and investments funds, and Horizon 2020*". The RIS3 was finally approved in autumn 2015 and new measures and instruments are to be announced in spring 2016 for the 2014-2020 period. Based on the evaluation of the support measures by the former Ministry of Economy for the 2004-2009 period (Jaklič, A. et al., 2012), the need to provide more systematic and harmonised support was stressed with emphasis on the requirement of avoiding frequent changes in the types of measures. The government recently reaffirmed[6] its intentions to support SMEs through creating favourable business environment by using the support of ESI funds.

Also, the Slovenian government is focusing on a transition from grants towards repayable sources (guarantees, loans and equity financing), especially for promoting the investment project of enterprises, in order to achieve leverage and a revolving effect (EC, 2015c).

Assessment

The lack of continuity in several support measures lead to instability in the R&D funding and caused serious problems in the R&D activity of PROs and HEIs. With the slow progress in the preparation of Smart Specialisation Strategy it is unlikely that 2015 will bring any new financing through instruments potentially developed for the structural funds of the financial perspective 2014- 2020. It is too early to speculate on how the reduced direct government support for R&I has affected the business sector's investment, since it relies more on the tax incentives. The Ministry of Economic Development and Technology and the Ministry of Education, Science and Sport have experienced significant cuts in funds aimed at support of technological projects in the last years, with further cuts planned for 2015[7], which gives indications the budget constraint are not solved yet . On the other hand, the R&D performers realised they have to look for alternative funding sources, mainly from abroad, which lead to an increased interest to and absorption of European funds. This opinion can be supported by the collaborative approach of the Slovenian researchers as they have actively participated in the Framework Programmes from FP5 on, with each following one increasing both the number of participation (914 in FP7), number of coordination projects (55 in FP7) as well as the EC contribution (€170.8m in FP7). The numbers can be considered as a reflection of relatively intensive international research collaboration of Slovenian R&D units, both PRO and SMEs.

[6] Webpage of the Government Office of Slovenia http://www.vlada.si/en/media_room/newsletter/slovenia_weekly/news/article/minister_pocivalsek_announces_strengthened_support_for_smes_in_their_breakthrough_to_markets_53080/ (3rd March 2016).

[7] In 2013, MEDT had €24.4 million for the subsidies of technology projects of business enterprises, in 2014 this was reduced to €13.4 million, and for 2015 only €7.2 million are planned. The allocations at MESS for this type of financing have decreased from €21.3 million in 2013 to €7.3 million in 2014, with only €0.82 million planned for 2015.

However it still remains unclear whether the inflow of ESIF (rough data from the new Operational Programme 2014-2020[8] estimates the support to R&D to €461 million) will manage to compensate the R&D budget cuts[9]. In addition, the repayable sources were not welcomed so far and also used only very conservatively by SMEs[10]. The firm policy commitment made by the government is in place, but the progress in the implementation of the different instruments remains to be seen.

Challenge 3: **Improve the links between R&I investment and performance**

Description

Innovation Union Scoreboard 2015 ranks Slovenia among the "innovation followers" (12th), which according to the methodology used, indicates above or close to EU average performance. Especially when it comes to "enablers", the country progressed in all indicators, with only one exception – the low level of R&D expenditure in the public sector (already mentioned in challenge 2). When applying the approach used by Edquist and Zabala-Iturriagagoitia (Edquist and Zabala-Iturriagagoitia, 2015), Slovenia ranks 7th in EU28 in terms of R&I input, mainly due to the high BERD.

On the other hand, as far as output indicators are concerned, several weaknesses are observed in: license and patent revenues from abroad, sales of new to the market and to firm innovation, knowledge-intensive services exports. Edquist ranks Slovenia 18th[11] in terms of innovation outputs and goes even further stating that in terms of productivity (innovation performance) the country holds 25th position.

This is somehow in line with the way the country performs in another ranking – the Innovation Output Indicator. Although the score of Slovenia ranks it in the middle, there is a deterioration in 2012 (87.42), compared to the previous year (90.3) and the country slid a position back to rank 14th in EU28.

Policy response

Slovenia adopted a number of strategic documents, dealing with different aspects of this challenge, but it is not yet addressed on policy level in a comprehensive manner. With regards to the promotion of knowledge transfer as a driver for the economic growth, several instruments have been put in place. The RISS (2011) includes important measures to help commercialising research results and value added (as the fact that policy area of "knowledge transfer and poles" received the majority of ERDF in the previous funding period), but its implementation lags behind for several afore-mentioned reasons. Industrial Policy Strategy (2013) focuses more on entrepreneurship and technological innovation. In the national operational programme of Slovenia[12] several output indicators were chosen to evaluate performance. The Smart Specialisation Strategy, already quite a comprehensive document (approved in autumn 2015[13]), is expected to bring about better focusing of the R&I investments and more clear prioritisation. The key Smart Specialisation Strategy objectives are raising the value added per employee, increased share of high-tech intensive products and knowledge-intensive services, and increased entrepreneurial activity. The synergy between them will seek to direct the funding towards selected areas thus boosting the quality of research investment and creating economic impact.

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[8] More at http://www.svrk.gov.si/fileadmin/svrk.gov.si/pageuploads/KP_2014-2020/OP_SFC_poslano_11_12_2014.pdf (1st October 2015)

[9] Estimated Structural Funds dedicated to research and innovation activities in the OP (2007-2013) is approximately €950m (S2E, 2015).

[10] In 2009-2010, SEF had a line of funding for SMEs where money was available as a repayable loan at subsidised interest rate, but there were practically no applicants for that particular call.

[11] As mentioned in the beginning, Slovenia ranks 12th according to the IUS.

[12] More at http://www.svrk.gov.si/fileadmin/svrk.gov.si/pageuploads/KP_2014-2020/OP_SFC_poslano_11_12_2014.pdf (1st October 2015).

[13] More at http://www.svrk.gov.si/nc/en/media_room/news/article/1328/6173/ (1st October 2015).

Assessment

Despite the increased investment in R&I, the IUS findings remain almost unchanged during the last years. Slovenia did not progress in the overall ranking over the last years (since 2008, when it joined the group of "innovation followers"). Although there is a certain time lag between investing in new knowledge and performance it's clear that Slovenian NIS needs to further improve in some areas. In some others it already showed considerable improvement - i.e., scientific publications among top 10% most cited where Slovenia is on the right track and improved its performance by 5.9%. External evaluations of strategic documents and the R&D system were commissioned in the past, which is a good practice to assess the positive/negative characteristics of the system and make recommendations. This contributes to the fine-tuning of measures and instruments and seems to be a good way forward to maintain dynamism and further improve the performance of the NIS.

1. Overview of the R&I system

1.1 Introduction

Slovenia is among the smallest EU member states with 20,273 km2 and 2 million inhabitants (0.4% of EU28 total population), with an economy basing mostly on tertiary sector (agriculture presents 2% of total GDP, manufacturing 29.2 %,[14] while the service sector 54.8% of GDP)[15] and a GDP per capita €18,100 (2014). Until 2008 Slovenia was among the most prosperous new member states, but the 2008 economic crisis hit Slovenia very strong. In 2009 its GDP decreased for almost 8 %, in 2010 and 2011 it stagnated, while in 2012 and 2013 Slovenia faced again a GDP drop (in 2012: -2.7 %; 2013: -1.1 %). 2014 was the first year within the economic crisis cycle when Slovenia had a strong GDP growth of 3 % (IMAD, 2015).

The deceleration of economic performance left direct consequences also on the labour market and on the financial figure of the country. As seen from data from the Slovenian office of Statistics (ILO methodology) (SORS, 2015a)[16] in 2008Q1 Slovenia's level of unemployment was 5.1 %. A year later the level increased to 5.4 %, while in 2010 it amounted up to 7.1 %. The "unemployment peak" was reached in 2013Q1, when the level of unemployment increased up to 11.1 %. From that point forward the rate of unemployment has been slightly decreasing (in 2014Q4 was 9.6 %, while in 2015Q2 was 9.2 %). While the unemployment has been decreasing in the last years, the public finance deficit and public debt has been galloping. The 2008 data show that before the start of the economic crisis Slovenia was low indebted, since its public debt (end of year methodology) amounted up to 21.6 % of the total GDP. Two years later this debt increased for almost 17 % (38.2 %), while in 2012 it stopped at the level of 53.7 % of GDP. The 'capitalisation' of banks aimed for a new borrowing in 2013 and that is why at the end of 2014 the public debt stopped at the level of 80.8 % of GDP (SORS, 2015b).[17] In July 2015 the National Assembly adopted a "Fiscal rule law", which claims that the structural deficit should be annulled until 2020. This sent a strong signal to international financial authorities of Slovenia's commitment to decrease its deficit in next five years and in the next ten years also its public debt.

The economic turmoil in overall figures have not influenced the investments in RDI, which have been growing steadily since 2006 (in 2006 GERD was at the level of 1.5 % GDP, while in 2013 the level was 2.59 %). But as expected in 2014 (especially because of the ended funding of EU structural funds) the level of GERD dropped from 2.59 % (in 2013) to 2.39 % (in 2014). This was especially due to the decreased level of budget outlays, which fell under 0.5 % of GDP and stopped at the level of €161.3 million, being 0.43 % of GDP (SORS, 2015c).[18] Thus also the GBAORD decreased and in 2014 stopped at the level of 0.55 % of GDP, which is by far the lowest level of GBAORD in the last years. The main issue for such decrease can be found in the austerity measures introduced drastically also in the field of RDI after the start of the 2008 economic crisis. All-in-all from 2008 it is possible to see that BERD is slowly replacing GOVERD and HERD and that the proportion of BERD in total GERD – especially after the introduction of 2010 (and the expansion of 2012) RDI tax relief – increased significantly.

[14] The largest part of this share is presented by the low-tech manufacturing (see http://pxweb.stat.si/pxweb/Dialog/Saveshow.asp, 1st October 2015)
[15] Data available at http://www.umar.gov.si/fileadmin/user_upload/publikacije/analiza/jesenska_napoved_2015/JNGG2015-splet2.pdf (1st October 2015).
[16] Database on labour statistics http://pxweb.stat.si/pxweb/Dialog/Saveshow.asp (1st October 2015).
[17] Database on public debt http://pxweb.stat.si/pxweb/Dialog/Saveshow.asp (1st October 2015).
[18] News on the Statistical portal http://www.stat.si/StatWeb/prikazi-novico?id=5497&idp=25&headerbar=16 (1st October 2015).

The data of 2014 and 2015 are important, because Slovenia in 2010 (because of the crisis) expanded the time period for reaching 3 % of GDP per RDI. If the amount spent for RDI in 2014 and 2015 would be decreasing comparing to the previous years, Slovenia would hardly reach the set share of GDP per RDI.

The economic situation of the country influenced also the political stability of Slovenia. It was in 2011 that Slovenia for the first time went to early elections. Thus in 2012 the Government was appointed, replaced by the new Government in 2013. In July 2014 Slovenia went again to the, now second, early elections in its history. Such political changes that were not present in Slovenia earlier, disillusioned the political agents, parties and the population and many of the measures proposed by the Government are met by relatively high level of public mistrust, slowing the implementation.

Table 1 Main R&I indicators 2012-2014

Indicator	**2012**	**2013**	**2014**	**EU average**
GDP per capita	17.500	17.500	18.100	27.300
GDP growth rate	-2.6	-1.0	2.6 (3.0*)	1.3
Budget deficit as % of public budget	-4.0	-14.9	-4.9	-2.9
Government debt as % of GDP	53.7	70.3	80.9	86.8
Unemployment rate as percentage of the labour force	8.9	10.1	9.7	10.2
GERD in €m	928	935	890.2	283,009.388m (total for EU-28)
GERD as % of the GDP	2.58	2.59	2.39	2.03
GERD (EUR per capita)	451.6	454.1	431.9	558.4 (2014)
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	7.8	8.3	8.6	5.7 (2014)
Employment in knowledge-intensive service sectors as share of total employment	35.42	34.4	34.7	39.8 (2014)
Turnover from innovation as % of total turnover	16.3 (2008)	10.6 (2010)	10.5 (2012)	11.9 (2012)
Value added of manufacturing as share of total value added	36	36.2	NA	26.2 (2012)
Value added of high tech manufacturing as share of total value added	5	5.2	NA	2.5 (2012)

Data source: Eurostat

1.2 Structure of the national research and innovation system and its governance

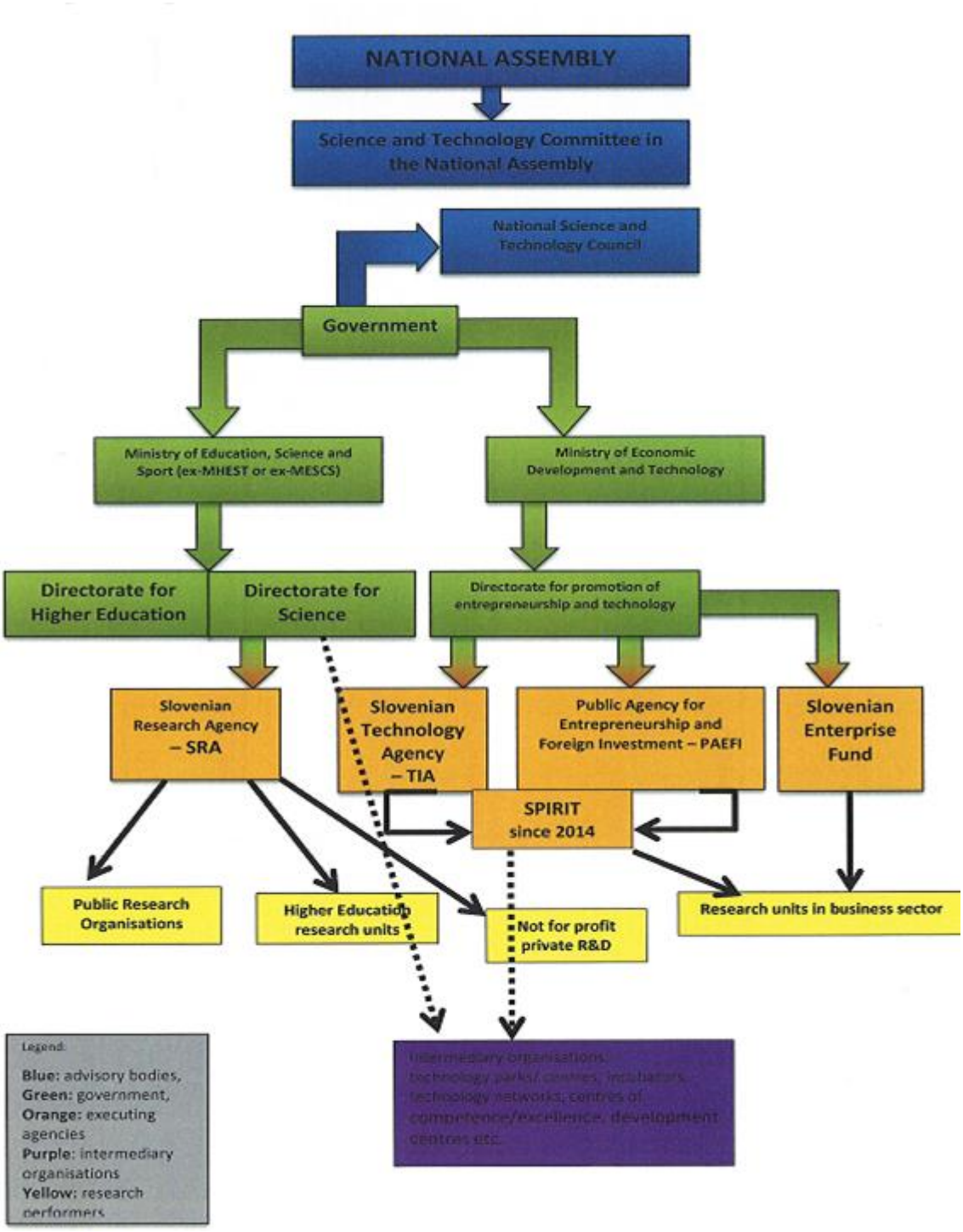

Figure 1 Organisation structure of the Slovenian RDI system

1.2.1 Main features of the R&I system

Slovenian Research, Development and Innovation (RDI) system is quite complex, with two major characteristics: it is centralised[19] and its financing is executed mostly on a competitive-basis. The most important players in the field are two ministries (Ministry of Education, Science and Sport – MESS; and Ministry of Economic Development and Technology – MEDT), entitled to promulgate relevant documents and policy measures, but also to co-finance projects, mostly indirectly (MEDT through SPIRIT, MESS through SRA). The main RDI funders are the business and government sector – where the business funds play an increasingly more important role in the last eight years.[20] At the same time, the majority of funds is spent in the business sector as well (SORS, 2015).

In spite of the recent trends, the HEIs and PROs still play an important role in the Slovenian RDI system, especially in the area of basic research. However, it is necessary to emphasise that in last years also business entities became more important in the RDI system, especially entities from the manufacturing of fabricated metal products (32 % of total BES in 2013) and pharmaceutical sector (22 % of the total BES in 2013), which have the main impact of Slovenian business RDI. According to the SORS (2015a,b,c) data in 2013 50 % of total GERD was invested in manufacturing, 40 % of total GERD were disbursed in large enterprises (some of them being also MNCs), while 60 % of the total expenditures were allocated to SMEs, which are becoming more and more important in the Slovenian RDI system.

1.2.2 Governance

The austerity measures and fiscal consolidation left dire consequences in the Slovenian RDI financing system from 2011 onwards, since public funds have been decreasing. To certain extend, the lack of public funds was partially replaced by EU structural funds and by private funds, mostly generated by the 2010 and 2012 tax relief. However, 2015 had been the first year when Slovenia was not able to draw on EU structural funds from financial perspective 2007–2013 for R&D projects, since the measures planned for this perspective had been fully implemented by then. As pointed out by critics, because of the decreasing funds for RDI Slovenia would hardly achieve its goal of investing 3.6 % of GDP for RDI until 2020. Parallel with the afore-mentioned constraints, the unpredictable budget policy also left consequences in the predictability of the issuance of RDI measures.

The top legislative bodies in the field of RDI are the National Assembly (Državni zbor) and its two committees (Committee for Education, Science, Sport and Youth and Committee for Economy), who have the authorities to promulgate laws and resolutions related to RDI policy. In the executive branch, the authorities in charge of RDI are the two ministries, i. e. the Ministry of Education, Science and Sport (MESS) and the Ministry for Economic Development and Technology (MEDT). The ministries are being responsible for the preparation of the main policy documents, support measures and all of the activities connected with the RDI policy. The two ministries are also the "main funders" of the RDI policy.

The main science policy advice body is the Council for Science and Technology (CST (EN), SZT (SI)), which is, according to the Law on Research and Development (2002 and changes later on), composed of fourteen members that are nominated and nine non-elective members regarding their position. Out of 14 nominated members, 6 represent the research community, 6 the business community, 1 is representing the labour unions and 1 the general public.

[19] Slovenia has no regions.

[20] BERD has been nominally and in percentage increasing since 2008 onwards.

The group of 9 "non-elective" members of SZT is composed of the president of Slovenian Academy of Science and Arts (SASA), the rectors of the four Universities, the representative of the Chamber of Commerce and Industry as well as the Minister of Education, Science and Sport, the Minister of Finance and the Minister of Economic Development and Technology. The Council for Science and Technology has a mandate to prepare and accept the guidelines for the National Research and Development Programme (NRDP). In the last five years the SZT played an important role in the preparation of RISS 2011–2020 and of the draft of the Law on R&D (which is not adopted yet). The current Council was appointed in July 2014, with a mandate of four years.

At the executive level the Law on R&D_provided two special public agencies: the Slovenian Research Agency (SRA) and the Slovenian Technology Agency (TIA). SRA, which is responsible for the execution of public research financing, for the professional and independent selection/evaluation process of projects and programmes and the monitoring of research programmes and projects implementation, was established in 2004. TIA, which was established in 2006, and was entitled to promote technology development and co-finance business RDI, was merged with the Public Agency for Entrepreneurship and Foreign Investments (PAEFI) on 1 January 2013 – also entitled to perform some RDI programmes – and the Slovenian Tourism Agency (STO) into a newly-established agency SPIRIT. Here, also the Slovenian Enterprise Fund (SEF) should be mentioned, which is an independent agency, dealing mostly with co-financing and subsidizing the activities of SMEs and start-ups.

Regarding the evaluation system it should be noted that Slovenia – since most of its RDI activities are competitive-based – has built relatively effective evaluation system at the project level. The evaluations are done by every agency that issue calls for financing or co-financing projects, for their individual calls. The most important (and the largest) is the Slovenian Research Agency (SRA), which has a strong system of ex ante and also in some cases ex post evaluations for projects/programmes that are to be co-financed. The evaluation system within SRA is defined by the Regulation (adopted 21st January 2011, revised several times, last 2014), which sets clear criteria and procedures for each instrument implemented by the SRA. In cases of the measures not financed by the SRA (especially in the field of innovation), the authorised body (agency) usually presents the selection criteria ex ante at the time of publishing the call. SRA has a practice of regular ex post evaluations for all research programmes.

To sum up: the Slovenian R&D system is a complex system where the responsibilities of certain authorities (and therefore also measures) sometimes overlap. It is a system where sometimes a clear division of the workload between ministries is missing (especially MEDT and MESS). The budgetary framework has been becoming more and more unstable, because of strong austerity measures. This is visible especially in the work-process of SRA (being the main MESS executive agency), which changes its own rules to obtain projects year-by-year and launches tenders for Basic and Applied Projects (BAPs) only when there is money available[21]. Similar is the faith of Targeted Research Programmes (TRPs) where severely reduced calls were launched for at least five years (in summer 2015 only some very specific TAPs projects were offered), which causes a problem in the R&D sector, especially in the more applicative branches. The problem of low-financing of R&D is not opposed only by public universities and research institutions, but also by the SRA itself.[22]

Regarding the issue of evaluation, we need to distinguish two different levels of evaluations. Slovenia's RDI system already in the past developed a strong and solid competitive system of evaluation at the project level.

[21] In the past, the calls were scheduled in regular intervals.

[22] See more at http://www.arrs.gov.si/sl/obvestila/15/upadanje-sredstev-za-znanost.asp (1st October 2015).

There are clear procedures of ex ante evaluation, with regular engagement of international evaluators. The ex post evaluation system is more complex, since Slovenia is a small country, where it is almost impossible to find evaluators in Slovenian language with no conflict of interest, yet it is compulsory to provide a final report on the programme/project in Slovenian language.

More problematic is the evaluation of the R&D system/policy and its measures. Here the evaluations are less systematic, usually tied to the preparation of new policy documents and in principle should serve as the basis for the design of adjustment of the measures implemented. Except for the ex-ante and ex-post evaluations prepared within the Operational Programmes, other evaluations are ordered by the MESS or MEDT with no pre-announced frequency and even if/when carried out with limited policy impact. The RISS addressed this issue and called for more systematic approach to evaluation, but just as several other elements of the RISS are not yet implemented, this issue is also not approached. There is however, periodic evaluation of the implementation of RISS by the responsible Ministries – the results of 2015 evaluation are expected to be published in spring 2016.

1.2.3 Research performers

The RDI performers in Slovenia can be divided into three groups: universities and higher education institutions (HEIs), public research organisations (PROs) and research units within business enterprises. Slovenia has 5 universities (see below) and 38 independent higher education institutions; 47 PROs and 777 business units registered for the conducting RDI (IZUM, 2015).[23] Among the PROs, 15 are having the status of the public research institutes, founded by the Republic of Slovenia. This means that they are entitled to block-funding for basic expenditures (but even for them the block-funding does not represent more than 10-30% of total income), while all other RDI units are funded on the competitive-basis.

Higher education institutions

Slovenia has five Universities (University of Ljubljana, University of Maribor, University of Primorska, University of Nova Gorica and EMUNI University) and 47 research institutes. The first three are public universities, funded for their academic tasks mostly by the government, while the University of Nova Gorica presents a public-private partnership. Within the four universities, there are 60 different faculties and/or academies in all academic fields.

In 2014 the higher education institutions employed 2,667 (in FTE) or 5,472 (in headcount) research personnel (18 % of the total research personnel employed in RDI), 2,180 (in FTE) or 4,376 (in headcount) of them were researchers (25 % of all researchers employed in RDI) (SORS, 2015). The current employment regulations allow regular teaching staff with 100 % pedagogical assignment to participate on top of these 100 % in the amount of 20 % of FTE in publicly funded research, so most of the university professors would be counted as 20 % of FTE – which explains the difference in head count from the FTE.

One of the characteristics, which is hindering the research system at the universities are small and fragmented research groups, established sometimes by two or three researchers, covering a specific research area. Such fragmentation has been already marked as a weakness of the Slovenian research system (ERAC, 2010), but just few steps have been made in the direction of overcoming these problems.

[23] The information on PROs can be sometimes misleading, since there are two views on what PROs in Slovenia are. Some experts name that PROs are the three public universities and 15 public research institutes that are founded by the state, while other researchers define PROs as all organisation that conduct public research activities.

Public research organisations

In Slovenia, the government RDI is composed of 47 institutes, employing 1,744 researchers (2,490 research personnel) in FTE in 2014 (SORS, 2015a, b, c). The public research institutes (15), which are having the Republic of Slovenia as their founder, are entitled to institutional funding.

The most important government funded public research institutes are:

- Agricultural Institute of Slovenia;
- Educational Research Institute;
- GeoZS, Geological Survey of Slovenia;
- IER, Institute for Economic Research;
- Institute for Hydraulic Research;
- IJS, Jozef Stefan Institute;
- IMT, Institute of Metals and Technology;
- INV, Institute for Ethnic Studies;
- INZ, Institute of Contemporary History;
- National Institute of Chemistry;
- NIB, National Institute of Biology;
- Slovenian Forestry Institute;
- UI, Urban Planning Institute;
- ZAG, National Building and Civil Engineering Institute; and
- ZRC SAZU, Scientific Research Centre of SASA.

The PROs are highly different in terms of number of employees, in terms of level of cooperation with the business sector or participation in the higher education programmes. The largest and most influential national research institute is the Jozef Stefan Institute (IJS) with 962 employees (at the end of 2014). IJS is the most relevant institute also in the natural sciences, biotechnology and medicine in Slovenia, having a large number of patents. Since IJS is the largest and also economically powerful institute it is also an influential stakeholder in the national RDI policy.

Business Enterprise Sector

The statistical data explains that in 2014 the business sector employed 12,661 (9,696 in FTE): 5,689 (4,637 in FTE) were researchers and 5,494 (4,059 in FTE) were qualified as technicians. Comparing to the year 2013, it is possible to see that also in the business sector the number of employed in RDI in 2014 slightly decreased (index 2014/2013=98)[24].

Next to technology centres and technology parks, developed in 1994, and technology platforms developed in 2005, Slovenia launched an instrument of the Centres of Excellence and Centres of Competence in 2010, which lasted until the end of 2013. A modification of the measure is included in the Operational Programme 2014-2020, but while the OP was approved by the EC in December 2014, the implementation scheme had to wait for the adoption of RIS3. Following the confirmation of the RIS3 strategy by the EU Commission in the first week of November 2015, the Government started with the new measures, directed also to the business sector, in spring 2016.

In 2014 in Slovenia more than 186,000 enterprises operated: 95 % of them were micro enterprises, 4.8 % were SMEs and just 0.2 % were large enterprises. All enterprises employ 827,400 employees (40 % of them are employed in SMEs, 31 % in large enterprises, while 29 % in microenterprises) (SORS, 2015).

[24] In part, this can be explained with the decline in financing from the Structural funds (CO and CC) were statistically counted as business sector R&D institutions) as well as with lower support for employment of young researchers in business sector.

Taking into consideration the expenditures for RDI, the largest amount of funds for RDI was spent by the large enterprises, following by the SMEs. According to the SORS (2015) data in 2013, 50 % of total GERD was invested in manufacturing. 40 % of total GERD were disbursed in large enterprises (some of them being also MNCs), while 60 % of the total expenditures were allocated to SMEs, which are becoming more and more important in the Slovenian RDI system.

2. Recent Developments in Research and Innovation Policy and systems

2.1 National R&I strategy

In May 2011 the Slovenian National Assembly adopted a long-term strategic document of research and innovation (covering RDI in an integrated manner), named Research and Innovation Strategy of Slovenia (RISS) 2011–2020, which reflects the main EU priorities in the field of RDI. RISS defined the R&D priorities for the next decade (2011–2020) summarised as follows:

a) Better integration of research and innovation;

b) Publicly funded sciences and scientists shall contribute to economic and social restructuring;

c) Enhancing/ensuring closer cooperation between PROs and the business sector;

d) Increasing scientific excellence, partly by increasing competitiveness within S&T stakeholders and partly by providing necessary resources, both human and financial.

The political changes contributed to relatively slow implementation of RISS. The current Government (from 2014 on) is strongly committed to RISS 2011–2020, but they face a significant challenge in catching up with the implementation process, especially because the situation in the field of RDI has changed (as seen from 2014 figures) significantly. While RISS 2011–2020 planned for a continuous increase of public financing of RDI activities, the austerity measures in the last years decreased the level of RDI finance. The result is that several measures have not been launched and some measures and activities defined by RISS 2011 – 2020 met a serious delay in their performance (e.g. cross-border operations, new measures for alleviating the cooperation between PROs and private enterprises etc.). On the basis of periodical evaluation reports, it is expected that RISS will be partly revised in 2016 (MESS Mimeo, 2015).

Here also the RIS3 strategy should be mentioned, which was adopted by the Government on the 20th September 2015 and received a green light by the European Commission in the first week of November 2015. As pointed out by the RIS3, in the period 2015–2020 Slovenia has the following priorities that would influence also the field of RDI: (1) Healthy living and working environment, (2) Natural and traditional sources for future, (3) S(INDUSTRY) 4.0.

2.2 R&I policy initiatives

Striving to reach RISS 2011–2020 recommendations, the 2013 Government started to prepare two new laws: Law on Higher Education, that would be in line with the National Programme of Higher Education 2011–2020 and with RISS 2011–2020, and the Law on Research and Development, that should reflect the direction and accents presented in RISS 2011–2020. The Law on Higher Education was put in the public debate and its was prepared for the legislation process, but the 2014 early elections postponed its adoption. The changes of ministers at MESS decelerated the process of the adoption of the new Law on Higher Education, which is being prepared for the public consultation in the first half of 2016.

A similar situation occurred when adopting the Law on R&D. The 2013 established expert group has prepared the draft proposal of the new Law on R&D. But before the draft was released for the public debate, the Government was dismissed and the proposal remained only as a sort of expertise.. In December 2015 the MESS appointed a new group of experts to prepare a new draft. According to minister's statement, R&D law should be put into the public discussion by summer 2016.

Table 2 Measures adopted, revised or annulled from 2011 onward

	Adopted	Revised	reduced/ stopped
Research Group Programme		X	
Targeted Research Programmes			x (reduced)
Research Infrastructure financing		x	
Co-financing of employment of PH.D. graduates	x		
Early-stage researchers	x		
Basic and Applied Projects		x	
KROP			x
Centres of Excellence			x
Centres of Competence			x
Innovation voucher			x
Process voucher			x
Different programmes related to innovation			x

2.2.1 Evaluations, consultations, foresight exercises

Traditionally, Slovenia commissions evaluations at the time when the strategic documents in the field of RDI are being prepared. That is how the ERAC (2010) and OECD (2011) evaluations of the RDI system in 2010 were carried out: they offered an external view of the system and its positive/negative characteristics during the preparation of RISS 2011–2020. Some of the recommendations were taken on board, some were to be integrated in the follow-up legal documents and some were dismissed. RISS requests its own periodic assessment by the implementing bodies, so the two Ministries (MESS and MEDT) have prepared a periodic assessment to be submitted to the Council of Science and Technology in spring 2016.

The MESS commissioned in the beginning of 2014 the evaluation of the Centres of Excellence (COs) and competence centres (CCs) as the instruments, supporting the cooperation between public and private RDI (not the performance of individual centres, only the achievements of the instruments as such). On the basis of analysing the end reports submitted by the COs and CCs and interviews with the members of the COs and CCs from all three research communities (PROs, HEIs and business), the assessment of achieving the policy objectives was carried out (Bučar et al., 2014)

In the preparation of the RIS3, two different in-depth analyses were prepared for GODC: one prepared by FIDEA (2014) and one prepared by Burger and Kotnik (2014). As seen from the text of the adopted RIS3, both analyses played an important role in the preparation of RIS3.

2.3 European Semester 2014 and 2015

The EC Report on Slovenia's progress states one of the main problems in the Slovenian R&D, i. e. the relationship between the input and output. As presented by the EC in 2015 "the level of R&D investment in Slovenia has increased considerably but the results have lagged. […] Increases in R&D investment could be attributed to a favourable system of tax incentives and significant co-financing from the Structural Funds. However, the low performance regarding research and innovation outputs calls into question the quality of the investments" (p. 61).[25] This problematic relations has been put on table few times, but the answers on how to solve this deficiency are not so straight-forward. One of the possible measures would be the simplification of the Slovenian RDI system, which would establish a clear line of command, while on the other hand this would lead to a further centralisation of RDI policy in Slovenia, which maybe cannot be fruitful. As already pointed out in the previous subchapters, the most concerning fact is that Slovenia's budget outlays for RDI have been sharply decreasing in the last years and some already claims that such short-run austerity can exert a strong negative long run influence the developments in the Slovenia RDI. This concern was reaffirmed also by the new coming data on RDI expenditures in 2014, where Slovenia faced a serious drop in its GERD level. However to understand the figures it should be noted that in 2014 the GOVERD decreased for 5 p.p. (from 26 % in 2013 to 21 % in 2014). Some experts expressed their concern that the situation in 2015 can be even worse, since the level of EU funds will be really low and the BES investments will not be able to replace the decrease in public financing.

2.4 National and Regional Research and Innovation Strategies on Smart Specialisation

Smart specialisation strategy was adopted in Slovenia on 20th September 2015 and approved by the European Commission in the first week of November 2015. As explained in the previous reports Slovenia prepared more drafts of the Smart Specialisation Strategy in the last three years, but the one adopted was prepared by GODC on the basis of the previous three in Spring 2015, adopted by the government in Sept.2015 and submitted to the European Commission. The Commission approved the document in beginning of November 2015. RIS3 or in Slovenian S4 (Slovenian Smart Specialisation Strategy)[26] presents three priorities of the Slovenian economy for the next financial period:

(1) Healthy living and working environment

1.1 Smart cities and communities with IT platforms and conversion, distribution and energy management.

OBJECTIVE: raising the value added per employee by 15%.

Focus areas and technologies

Focus areas:

1. Systems and IT platform solutions – IT ecosystem for hosting (mobile) applications
2. Conversion, distribution and energy management

Technologies:

1. Cloud computing and big and open data
2. Internet of things and future internet

[25] Available at http://ec.europa.eu/europe2020/pdf/csr2015/cr2015_slovenia_en.pdf (1st October 2015).
[26] More available at http://www.svrk.gov.si/fileadmin/svrk.gov.si/pageuploads/SPS_predstavitve/S4_dokument_2015_october_eng_clean_lekt.pdf (31st December 2015).

3. Embedded smart systems

4. High Performance Computing (HPC) infrastructure

5. Capture and use of long-distance earth observation data

1.2 Smart buildings and homes including wood-chains with smart building units, building management systems, smart appliances and advanced materials and elements.

OBJECTIVE: raising value added and export of companies by 15%.

Focus areas and technologies

1. Smart housing units

2. Smart environment using intelligent building management systems

3. Smart appliances

4. Advanced materials and products, including wood composites

(2) Natural and traditional sources for future

2.1 Networks for the transition to circular economy.

OBJECTIVES: 1. raising the material efficiency index of 1.07 (2011) to 1.50 (2020); 2. establish 5 new value chains with closed material cycles.

Focus areas and technologies

1. Technologies for sustainable biomass transformation and new bio-based materials

2. Technologies for use of secondary and raw-materials and reuse of waste

3. Production of energy based on alternative source

2.2 Sustainable food production.

OBJECTIVES: 1. establishing at least three value chains which will provide a critical mass of consumption and which will be supported by long-term contractual partnership based on economic initiative; 2. raising value added per employee in companies by 20%.

Focus areas and technologies

1. Sustainable production and processing of food products into functional foods

2. Technologies for sustainable agricultural production (livestock and plants)

2.3 Sustainable tourism

OBJECTIVES: 1. Raising value added of tourism by 15%; 2. increasing the inflow from export of travel services by 4 to 6 % annually; 3. enhancing energy efficiency in tourist facilities by 20%.

Focus areas and technologies

1. IT-based marketing and networking through the creation of innovative, integrated and sustainable tourism products and services in line with upcoming needs

2. Knowledge for enhancing the quality of services -> service design, innovative management, process innovation, branding of basic (catering) and thematic tourism products by taking into account internationally recognised brands, and training

3. Technological solutions for sustainable use of resources in accommodation facilities -> in relation to activities in the field of smart buildings

4. Green Slovenian tourism scheme -> systematic approach to integration, guiding and developing sustainable and integrated solutions at the destination and local level

(3) S(INDUSTRY) 4.0.

3.1 Factories for future

OBJECTIVES: 1. Comprehensive technological restructuring of tool industry by raising value added per employee by 25%, i.e. on average €45,000; 2. Raising the level of digitalisation with automation and robotisation in manufacturing. In the framework of demonstration factories value added per employee will rise by at least 20%. 3. Connecting knowledge and creativity of stakeholders in the field of photonics for new impetus and new market opportunities in the global markets with the aim of achieving the average value added of €75,000; 4. Increasing export of automated industrial systems and equipment by at least 25%.

Focus areas and technologies

Focus areas:

1. Production optimisation: (distributed) production management and control, quality assurance, regulation and data processing, intralogistics, automation

2. Optimisation and automation of production processes: smart machines and equipment, mechatronic systems, actuators and smart sensors.

Technologies:

1. Robotics

2. Nanotechnologies

3. Modern production technologies for materials

4. Plasma technologies and photonics

3.2 Health – medicine

OBJECTIVE: 1. Increasing the export of companies by over 30% of which small and medium-sized enterprises should increase export by at least €250 million; 2. Promoting the establishment of at least 20 new companies; 3. Attracting at least one foreign direct investment which will employ over 50 people.

Focus areas and technologies

1. Biopharmaceuticals

2. Translational medicine: diagnostics and therapeutics

3. Cancer treatment – diagnosis and therapy

4. Resistant bacteria

5. Natural medicines and cosmetics

3.3 Mobility

OBJECTIVE: raising value added of companies by 20%; 2. increasing the number of pre-development suppliers from 15 to 22 (45% increase).

Focus areas and technologies

1. Niche components and systems for internal combustion engines

2. E-mobility and energy storage systems

3. Systems and components for security and comfort (interior and exterior)

4. Materials for the automotive industry

3.4 Development of materials as end products

OBJECTIVES: 1. Raising value added per employee in companies manufacturing alloys by 25%; 2. increasing exports and value added per employee in the field of smart coatings by 20%; 3. increasing investment in development by 15%, value added by 5% and exports of multi-component smart materials by 10%.

Focus areas and technologies

1. Sustainable production technologies in metallurgy

2. Multi-component smart materials and coatings

As pointed out by the document, the intention of the RIS3 is to address "in a comprehensive manner a broad range of development policies related to innovation, in particular the policy of promoting research and innovation, industrial policy, entrepreneurship promotion as well as some parts of the education system, rural development policy, international relations, improved regulatory environment (procedures related to the issuing of permits), etc. The state will provide financial support to the identified priority areas as well as non-financial support providing services implemented in close cooperation with strategic partnerships". According to the document "RIS3 optimizes the supportive business-innovation ecosystem the nature of which should be horizontal with the performance thereof also depending on the competitiveness of priority areas. […] Due to Slovenia's limited critical mass in a given area and due to the strong regional complementarities between stakeholders in all areas, RIS3 is designed as a nationwide document [bold by B. U.]" (p. 8). The document continues with an assessment that "RIS3 is based on a model of 'open and responsible innovation', including social innovation" (p. 9).

According to RIS3 there are six key principles, which will enhance the implementation of RIS3. Besides the *Consistency of the policy mix,* the document stipulates an *Integrated and strategic approach* towards RDI, followed by *Complementarity* of measures. However the documents stimulates a *tailored response* to individual priority areas, which are not linked only to current potential, but focus also on *emerging industries and areas*.

In the period 2016 – 2018, Slovenia plans to invest through the Operational Programme in accordance with RIS3 € 1.9 billion (€ 1 billion to RDI, 0.8 billion to entrepreneurship and 0.05 billion to human resources).

Since the basic RIS3 document has only recently been released, the first measures (co-financed in line with RIS3 priorities) are to be launched during the spring 2016. The government (GODC, MEDT and MESS) organised a presentation of the planned calls for 2016 on 4th December 2015. In parallel with the preparation of the measures and issuing of the calls for support, the elaboration of the managerial structure for RIS3 is going on. The document proposes a relatively complex managerial scheme with several bodies. To establish close, operational and smooth cooperation supporting RIS3 implementation, a working group called Implementation Working Group is to be established at the national level within two months following RIS3 approval. The Working Group shall comprise representatives, namely State Secretaries, of ministries directly participating in RIS3 implementation. The State Secretaries of GODG, MEDT and MESS constitute Working Group's chairmanship and a special unit within GODC is to be dedicated to support the WG, prepare all necessary documentation and analyses. An important part of governance system is to be the National innovation Platform, bringing together development-related stakeholders to monitor the RIS3 implementation and suggest adjustments. A special role is planned for the Strategic partnerships, which will facilitate system-wide and long-term cooperation of stakeholders within an individual area, namely cooperation between stakeholders, cooperation of stakeholders with other entities, and cooperation with the state (GODC, 2015).

It remains to be seen how the proposed scheme of governance will function and how effective the coordination between the three ministries will be. The expectations of the business and public research community are high, since they hope that access to structural funds will compensate for the lower public finance available, so close monitoring of the activities of the RIS3 Working Group is expected.

2.5 Main policy changes in the last five years

Main Changes in 2011
Adoption of RISS 2011 – 2020 *Adoption of NPHE 2011 – 2020*
Main changes in 2012
Preparation of the Slovenian Industrial Policy.
Main changes in 2013
Preparation of the new Law on Higher Education. Not adopted. *Preparation of the new Law on R&D. Not adopted.* *Preparation of the draft of RIS3. Revise and resubmit by the EC.* *Slovenian Industrial Policy. Adopted.*
Main Changes in 2014
Preparation of the new Law on Higher Education (2). Not adopted. *Preparation of the new Law on R&D (2). Not adopted.* *Preparation of the new S3. Not adopted.* *Preparation of the OP. Adopted.*
Main Changes in 2015
Preparation of the RIS3. Adopted and approved. *Adoption of the Open access Strategy.*

3. Public and private funding of R&I and expenditure

3.1 Introduction

The austerity measures introduced after 2010 have left also some consequences in the RDI sector. Even though in prima facie this is not visible (since GERD had been sharply increasing in the last four years), a deeper analysis show that what happened was the replacement of public funds with the private ones. This was mostly generated by the 2010 and 2012 tax relief for investments in RDI and by the European funds, which through Centres of Excellence and Centres of Competence significantly influenced the overall RDI activities. Nevertheless, the data are through years mostly stable: GERD funds come mostly from business and government sector, while also some funds come from abroad (table below).

Table 3 Distribution of GERD between 2011 and 2014.

Share of [...] in total GERD	**2011**	**2012**	**2013**	**2014**
BERD	61	62	63	69
GOVERD	31	28	27	21
HERD	0.23	0.43	0.34	0.5
Abroad	7	8.5	8.9	9.2

Source: SORS (2015a,b,c) and EUROSTAT (2015) database.

The largest RDI performer are business enterprises, which in 2014 presented more than 77 % of the total GERD expenditures. A detailed analysis show that taking into consideration BERD, business enterprises spent more than 96 % of BERD.

However, what is a peril now for years is – because of the introductions of heavy austerity measures – the decrease of GBAORD and the budget outlays for RDI. While in 2009 Slovenia's budget outlays for R&D was at the level of €250 million (38 % of the total GERD), the amount in 2011 decreased to €219 million (25 % of the total GERD), while in 2013 it stopped at the level of €174 million (18.6 % of the total GERD). In 2014 the level of budget outlays for RDI stopped on €161 million. The same is the situation with GOVERD, which is decreasing year-by-year since 2011, when it reached a share of 31 %. Three years later the share dropped to 21 % (SORS, 2015).

The R&D sector enjoyed significant support from EU structural funds during the financial period 2007-2013. By the end of 2014, €606 million EU funds (out of available €613 million) were approved for RDI programmes under the Operational Programme 2007–2013 (MESS mimeo, 2015).

Finally, it is also important to expose Slovenia's performance in the FP6 and FP7. Within FP6 Slovenia's received € 73 million from EU funds, while in FP7 the amount received more than doubled and stopped at the level of € 171 million, which were disbursed among 725 projects.

Table 4 Basic indicators for R&D investments

Indicator	**2011**	**2012**	**2013**	**2014**	**2015***	**EU average (2015)****
GERD (as % of GDP)	2.43	2.58	2.59	2.39	NA	2.03% (2014)
GERD (Euro per capita)	436.2	451.2	454.1	441	NA	€558.4(2014)
GBAORD (€m)	219	189	174.5	161.3	NA	€92,828.145m (2014)
R&D funded by GOV+HES (% of GDP)	31.2	28.5	27.3	22.1	NA	0.67% (2014)
R&D funded by PNP (% of GDP)	0	0	0	0	NA	1.12% (2013)
R&D funded by BES (% of GDP)	61	62	63	68.3	NA	0.66% (2013)
R&D funded from abroad	7	8.5	8.9	9.2	NA	0.02% (2013)
R&D performed by HEIs (% of GERD)	11.7	11	10.3	10.4	NA	0.03% (2013)
R&D performed by government sector (% of GERD)	14.2	13.03	12.9	12.1	NA	0.20% (2013)
R&D performed by business sector (% of GERD)	73.82	75.75	76.47	77.3	NA	0.47%

Data source: Eurostat

3.2 Smart fiscal consolidation

3.2.1 Economic growth, fiscal context[27] and public R&D

Slovenia faced a large contraction with a cumulative loss of more ca. 9% of GDP between 2008 and 2013 due to a bubble in constructions fuelled by a credit boom facilitated by the euro adoption. Economic growth returned in 2014 (3.0%) driven by exports and infrastructure construction financed from EU funds. Real GDP is expected to grow annually by 2.2% on average in 2015-17. Before the crisis Slovenia had low levels of both public debt (2007: 23% of GDP) and government deficit (2007: 0.1 of GDP). In 2009 the deficit increased to 6.1% (Figure 2) due to declines in budgetary revenues and excesses above previously budgeted amounts of countercyclical measures[28]. The 2012 fiscal consolidation package [29] decreased the deficit to 4.0%. One-off bank recapitalization packages had a huge impact in 2013-14. The Commission expects a reduction of the deficit to 1.9-2.4% in 2016-17. Public debt increased significantly after the crisis reaching 83.5% in 2015 (from the 2008 value of 21%) due to primary deficits and bank recapitalisations. With no-policy change it is expected to increase to 85% of GDP by 2026.

According to DG ECFIN, expenditures side fiscal consolidation measures are of a temporary nature. The reform of the fiscal framework[30] is lagging behind and the ageing population puts pressure on the sustainability of the pension and long-term care systems.

In July 2015 Slovenia adopted the Law on the fiscal rule, which aims to decrease the structural deficit until 2020 and to lower the level of the public debt of Slovenia in the coming years. Due to the adoption of this rule the two prepared budgets for 2016 and 2017 have been set in a very restrictive manner, meaning that Slovenia tries to introduce even stronger austerity measures than they were until now. This will target also the RDI sector, which is not understood as an exemption, but – according to Slovenian political decision-makers – it has to follow the same cycle as all other budget-dependent actors.

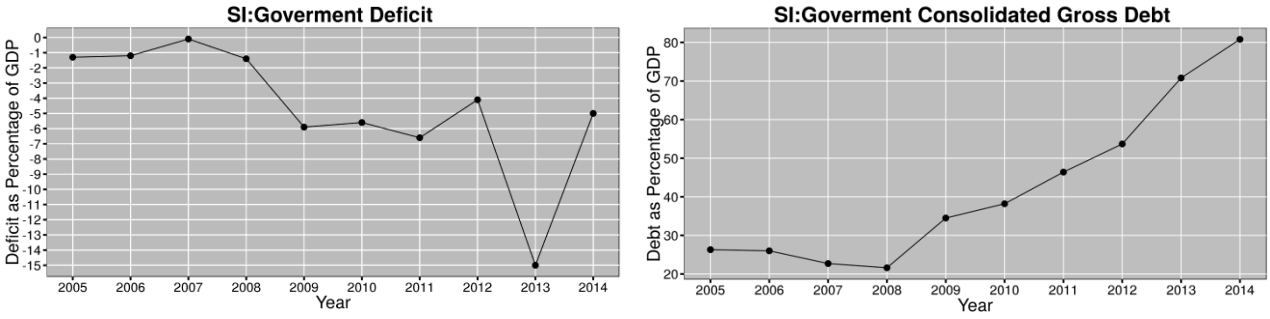

Figure 2 Government deficit and public debt
Data source: Eurostat

[27] Sources: DG ECFIN, RIO
[28] Subsidies for retaining jobs and for self-employment, guarantees for company loans and unemployment benefits.
[29] Cuts in the wages and benefits of the public sector, no indexation of pensions, cuts in social and family allowances, reduction of capital transfers.
[30] Legislation transposing the directive on budgetary frameworks into the national legal order is still delayed (DG ECFIN)

Total GERD in Slovenia was 935 MEUR in 2013. There are three main sources of R&D funding: the business sector (597 MEUR), the government (251 MEUR), and foreign funding (83 MEUR). Direct funding from the government goes to R&D institutes in business enterprises (90 MEUR), the government (97 MEUR) and the higher education sector (64 MEUR).

Table 5 Key Slovenian Public R&D Indicators

	2007	2009	2013
GBAORD, % of gov. exp.	1.22	1.40	0.81
GERD, % of GDP	1.42	1.82	2.60
out of which GERD to public, % of GDP	0.57	0.64	0.61
Funding from GOV to, % of GDP			
Business	0.07	0.14	0.25
Public (GOV+HES)	0.44	0.51	0.45
Total	0.51	0.65	0.70
EU funding, % of GDP	0.06	0.06	0.11

Source: Eurostat

3.2.2 Direct funding of R&D activities[31]

Figure 2, below shows the historical evolution of GERD financing in current prices in Slovenia. The private sector plays a leading role in the financing of the GERD with a monotonic growth from 2009 onwards. The funding from the government tends instead to decline after 2011 onwards. The funding from the EC has been on the rise since 2007 and in 2013 it was around 4.1% of total GERD (more than 15% of the government funded GERD, Table 6, below).

[31] The sources of R&D funding according to the Frascati manual are: Government sector (GOV), Higher education sector (HES), Private non-profit sector (PNP) and Abroad (including EC). In this analysis the public sector as source of funds is given by the GOV part of the total intramural R&D expenditure (GERD), whereas the public sector as a sector of performance is the aggregation of GOV and HES.

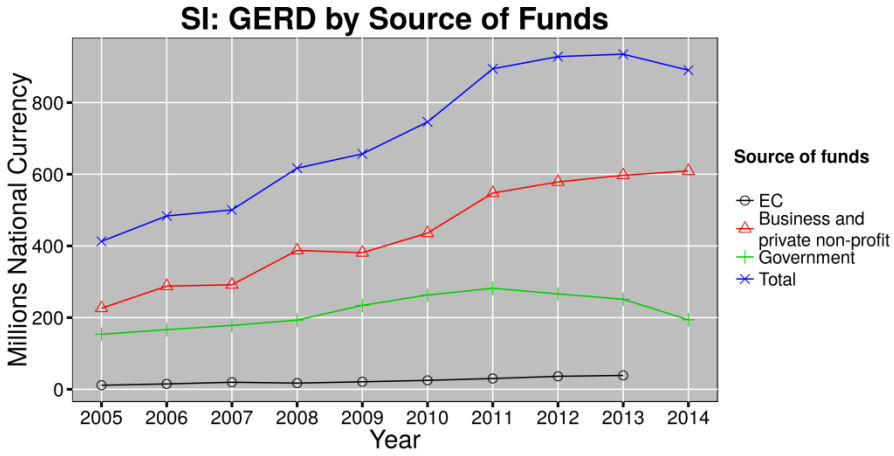

Figure 3 GERD by source of fund.

3.2.2.1 Direct public funding from the government

The decline of the government GERD from 2011 is not substantially altered by the inclusion of the funding from the EC (see Figure 4). Similarly the declining trend in the appropriations that started in 2009.seems to continue even in 2015. The direct public support to R&D.is clearly decreasing since 2011 but the increase in the business R&D investments over the same period compensates the loss and maintains the level of the total GERD. The appropriations for military R&D in Slovenia are minimal, as one can see from the almost perfect overlap of the total and total civil R&D appropriations.

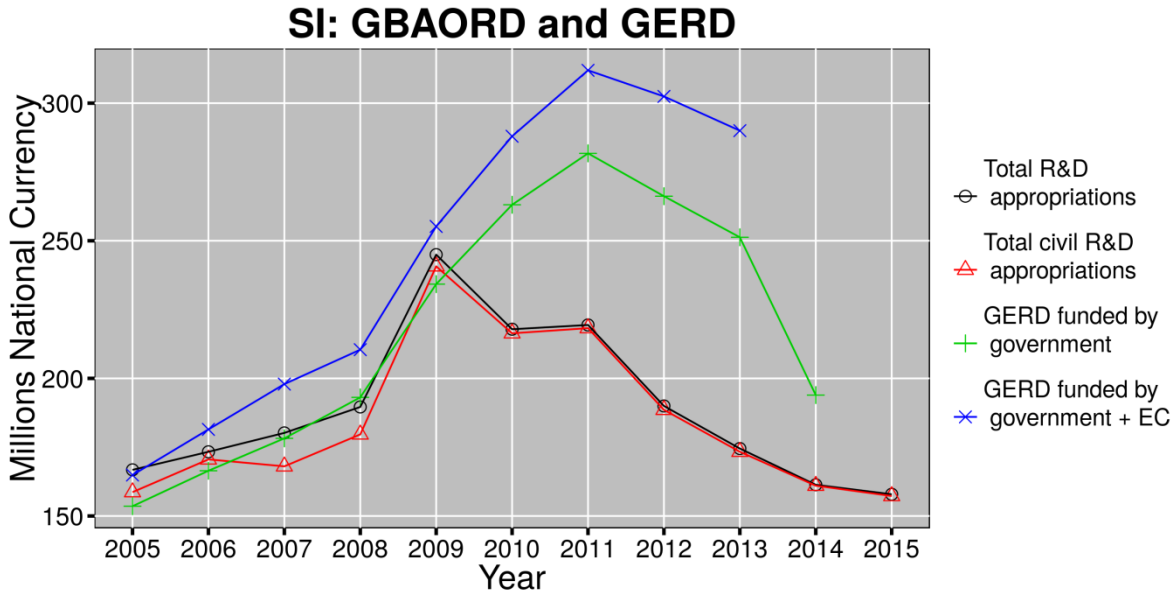

Figure 4 total (civil) appropriations and GERD funded by the government.

3.2.2.2 Direct public funding from abroad

Table 6 shows that the business and the EC are the most important funders from abroad. Since 2009, the EC has been expanding in terms of share of the government GERD. The contribution from abroad from higher education and international organisations is negligible.

Table 6 Public Funding from Abroad to Slovenian R&D (in millions of national currency)

Source from abroad	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Total	29.98	28.09	28.82	34.48	39.67	44.84	62.79	79.49	83.33	82.48
BES	15.62	10.02	5.74	12.89	14.79	15.00	18.63	26.45	27.19	NA
EC	11.34	15.02	19.71	17.33	20.96	24.89	30.16	36.25	38.74	NA
GOV	0.23	0.12	0.40	0.19	0.65	0.28	0.26	0.33	0.04	NA
HES	0.28	0.25	0.38	0.50	0.43	0.19	0.32	0.36	1.56	NA
International Organizations	1.90	0.98	1.42	2.28	1.81	1.54	3.23	3.55	3.772	NA
Total as % GERD	7.26	5.81	5.76	5.59	6.04	6.01	7.02	8.56	8.91	9.26
EC as % GOVERD	7.38	9.02	11.06	8.97	8.95	9.46	10.70	13.62	15.42	NA

Data source: Eurostat

Figure 5 below shows how the distribution of public funding to sectors of performance evolved over time:

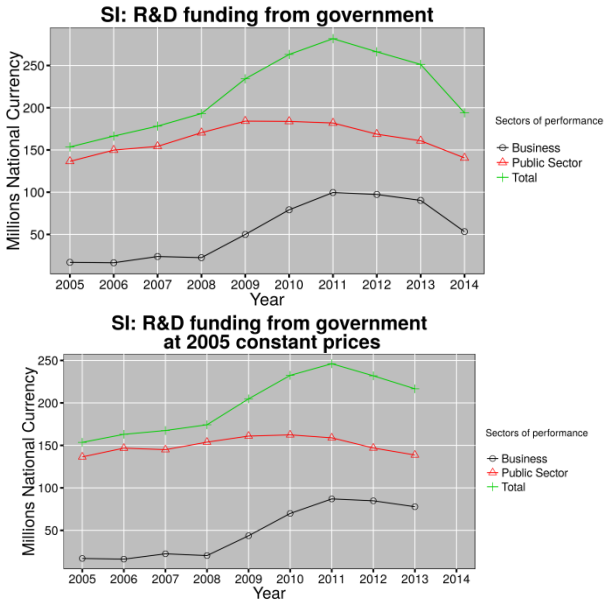

Figure 5 Government intramural expenditure by sectors of performance
Data source: Eurostat

Unsurprisingly the public sector (GOV+HES) is the main recipient of the government funding. The funding received by the public sector has been declining since 2009, whereas the funding from the government to the business grew substantially in 2008-2011. From 2012 the continues decrease in the direct public support gradually affects the business sector as well. The use of 2005 constant prices does not alter significantly the previous considerations.

3.2.3 Indirect funding – tax incentives and foregone tax revenues

Considering the absence of harmonisation of the tax regimes in EU law, data come directly from national sources, using domestic definitions. Attention should be paid when interpreting data from different sources.

Slovenia has introduced R&D tax incentives already in 2006 (OECD Review of Innovation Policy: Slovenia, 2011) and their impact on the business investments expanded throughout the years with the last amendments into force since 2012 (for comparison in 2010 tax subsidy for R&D investments was at the level of 20%). Actually, Slovenian R&D tax incentives system is quite simple, but efficient: "*A general research and development (R&D) investment incentive is represented as a deduction from the tax base of 100% of the amount invested in internal R&D activities and purchase of R&D services, but not exceeding the amount of the taxable base. There is also a tax incentive – a deduction from the tax base of 40% of the amount invested in equipment and intangibles, but only up to the amount of the taxable base. There are also further general tax incentives under certain conditions for entities that provide work for employees, trainees or disabled persons, as well as relief for donations and voluntary supplementary pension insurance.*"[32]

[32] Ministry of Finance, Taxation in Slovenia 2012: http://www.mf.gov.si/fileadmin/mf.gov.si/pageuploads/Davki_in_carine/Angle%C5%A1ki/Taxation_in_Slovenia_2012-final__2_.pdf

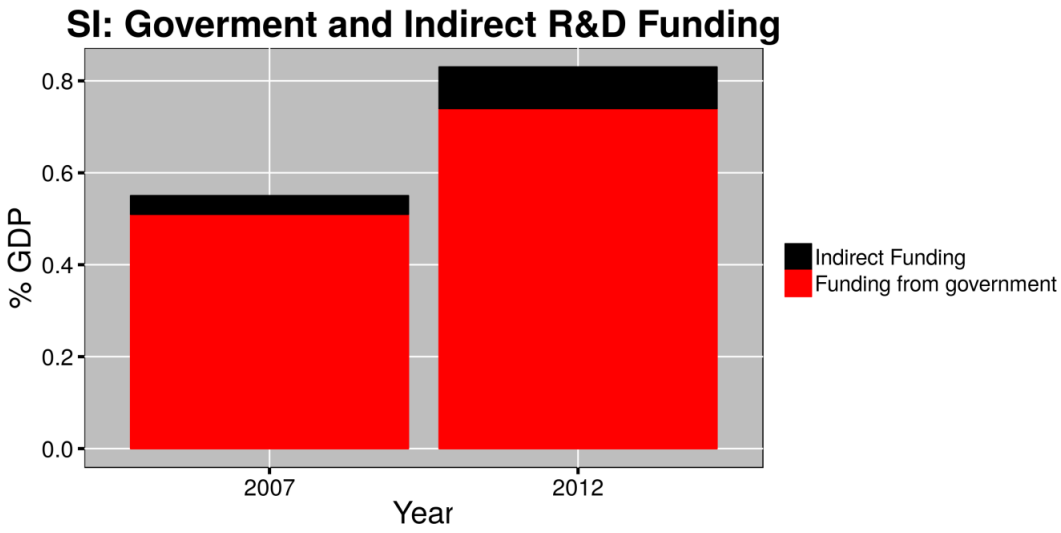

Figure 6 Government and indirect funding to R&D. Data sources: OECD.

There are little quantitative data about the impact of the Slovenian indirect funding. Based on Figure 6, a conclusion can be drawn that it is expanded as share of GDP in the period 2007-2012.

3.2.4 Fiscal consolidation and R&D

Figure 7, below shows the scatterplot of the structural balance on the one hand and GBAORD as % GDP, first panel as well as GERD as % GDP, second panel, on the other hand[33]:

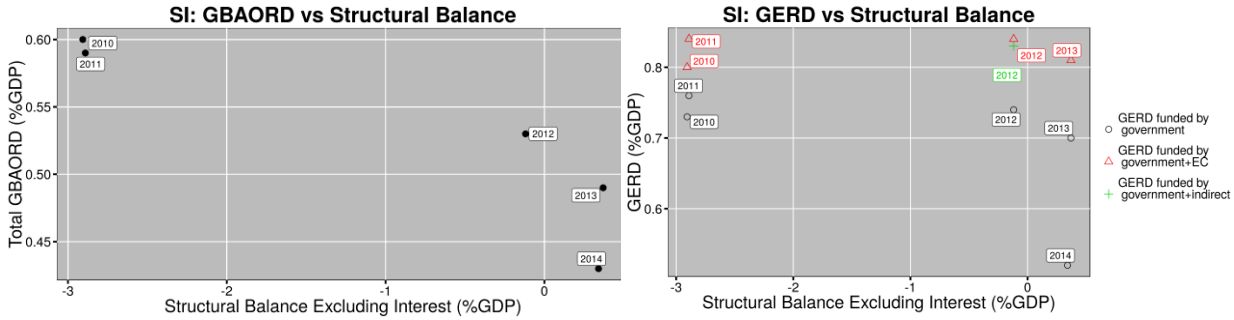

Figure 7 Fiscal consolidation and R&D
Data source: AMECO, Eurostat, OECD

Based on Figure 7, the fiscal consolidation in structural terms (3.3% improvement between 2010 and 2013) had a negative impact on R&D appropriations between 2010 and 2014, translating into a loss in GBAORD of almost 0.2% of GDP during this period.

In terms of government financed GERD (Figure 7 right) the decrease was about the same as the one of GBAORD, unless EC financing via Structural Funds is also accounted (see Section 3.2.2).EU contributions play a very important role in the public funding of the Slovenian R&D system. Figure 7 shows that the loss in the direct public support to RD due to the fiscal consolidation measures is significantly reduced when EU support is taken into account.

[33] Structural balance data comes from the AMECO database the other indicators were taken from Eurostat, OECD.

Indirect financing in 2012 seems to have had a strong positive impact (see also Section 3.2.3), but data quality concerning indirect financing through R&D tax incentives is not sufficiently good in order to be able to take it into account in this analysis.

As already explained, in Slovenia also the RDI expenditures were partly determined by the austerity and fiscal consolidation measures. On one hand the state has decided to alleviate the investments in RDI by the tax relief, introduced in 2010 and expanded in 2012, while on the other hand the government funding for RDI has been decreasing sharply and in 2014 stopped at the level of 0.52 % of GDP. The decrease in budget appropriations for RDI has effected significantly also the conduction of RDI in public and private enterprises. All-in-all it is possible to say that from 2011 onwards most of the measures for innovation have been abolished or restructured, while some programmes that were important in the field of R&D in business sector were minimised or partially-dismissed (such as TAPs or Young researchers in the business sector etc.).

Based on the above discussion one can argue that the post-crisis fiscal adjustment process has come to an expense of direct public support to the Slovenian R&D. There is not enough evidence to draw conclusions concerning its impact upon the total public support (direct domestic + EU + indirect).

3.3 Funding flows

3.3.1 Research funders

The main research funders in the Slovenian RDI system are two ministries that are in charge of the RDI policy, i. e. the Ministry of Economic Development and Technology (MEDT) and the Ministry of Education, Science and Sport (MESS). Their funding is mostly channelled by two executive institutions: SPIRIT and the Slovenian Enterprise Fund (SEF), which serve as funding agencies for the MEDT, and SRA, which is a key executive agency for MESS for R&D projects.

Most projects financed by these above-mentioned agencies are financed on the competitive-basis. It is usual that the agency issues a call, on which the interested public (researchers, enterprises, other candidates that are eligible) can apply. The call usually contains the specification of the project, the level of co-financing and the criteria that should be filled for obtaining the co-financing. After the evaluation of proposals the list of projects that will be co-financed is issued. Soon after the authorised agency stipulates contracts with the project-holders.

In Slovenia there is almost inexistent a non-for-profit RDI financing system. In this field only the Slovenian Science Foundation should be mentioned, which serves as a sort of platform for researchers that are going to study abroad. However there are no other charitable foundation in Slovenia that would support the classical RDI research.

3.3.2 Funding sources and funding flows

The level of RDI expenditures has been growing fast in the last decade: in 2007 Slovenia's GERD amounted up to 1.42 % of GDP, while in 2010 it surpassed the ceiling of 2 % (with 2.06 % of GDP) and in 2013 stopped at the level of 2.59 % of GDP (SORS, 2015). In 2014 the level of GERD dropped to 2.39 % (SORS, 2015). This period of GERD growth can be divided into two sub-period: 2007–2011 and 2012–2014. In the first period the GERD growth was a result of the fast-growing investments in RDI from the government sector and from private enterprise sector. However the economic crisis and the introduction of the austerity measures caused that in the second period the government sector's expenditures for RDI had been decreasing, while at the same time the investments of enterprises in RDI had been significantly increasing.

The majority of funds for RDI comes from "national" funds, while only 9 % of total GERD comes from abroad. Here, EU structural funds and FP 7 programme played an important role, since especially after 2011 Slovenia accelerated its participation in the latter. Regarding all other possible external funds it should be noted that Slovenia received some funds through the Norwegian mechanism as well as Swiss one, where also R&D projects are recipients. Slovenia is participating in several INTERREG programmes[34].

Regarding the issue of foreign direct investment (FDI) related RDI investments it should be noted that international analyses point out that Slovenia is not very attractive for FDI in general.35 The investment climate is not assessed as favourable (high costs of labour, relatively complex regulations and red tape barriers). Mostly FDIs are concentrated in services (wholesale and retail trade, financial services and insurance) and in manufacturing, but not dedicated RDI investments. Of already limited amount of FDI only 3.7% is in the category "professional, scientific and technical". Understanding this it is clear that there is still room for improvement in the relationship between RDI investments and FDI.

3.4 Public funding for public R&I

3.4.1 Project vs. institutional allocation of public funding36

In the last year there were not changes regarding the legal framework on the allocation of RDI projects. As already explained the main part of the RDI research funding in Slovenia is based on a competitive funding, however there are some programmes that can be understood as "block funding". The block funding (in our case known as the 'institutional funding') is provided only for the PROs (there are 15 such PROs), where the founder is the state itself. The institutional funding provided under the founder's obligations comprises part of the administrative costs, fixed operating costs and the fixed costs of maintaining and repairing property and equipment. In 2014 institutional block funding represented 18% of the total budget of SRA (between 10-30% of PROs basic running costs).

As explained also in the previous reports, the funding system in Slovenia remained mostly the same for years. Therefore there has been no change regarding the balance between institutional and project funding in the last years; the same can be observed for the relation between the competitive and institutional funding system. Even though things remain the same through years, there have been some attempts to change the systemic approach towards a less competitive to a more "block" or "institutional". This happened in spring 2015, when the SRA launched the call for young researchers, which was not anymore dependent on the positioning of mentors/supervisors, but it was linked to the Research Group Programme (RGPs), being sort of block funding.

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[34] See more at http://ec.europa.eu/regional_policy/EN/atlas/programmes?countryCode=SI&regionId=314 (31st December 2015).

[35] See more at https://en.santandertrade.com/establish-overseas/slovenia/investing (31st December 2015).

[36] "Institutional funding is defined as the total of national budgets in a given country, attributed to an institution, with no direct selection of R&D project or programmes and for which money the organisation has more or less freedom to define the research activities to be performed." Institutional funding can be in the form of non-competitively allocated Block funding. Institutional funding may also be allocated in a variable/competitive manner tied to institutional assessments. project funding is defined as the total of national budgets in a given country, attributed to a group or an individual to perform an R&D activity limited in scope, budget and time, normally on the basis of the submission of a project proposal describing the research activities to be done". Steen, J. v. (2012), "Modes of Public Funding of Research and Development: Towards Internationally Comparable Indicators", *OECD Science, Technology and Industry Working Papers*, 2012/04, OECD Publishing. http://dx.doi.org/10.1787/5k98ssns1qzs-en. Assessments of the total share of competitive vs non-competitive funding can be a relevant starting point of the analysis, but.the aim is to have the competitive funding separated between project funding and competitively allocated institutional funding. Competitive funding of research infrastructures through e.g. a research council can be labelled as project funding. However when infrastructure funding comes in the form of a lump sum budget or earmarked budget then it should be considered as institutional funding.

Thus the basic idea was that the young researchers should be given to the RGPs with a good delivery of scientific results and that mentors/supervisors can be only those researchers that are member of RGPs.

3.4.2 Institutional funding

Due to the competitive nature of the Slovenian RDI system, the institutional funding is relevant only for few public institutes, that were founded by the Republic of Slovenia. The institutional funding provided under the founder's obligations comprises part of the administrative costs, fixed operating costs and the fixed costs of maintaining and repairing property and equipment, but does not provide resources for research. There are 15 public research institutes, which are entitled for such funding and they submit their expenditure claim to the SRA annually in accordance with the methodology decided by the MESS and SRA.[37] Among them at least three should be mentioned, being the largest carrier of the RDI activity: the Jozef Stefan Institute (IJS), the Chemistry Institute (KI) and the Scientific Centre of the Slovenian Academy of Science and Arts (ZRC SAZU). In 2014, these three PROs received by the SRA more than 70 % (IJS: 40 %, SASA: 17 %; KI: 14 %) of the total amount directed for the institutional funding, or better said 8 % of the total RDI expenditures of the SRA (SRA financial report, 2015).

At this point it should be emphasised that universities/faculties do not receive the institutional funding for their research, but only for their educational purposes. Therefore the majority of RDI activities at the HEIs are financed through regular participation at public calls at the Slovenian Research Agency (competitive funding), other governmental public calls, international calls or from business sector.

Slovenia uses an ex ante evaluation mechanism for the allocation mechanism of project/institutional funding. The largest share of the basic research is funded through Research Group Programme funding, a system established in 1999 to secure stability in the funding of basic research. The funding provided by SRA is long-term support (up to 6 years) and it is more stable than typical research project funding. The SRA indicates this is a clear competitive funding scheme, since it uses periodical calls and the applications are submitted by existing as well as new research groups. The applications (research proposals) are evaluated with assistance of external evaluators (see next section).

3.4.3 Project funding

The largest instrument of competitive funding are the Research Group Programmes (RGPs), introduced in 1999, with the goal of establishing a more stable system of research funding. This type of programme fits well into "responsive mode" funding where funding is provided directly to research teams to carry out specific projects of their own choosing. The system provides a formation of research groups, formed within specific science disciplines. Each Research Group Programme comprises a head of the group, at least five researchers holding a doctorate and technical staff from one or more research organisations. Programme members can take part in only one RGP. Researchers must have, next to a doctorate, a record of research and development results for the last five years and research titles in line with the existing regulations. Young researchers may also participate in a RGP, but do not receive extra funds for this. The evaluation process is two-fold, first at the time of selection of the RGP and then annually during the financing period.

[37] The institutional funding is provided to the following institutes: Agricultural Institute of Slovenia; Educational Research Institute; GeoZS, Geological Survey of Slovenia; IER, Institute for Economic Research; Institute for Hydraulic Research; IJS, Jozef Stefan Institute; IMT, Institute of Metals and Technology; INV, Institute for Ethnic Studies; INZ, Institute of Contemporary History; National Institute of Chemistry; NIB, National Institute of Biology; Slovenian Forestry Institute; UI, Urban Planning Institute; ZAG, National Building and Civil Engineering Institute and ZRC SAZU, Scientific Research Centre of SASA.

The evaluation process is conducted by the Slovenian Research Agency, being responsible for monitoring, financing and administering the RGPs. In 2014 the SRA disbursed for RGPs €55.6 million; 29% has been allocated to Natural sciences, 29% to Technology; 12% to Humanities, 10% to Social Sciences, 8.9% to Biotechnology and 8.8% to Medical sciences (SRA financial report, 2015). In terms of research performers, most of the financial resources went to PROs and HEIs (98%); the business sector received 1.5% of the public funds and 0.5% went to private non-profit institutions (SRA financial report, 2015). The funding is provided to the RGP for up to 6 years (depending on the quality assessment by the evaluators), but the RGP can re-apply for the continuation upon positive evaluation.

The RGP funding is a subject of debate among evaluators of Slovenian research system. The SRA claims this is a clear competitive funding scheme, since there are periodical calls and the applications are submitted by the existing and new research groups. The applications (research proposals) are evaluated with assistance of external evaluators. However, on the other hand, the RGPs are a long-term instrument, since once a RGP is selected for funding it can re-apply to all subsequent calls. The data shows that there is practically no exit flow, so the external evaluators of the measure (ERAC team in particular[38]) determined that RGPs in fact constitute semi-institutional or at least not fully competitive funding.

The SRA finances also the measure "Basic and Applied projects" (BAPs). In 2014, €23.6 million were disbursed for this measure (33.5% for applied and 66.5% for basic projects). In the category of basic projects, Natural sciences and technology received a share of 40% of total funds available, while the SSH received 22.5%. On the other hand in the category of applied projects natural sciences and technology received 60% of total funds, while the SSH received a share of 8%.

The third measure, known as Targeted Research Programmes was launched yearly until 2012, when it has been suspended temporarily due to austerity measures, to be gradually re-introduced at a smaller scale in 2014. The basic idea of the TRPs was to establish a scheme where the implementation of different priorities of the Slovenian Development Strategy would be evaluated. The calls were issued on a yearly basis; the projects lasted from one to three years. The reporting was semi-annual. Due to a major damage caused by a sleet in February 2014, the SRA issued a small TRPs' call in spring 2014, addressing only 'agricultural issues'. A similar 'limited' TRPs call was launched by the SRA also in the summer 2015, where a selected number of topics was covered, among them the "health prevention issues, knowledge development, regional development and competitiveness of Slovenian tourism" (SRA web page, 2015). The results of this call were published at the end of October 2015. In the beginning of 2016, the SRA web page announced that a new call for TRPs is to be prepared in spring 2016.

Through SRA the Government finances also some other projects, as scientific publications and periodicals, the participation of researchers in international meetings, bilateral short-term exchange of scientific teams etc.

All competitive projects clearly follow the system of peer review, which is well-developed by the SRA. The Regulation (see supra), which defines the criteria and characteristics of each measure, sets also the selection criteria, which are adopted when the application is evaluated. The system goes as follows. The SRA publishes a call for projects, which is usually opened for a month. This call is a two-step call where in the first step the main evaluation bases on bibliometric criteria of the project leader and partially on the substance of the project proposal. After the proposal passes the threshold, it enters in the second round, where the project proposal should be prepared in details. The proponent writes the proposal in Slovenian and English, because at least one evaluator of the proposal is an expert coming from abroad.

[38] Their assessment of RGPs was the following: "A very low rejection rate of research groups suggests that the system is actually system of soft funding." (ERAC, 2010, p. 22;)

This proposal is therefore evaluated by at least one foreign expert, but there can be two or even three. The last happens in cases where the topic is complex or when the assessment of two evaluators differs for more than 20 %. After the evaluations are submitted a panel is established, which has to reach an agreement on which projects should be financed. When the final decision is adopted, the applicant becomes the project-holder.

In the case of Slovenia most of all projects are "collective" projects, meaning that the whole research group is evaluated. However, within the measure of BAPs (see supra) there is also a sub-measure of post-doctoral projects, which are granted individually. In the last years there has been a strong competition at the level of post-docs and only few of them have been commissioned on a yearly-bases (for two years).

Due to the austerity measures and delays of different calls, the state decided twice (2014 and 2015) to launch a sort of a novel measure, i. e. the measure for subsidising the employment of researchers with PhD, being are unemployed. The main notion of this measure has been to help the young PhD in establishing their career within the research organisations. One of the conditions was that the institution that was interested in such a researcher should cover one third of yearly salary, while two thirds would be provided by the SRA.

3.4.4 Other allocation mechanisms

Officially there are no other allocation mechanisms of RDI funds in Slovenia but private enterprises often operate with public institutes or PROs in the field of RDI. Since the contracts have a non-disclosure clause, it is impossible to assess the amount of such collaboration.

3.5 Public funding for private R&I

3.5.1 Direct funding for private R&I

Before the start of the crisis, Slovenia had a well-developed system of supporting the RDI activities in private enterprises through three channels, all three coordinated by the Ministry of Economic Development and Technology (at that time it was the Ministry of Economy). The first was the Slovenian Technological Agency (TIA) that was the twin-agency to SRA, both established under the 2002 Law on R&D. In 2012, TIA was merged with the Public Agency for Entrepreneurship and Foreign Investments (PAEFI) into a new agency, named SPIRIT. The next channel was PAEFI, being mostly the agency dealing with the FDIs and promotion of entrepreneurship, but it incorporated also some R&I aspects. These were the innovation and the process voucher,[39] intended to help especially micro and small enterprises in starting their economic activity. The third channel that retained its pre-crisis programme is the Slovenian Enterprise Fund (SEF), which offers subsidised loans or subsidised interests rate, mezzanine capital etc. This agency is directed especially to micro and small enterprises and tries to enhance the establishment of spin-offs. This is also the most stable channel which is still supporting the RDI in the business sector. As visible from the web page of SEF (www.podjetniskisklad.si), SEF has divided all its measures between "young" and "established" enterprises. The analysis show that especially during the economic crisis SEF focuses more on young enterprises and spin-offs. SEF regularly evaluates all its programmes and adjusts the financing criteria (allocation of funding) in accordance with the popularity and success of individual measures.

[39] The idea of the innovation voucher was to co-finance costs related to the industrial innovation and the protection of industrial property. The measure was launched in 2010, 2011 and 2012, but later, because of austerity measures, the innovation voucher ceased to exist.

In 2015, SID Bank continued to provide the financial market with supplementary financial services in the form of:

a) SID Bank's long-term specific credit lines through commercial banks,

b) Loans with the status of state aid as part of the measure of financial engineering for the promotion of technological and developmental projects.

Little information is provided by SID on the recipients of its support, since the Bank maintains its policy of non-disclosure of data. Also, no evaluation of the success rate of the supported projects has been publicly available.

In the past, Slovenia had a much more developed system of R&I measures for business sector, which was characterised by frequent changes of the types of measures and at least until 2007 chronically underfinanced. One of the first such instrument were the technology centres (from 1994), which were independent legal entities established by several companies for the purposes of R&D in a specific field or branch, as well as for the provision of R&D equipment subsequently made available to companies for their development projects. After 2000, in Slovenia the cluster initiative began. The total 2003 budget for cluster policy was approximately €1.5 million. All together 29 projects related to clustering were supported: 3 pilot cluster projects, 13 early stage clusters and additional 13 cluster initiatives, bringing together 350 companies and 40 education/research institutes. With the change of Government at the end of 2004, the cluster support programme was discontinued in spite of a positive evaluation.

In 2005, the Ministry of Higher Education, Science and Technology in cooperation with the Chamber of Industry and Commerce introduced technology platforms. MHEST offered a financial subsidy for the establishment of the platform and their participation at the EU level. 12 technology platforms were formed in 2005. In 2008 and 2009 technology platforms were supported through two measures: one directed specifically to their functioning and the other, significantly larger, to joint research projects, initiated by the technology platforms.

The measure of technology parks was launched by the Ministry of Economy through PAEFI. Here, too, the modes of financing have changed several times since their establishment. With the support by the funds from European Regional Development Fund, construction of new premises and new research infrastructure investments were implemented during the financial period of 2004–2006 and partially also during 2007–2013. Currently, the support to Technology parks is provided at minimal level through PAEFI via the programme on innovation infrastructure. Four parks are functional, the biggest being Ljubljana Technology park (http://www.tp-lj.si/en/), where close to 300 enterprises are located (in 2014: 297).

Probably most comprehensive system existed under the instruments of the Cohesion Policy 2007–2013. The funding was provided for basic research via SRA and MHEST (COs); for applied research through the Technology agency (TIA), MHEST (CCs) and SRA; and Ministry of Economy via Slovene Enterprise Fund and PAEFI provided support to start ups, introduction of new technologies, incubators and technology parks. On its own, the Ministry of Economy funded Development Centres, which were to be the last element in the funding chain – already providing ground for test production. This means that during this period the entire process chain from basic research to entry to the market was covered, at least in theory.[40] Also, several instruments supported public-private partnership (competence centres, development centres).

[40] In practice, the system was less succesful due to the lack of coordination in the implementation of individual measures, with some more market-focused measures already completed prior to the results obtained from more »up-stream« measures.

With the end of financial perspective 2007–2013, with the introduction of the austerity measures and with the merger of the technology agency (TIA) in SPIRIT, the comprehensive financing scheme no longer exists and current RDI measures for business sector are less and less favourable, since their financing is continuously under question. The Government and the business sector count much on the EU structural funds, which according to RIS3 priorities should give an impetus in the following years to the field of R&I in Slovenia. Yet again, new types of measures are being prepared by the GODC and MEDT, with little regard to the evaluation of the results of the past measures (Jaklič et al., 2012; Bučar et al., 2014).

3.5.2 Public Procurement of Innovative solutions

What Slovenia had so far not sufficiently explored are various methods of innovative public procurement, even though the MEDT launched the initiative several times. The regulations with respect to public procurement remain under the Ministry of Finance, where the support to innovative/green procurement is practically non-existent, so no special promotion of this type of innovation support can be expected in the near future.

The share of the GDP of budget spending on public procurement in Slovenia in 2013 was 11.25% or €3.97 billion[41].

Legal Public Procurement framework

Slovenia transposed the two 2004 Directives on public procurement (2004/17/EC and 2004/18/EC) into national laws in 2006 and 2007, respectively into the Public Procurement in the Water, Energy, Transport and Postal Services Act (ZJNVETPS)[42] and the Public Procurement Act (ZJN)[43].

The PCP/PPI landscape in Slovenia

Developing and improving demand-side measures have been the subject of recommendation by both national evaluations[44] and international reviews[45].

As already mentioned, in the past, there were several initiatives from the relevant authorities to adjust the procurement policy to stimulate innovation, but the prime concern of the Ministry of Finance was given to transparency of the process and other legal stipulations. Although the Public Procurement Act has been revised several times during the years, so far a national target on public procurement of innovative goods and services has not been set. At the moment, Slovenia does not have a strategy or any specific scheme for using innovative public procurement.

PCP/PPI initiatives in Slovenia

Nevertheless, there are some sparse examples for tenders that apply qualitative criteria which would favour innovative solutions or green procurement procedures (GPP) when awarding contracts. These are mainly co-funded by the EU either through EUSF[46] or FPs[47] as part of bigger projects, involving several international partners.

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[41] More at http://www.mf.gov.si/fileadmin/mf.gov.si/pageuploads/mediji/2014/2014okt09_statisticno_porocilo_javna_narocila_leto_2013.pdf (1st October 2015).
[42] More at http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO4299 (1st October 2015)
[43] More at http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO4298 (1st October 2015).
[44] Jaklič, Andreja et al. (2012): Targeted Research Programme: The effectiveness of introduced measures for supporting innovations. Final Report
[45] OECD Reviews of Innovation Policy: Slovenia 2012
[46] See an example at: http://www.spiritslovenia.si/en/public-tenders/2015-02-23-A-public-invitation-to-tender-Implementation-of-an-Integrated-Innovative-Digital-Campaign (1st October 2015).
[47] See concrete examples at: https://procurement-forum.eu/resource/search?resource_id=&country=210&category=0&topic=0&language=0&product=0&level=0&q=&page=1 (1st October 2015).

The ERA-PRISM project (ERA-PRISM Best practices case study[48]) presents the outcomes of a PPI "Ljubljana Smart Card".

As far as "green procurement" is concerned, Slovenia adopted a National Action Plan on GPP, covering the period 2009-2012, which was not renewed in the period after. In 2010 Slovenia established the Public Procurement Agency which became operational in January 2011. This body is responsible for carrying out joint procurements and it implements GPP criteria in its procurement of electricity, paper, office IT equipment, vehicles and other. Slovenia participates in GPP2020[49].

3.5.3 Indirect financial support for private R&I

As already presented, the most important measure that was adopted for the indirect financial support for private R&I was the tax relief/subsidy that was introduced in 2006 and expanded in 2010 and 2012.[50]

The idea that also something should be done to enhance the indirect support for RDIs was launched in 2006, when the tax incentive for RDIs was for the first time established. At the time the idea was that the RDIs investments are tax deductible to at maximum to 20 % of their total value (OG 117/2006). This tax deduction was changed in 2010 so the enterprises could reduce their taxable income for corporate tax by 40 % of their investments in RDIs. However, at that point a sort of additional positive discrimination was introduced with the clause that the enterprises can have an additional 20 % of tax deduction, if investing in RDIs in regions with a development gap over 15 %. The eligible costs comprised the purchase of equipment and new technology for the purposes of RDIs, the cost of labour in RDIs activities, and the purchase of licences. In 2012 the Government decided that the tax subsidy for RDIs investments should be expanded to 100 % of the RDIs investment. However, the current Government was examining the possibility that this subsidy could be abandoned or at least decreased to the pre-crisis level, but the opposition from the business community as well as RDI experts was strong enough to withdraw this proposal.

KROP (Krepitev raziskovalnih oddelkov v podjetjih; *strengthening of development units in business enterprises*), which is another measure that has a sort of indirect financial outcome, has been established in 2011, when it replaced three measures that were important in the field of R&I, i.e. Young Researchers from business sector, Interdisciplinary teams in the business sector, Mobility grants for researchers from public sector to enter business enterprises. After 2011, KROP was launched also in 2012 and 2013 (the results were published only in January 2014), but later no KROP calls were issued.

3.6 Business R&D

3.6.1 The development in business R&D intensity

BERD in Slovenia has been on an increasing path since 2007. It has more than doubled in 2014 (€689 million; 1.85% of GDP) compared to 2007 level (€299 million; 0.85% of GDP). In 2014 the Business sector funded 68.4% and performed 77.3% of the total R&D in Slovenia (Eurostat data).

As one can see from Figure 8, BERD intensity in Slovenia grew steadily since the country's EU accession, becoming the highest (2014: 1.85%) among the countries that have joined the EU since 2004. In 2014 this trend seems to have come to a halt, mainly due to the decreased direct funding by the government sector. The strongest contributor to its growth was the services (G-N) sector, especially in the period 2010-2012. Still manufacturing is more R&D intensive than the services.

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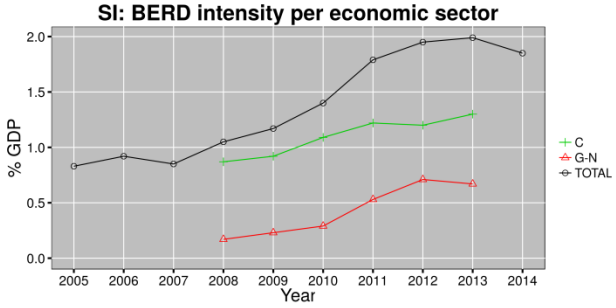
[48] https://procurement-forum.eu/resource/download/428/Eraprism_Best+Practice+Case+Studies.pdf

[49] http://www.gpp2020.eu/about-gpp-2020/partners/ (1st October 2015).

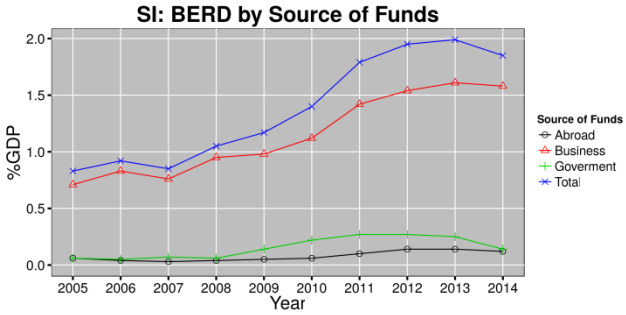
[50] There is an unofficial data that the level of tax subsidies for RDI in 2014 amounted up to 0.6 % of GDP (around €228 million).

Figure 8 BERD intensity broken down by most important macro sectors (C=manufacturing, G_N=services).



Businesses are the main funders of the Slovenian BERD (Figure 9). Funding coming from them grew significantly in 2010-14. The main reason for this strong increase may be the R&D tax incentives. Introduced as early as 2006 their impact on business investments expanded throughout the years (OECD Review of Innovation Policy: Slovenia, 2012). Better absorption by the private sector of funds from abroad has also contributed, but to a lesser extent: although their increase is remarkable these funds are of lower importance (2008: 14.2 MEUR, 2014: €46.6 million)[51]. Another possible explanation is the change in the methodology used by the Statistical Office of the Republic of Slovenia and the better reporting of R&D expenditure by the business following the introduction of the tax incentives.

Figure 9 BERD by source of funds

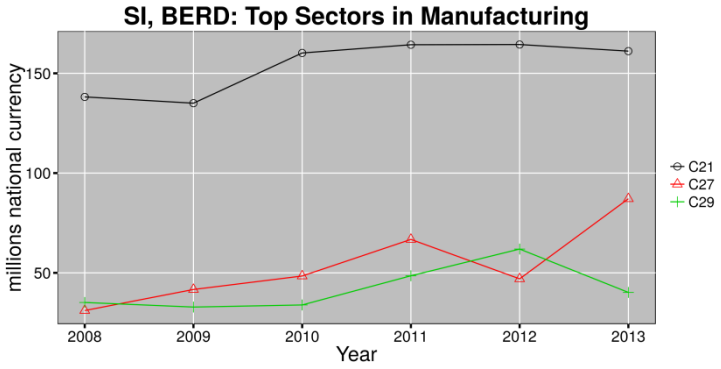


3.6.2 The development in business R&D intensity by sector

In terms of sectorial distribution, the most important for the private sector R&D are pharmaceuticals, manufacture of vehicles (producing different components for the car industry)[52], and manufacture of electrical equipment (Figure 10). Two pharmaceutical firms (Krka and Lek)[53] that produce generic products account for a very large share of Slovenia's BERD. Private R&D has been on a rise in all three sectors in 2009-11. In 2012 pharmaceutical R&D seems to have come to a halt and we notice a drop in BERD in manufacturing electrical equipment and an almost equal increase of BERD in manufacturing of motor vehicles. In 2013 both sectors followed a reverse trend – increase in manufacturing of electrical equipment and decrease in the automotive industry.

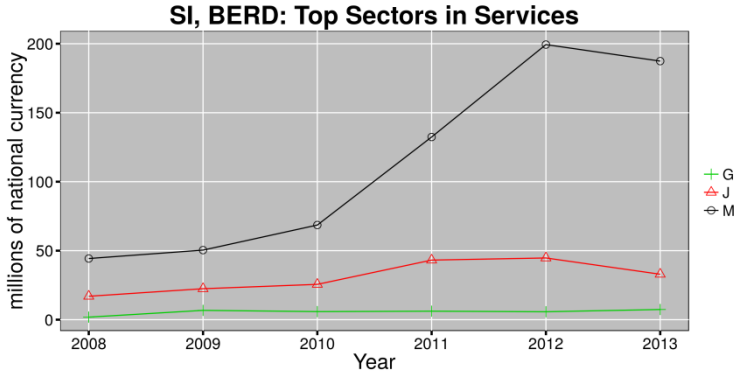
[51] According to Eurostat data the contribution from the European Commission corresponds to approximately 25% of these funds.
[52] More at http://www.investslovenia.org/industries/automotive/ (3rd March 2016).
[53] More at http://www.investslovenia.org/industries/chemicals-pharmaceuticals/ (3rd March 2016).

Figure 10 Top sectors in manufacturing (C21: manufacturing of basic pharmaceutical products and pharmaceutical preparations; C27=manufacturing of electrical equipment; C29=manufacturing of motor vehicles, trailers and semi-trailers)



In the services sector the main contributors to business R&D and its growth are professional and scientific services, information and communication services as well as wholesale and retail trade. The first category has quadrupled since 2008, recording a very significant rise between 2010 and 2012. This may be linked to the fact that in 2010 two instruments were launched of the Centres of Excellence and Centres of Competence with the primary target to provide scientific services and both were used by the BES. Both lasted until 2013 and will be renewed through the new operational programme (ESIF 2014-2020). The other two categories show much more modest growth, practically stagnating since 2010/11.

Figure 11 Top service sectors (G=wholesale and retail trade, repair of motor vehicles and motorcycles, J=information and communication, M=professional, scientific and technical activities).

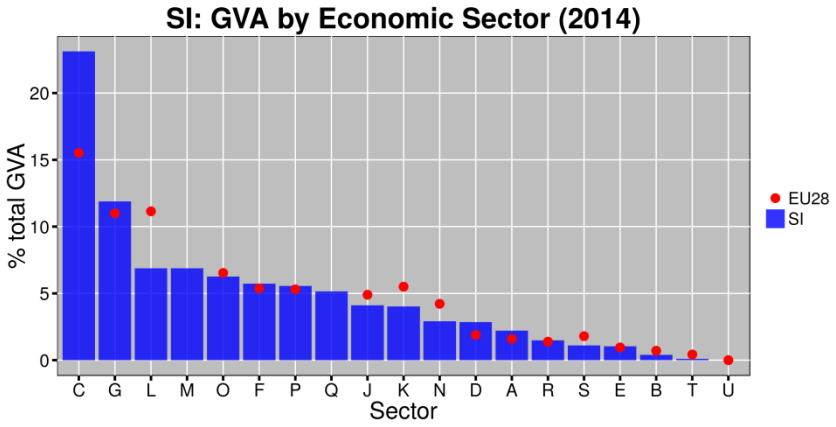


3.6.3 The development in business R&D intensity and value added

When looking at the contribution of the various sectors to the total gross value added (GVA), we notice that manufacturing, and services in wholesale and retail trade play a leading role. Real estate activities, public administration and professional & scientific activities are also more important sectors in terms of GVA (Figure 12).

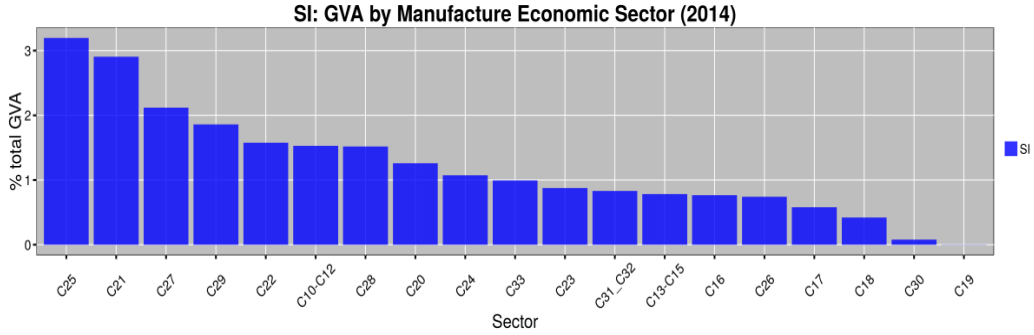
As we have seen on Figure 11, professional & scientific activities are important also on the input side of the private R&D. One observes also that information and communication sector is less significant in terms of GVA in spite of being the second among the services sectors receiving highest BERD.

Figure 12 Economic sectors as percentage of the total GVA. Top 6 sectors in decreasing order: 1) manufacturing, 2) wholesale and retail trade, 3) real estate activities, 4) professional, scientific and technical activities, 5) public administration and defence, 6) construction



The manufacture of fabricated metal products except machinery and equipment appears to be the leading manufacture service in terms of GVA. Consistently with its importance in the manufacturing sector in terms of BERD, the pharmaceutical, the electrical equipment and the automotive sector (motor vehicles, trailers and semitrailers) appears as one of the most important sectors also in terms of its contributions to the total GVA in manufacture (Figure 13).

Figure 13 GVA in manufacturing. Top 6 manufacturing sectors: 1) manufacture of fabricated metal products except machinery and equipment, 2) manufacture of basic pharmaceutical, 3) manufacture of electrical equipment, 4) manufacture of motor vehicles, trailers and semi-trailers, 5) manufacture of food products, beverage and tobacco products, 6) manufacture of rubber and plastic products.



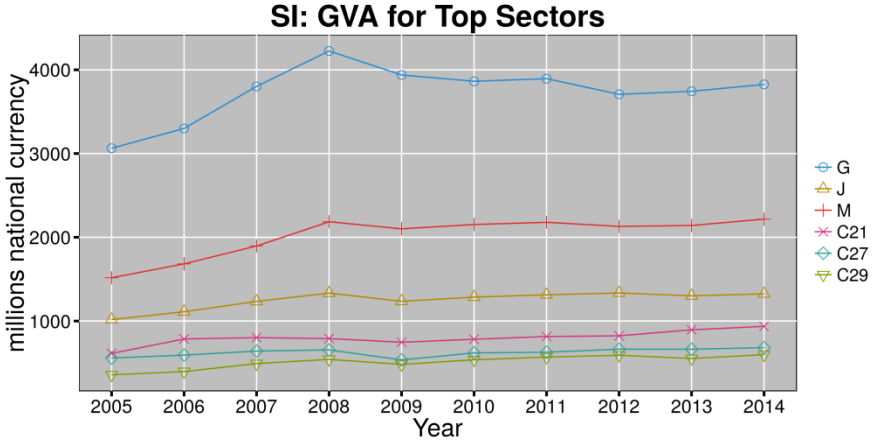
According to Figure 13 the top 6 manufacturing sectors are: 1) fabricated metal products except machinery and equipment (medium low-tech), 2) basic pharmaceutical (high-tech), 3) electrical equipment (medium high-tech), 4) motor vehicles, trailers and semi-trailers (medium-tech), 5) rubber and plastic products (medium low-tech), 6) food products, beverage and tobacco products (low-tech).

Though official data on their R&D expenditures in the local branches are scarce, Slovenia hosts a number of large multinational pharmaceutical companies, like Bayer Pharma Investments, Belimed and Lek/Sandoz (Novartis Pharma). Manufacture of fabricated metal products except machinery and equipment is another large sector in Slovenia.

Main companies[54] (both local and foreign) are Acroni/ OAO Koks (Manufacture of basic iron, steel & ferro-alloys), Arcont/Containex Container (Metal structures), Gorenje Orodjarna (Tools for sheet metal fabrication, plastics processing and CAD/CAM/CAE designed tools). The leading domestic and foreign-owned companies producing electrical equipment are listed on the webpage of InvestSlovenia[55].

The largest recent FDI inflows are the post-privatisation takeovers (Goodyear, Ljublana Airport, Mahle) or classic takeovers (Lek-Novartis, Simobil-Mobilkom, SKB-Societe Generale, NLB-KBC etc). Two Slovenian companies – KRKA, ranked 224 (Pharmaceuticals & Biotechnology) and HELIOS, ranked 909 (Construction & Materials) – are included in the European Industrial Innovation Scoreboard[56].

Figure 14 Value added for the leading sectors.



Employment in C21 (pharmaceutical sector) increased since 2008, but decreased in the other two important manufacturing sectors – C27 (electrical equipment) and C29 (motor vehicles, trailers and semi-trailers). In the services, the largest service sector G (wholesale and retail trade) decreased in terms of employees, the J (information and communication) slightly increased with some fluctuations throughout the years, whereas M (professional, scientific and technical activities) increased the number of workers. However in terms of the number of scientists and engineers we observe from table 3 in the annex that the manufacturing sector, remained stable with the biggest number of scientists in engineers between 2008 and 2014. The wholesale and retail trade also remained almost unchanged, though it employed only a marginal share of all the scientist and engineers. The information and communication sector saw a considerable increase. The professional, scientific and technical activities sector increased until 2012 then saw a minor drop in S&T employment.

3.7 Assessment

The Slovenian RDI system is relatively well developed. There are lots of stakeholders that participate within the system, which sometimes leads to overlap between activities and authorities. However, the aftermath of the 2008 economic crisis left dire consequences within the RDI system, since many measures that were for years a sort of warrant of the RDI system stability, were – because of the austerity measures – abolished or delayed (with the exception of research programmes). The consequence has been the insecurity that permeates the RDI sector from 2013 onwards. Because of the heavy austerity measures the level of GBAORD has been decreasing sharply, being in 2014 below the 2005 level.

[54] More at http://www.investslovenia.org/industries/machining-metalworking/ (3rd March 2016).
[55] More at http://www.investslovenia.org/industries/electrical-electronics/ (3rd March 2016).
[56] More at http://iri.jrc.ec.europa.eu/scoreboard.html (3rd March 2016).

At the same time, the funds allocated to RDI from the Structural Funds for the period 2007-2013 came to the end and new programmes for financial period 2014-2020 were delayed thus obstructing smooth transition from one to another financial period.

As already criticised by some experts in the public sphere in the field of RDI, the main problem is not just the decreased expenditures for RDI, but more the speed of decreasing. The experts strongly emphasise that it would be almost impossible to enhance the national economic recovery without a stronger support for RDIs. But the budget projections for the next years are not encouraging. However, the RIS3 that was adopted in September 2015 and confirmed by the EU Commission in first week of November 2015, can be a sort of impetus for the RDI system, since new funds from structural funds will be available. In this field the Operational Programme already settled 11 relevant priorities for the next financial perspective that will have also a strong impact on the RDI system and RDI activity.

However the austerity measures have not left only dire consequences to the structure of RDI, but also to the perception on working and developing the RDI. The delays in public calls or dismissal of measures establish a strong perception of uncertainty, which in cases where the major part of the RDI financing comes from a competitive basis, strongly influences the developments within the RDI sector. On the other hand, not only RDI, but also the higher educational institutions have been receiving less money for their activities. All this results in a defeatist approach on how the RDI system and activities should be developed within the country. Another thing that is criticised by some experts is the bibliometrical approach on scientific excellence that was adopted by the SRA in mid-2008 and 'forces' researchers to direct their research to quantitative bibiometric production only, with little regard to socio-economic impact of their work. Taking into consideration the small scientific community of Slovenia, this has a negative impact on the cooperation of PROs with business community (which is not interested in high impact factor, but specific results) and has also led to a fragmentation of research and a promotion of natural sciences and technical research against the social sciences and humanities (SSH). While in the 90s the SSH were the most prosperous part of the national RDI, after the economic crisis SSH is to be understood as an "unnecessary public expenditure". Such behaviour is not present only among the common public, but also among researchers and fund-disbursing institutions. The lack of cooperation between different streams of science limits the possibility to address big challenges, where inter and trans-disciplinary approach is needed.

4. Quality of science base and priorities of the European Research Area

4.1 Quality of the science base

The Slovenian RDI activity is visible also in the increased number of scientific publication. The data below demonstrate that Slovenia year-by-year increases its international cooperation. Only in two categories Slovenia is assessed below the EU28 average. The first is the percentage of publications in top 10 %, while the second is the share of private-public co-publication. The low level of publications in top-10 % can be explained also by the fact that these top-10 % publications are in English language, while in Slovenia researchers publish lots of important articles in national/Slovenian language. This can partly be explained by the fact that Slovenian language plays an important role in assessing scientific excellence (e.g. the habilitation criteria of the University of Ljubljana) and it is a compulsory language in the university process. However it should be emphasised that the trend of publicising in top-10 % ranked journals has improved in the last decade.

Regarding the second issue, where Slovenia had not performed well, it is possible to explain with the characteristics of the Slovenian RDI system, where a large gap still exists in the collaboration between public and private RDI units.

This problem has been addressed several times (since it was not the internal evaluation that pointed it out, but also some external evaluators; e.g. ERAC, 2010), but things have been changing slowly. This can be attributed partly to the spirit in the Slovenian RDI system, where the perception is that the activities of PROs and business enterprises are pursuing different objectives: PROs are focusing on basic research with results in scientific papers, while business sector needs solutions it can apply to their daily problems. Still, several instruments, financed during the past financial perspective, have contributed to improved links between the two sectors. Here especially centres of excellence and centres of competence need to be mentioned.

Regarding the issue of measures that have been adopted to improve the situation, RISS 2011–2020 and the SRA Regulation on project applications should be pointed out. RISS 2011–2020 suggested several measures to improve the level of scientific excellence in Slovenia, but because of slow and incomplete implementation of RISS (see supra) and due to strong austerity measures, several of the RISS 2011–2020 provisions have still not been applied in practice. On the other hand, the SRA changes its Regulation on projects applications frequently, trying to cope with scientific excellence year-by-year. This progressive approach towards achieving scientific excellence on one hand stimulates the researchers to comply with the rules and to publish in the most-known journals, but on the other hand there is an increasing number of researchers that do not want to comply with these rules, since they state that the scientific excellence cannot be measured only or mostly by citations and publications in the most-known world scientific journals, but should be evaluated less bibliometrically and more substantially (transcript of public debate during 2016 on new SRA regulations).

Table 7 Bibliometric indicators, measuring the quality of the science base.

Indicator	Year	Slovenia	EU
Number of publications per thousand of population		2.54	1.43
Share of international co-publications		44.9 %	36.4 %
Number of international publications per thousand of population		1.14	0.52
Percentage of publications in the top 10% most cited publications		5.91 %	10.55 %
Share of public-private co-publications (SciVal)	2011-2013	1.1%	1.8%
Public-private co-publications per million population (SciVal)	2011-2013	91.31	87.07
Public-private co-publications per million population (IUS) **	2011	85.4	52.8

Source: JRC IPTS RIO elaboration on Scopus data collected by Sciencemetrix in a study for the European Commission DG RTD (Campbell, 2013). The share of public-private co-publications is derived from the Scival platform and is also based on Scopus data (September 2015). SciVal ® is a registered trademark of Elsevier Properties S.A., used under license. The data on public-private co-publications is not fully compatible with the data included in the IUS, due to differences in the methodology and the publication database adopted.

4.2 Optimal transnational co-operation and competition

4.2.1 Joint programming, research agendas and calls

The ERA priority of optimal transnational cooperation and competition was pointed out as one of the key priorities of the Slovenian RDI system already in RISS 2011–2020, where a special chapter (3.3.) was devoted to this topic. On the page 13 of RISS 2011–2020 it is stated that "the increasing globalisation demands an improvement of the scientific and technological excellence and of sustainable development. Without increasing of the scientific and technological co-operation in the European and worldwide context, it is not possible to address effectively the challenges which are crossing the national and continental borders. Globalization calls for new and different approaches and methods on local, regional and national level. On a global international level the co-ordination of the R&D policies, instruments and measures has become a necessity, compelling also for Slovenia" (bolded by B. Udovic).

RISS presents two directions on how Slovenia should enhance its trans-border RDIs' activities, i. e. bilateral and multilateral. When the bilateral cooperation should be enhanced especially with BRICs and the "most advanced" countries, the multilateral activities are more relevant with neighbouring and other EU-28 countries. For the countries of the region i. e. Western Balkan countries Slovenia should be, according to RISS, a "hosting country for their excellent researchers and enterprises" (RISS 2011–2020, p. 15).

On the other hand RISS 2011–2020 clearly specifies that Slovenia should enrol as much possible into multilateral cooperation, especially within EU programmes and networks. Within this, a strong link between public-private research activities should be formed, further encouraging enterprises to participate with their R&D activities in the EU multilateral R&D and innovation programmes. The strengthening activity of companies in EU/trans-border multilateral programmes can be illustrated with two figures: (a) the increasing share of funds from abroad in total and especially in business sector, and the (b) increasing participation in various EU programmes. Regarding the first action, it should be noted that in the period 2007–2013, the funds from European Union in BERD tripled. In 2013, the share of funds from EU programmes presented 2.2% of total BERD (or 1.4% of total GERD) (SORS, 2015a,b,c). Complementing the data on BERD, the internal MESS data shows that the number of projects (within the FP7 framework) had been increasing annually. The numbers are higher in ICT and in nanotechnologies, but at the same time Slovenian enterprises cooperate with other partners (at the multilateral level) quite intensively in other fields as well.[57] During the period 2007–2014 Slovenia participated in 914 projects. The number reflects relatively intensive international research collaboration of Slovenian RDI units, both PRO as well as SMEs. Most common funding instruments remain collaborative research projects (53.6%), to be followed by coordination and support actions (23.3%) and SME measures (8.4%). As the "pull" factors, the existing international networks need to be mentioned as well as the ambition on behalf of research units to participate in EU research. The ability to gain additional research funds is also an important motivational factor, indicated by the interviewees, even though many research groups find it easier (or with less strings attached) to apply for the national research funding (Bučar, 2015).

At this point it should be clarified that Slovenia, next to RISS 2011–2020, has not adopted any other policy documents or activities, which would be complementary to RISS 2011 – 2020, since the Government clearly devotes itself to RISS provisions, that are – if they would be executed as presented in RISS – a fertile ground for international cooperation and joint programming/activities.

[57] In the period 2007–2014 Slovenia received from the FP7 funds €171 million, which is more than twice-times higher comparing to FP6, where Slovenia received €73 million.

So far, only two measures exist, supporting the researchers to apply to H2020 calls. SRA introduced a measure, under which it disburses a small amount of money to every applicant that submitted the application to the H2020 call and has been evaluated by the EC above threshold[58]. To address a low success rate with the European Research Council (ERC) of only 3.1% and very low submission of proposals by Slovenian scientists, a special measure was introduced by MESS and SRA in this regard: a project which was submitted to ERC and evaluated positively, but had not received ERC funding is automatically picked up for financing by SRA at the level of maximum project financing available under SRA[59] (Bučar, 2015).

MESS is also discussing the design of some of the new ESIF instruments so as to improve access to H2020 to Slovenian research community, and Operational Programme already indicates the possible option for synergies.

4.2.2 RI roadmaps and ESFRI

RISS mentions also the importance of cooperation in research infrastructure. The Research Infrastructures Roadmap (RIR) 2011–2020,, a special national strategy relating to research infrastructure, presents key areas and priorities in which international cooperation should be fostered, if Slovenia wants to become a knowledge-based society. The basic focus of the National roadmap in the ESFRI Roadmap and the national infrastructure development is highly aligned with the developments of relevant roadmaps at EU level.

Areas that are deemed extremely important for Slovenian R&D infrastructure are: (a) advanced materials and nanotechnology, (b) energy efficiency, (c) environmental technologies, (d) biotechnology, (e) biomedicine and biological sources etc. Next to these, RISS also calls for the better exploitation of RI with diversifying among RI, which is important for Slovenia, and RI in which Slovenia should be a partner of the international consortia.

Among the priorities for the international cooperation in the national roadmap, Slovenia managed so far to participate in the following international R&D infrastructures or ESFRI projects: CERN, FAIR, CERIC, SHARE, ESS, DARIAH, CESSDA, Belle 2, LifeWatch, EATRIS/ ELIXIR and CLARIN. In some of these infrastructures Slovenia is already a full partner, in others it is a partner in the process of establishment and in some it is participating at the level of development of full project proposal for specific ESFRI project. The MESS commissioned in 2015 a partial evaluation of the current participation and preliminary assessment of the ESFRI 2016 Roadmap (MK Projekt, 2015). The objective of the evaluation was to see what have been the positive experiences of the Slovenian researchers cooperating in ESFRI projects and where the major barriers to fuller participation were experienced. As expected, the major barrier to participation is the financial resources, especially in the cases of infrastructures in the field of natural sciences, where the memberships are very costly. On the other hand, Slovenia is involved in all ESFRI projects in the area of SSH.

The austerity measures limit the possibility of Slovenia to participate more fully in other ESFRI projects or initiatives, but MESS tries to support involvement of some kind in all the projects identified by Slovenian research community as relevant for the country. It is expected that some of the ESIF will be directed to research infrastructure support as well.

[58] How serious is the financial situation in SRA can be illustrated also by this measure: even though only €1500 is awarded to the participant and €5000 to the coordinator of a succesful project, SRA had to stop this support in the second half of 2015 due to the lack of finance.
[59] In 2015, this means €200,000 over the period of three years.

4.3 International cooperation with third countries

In this field Slovenia has not specific (extra RISS) national strategy, but tries to participate in several EU-led initiatives, like Marie Skladowska Currie Programmes, which are actively promoted within science community. MESS staff regularly participates at various coordination meetings at the EU level, but a more pro-active approach towards third countries and international organisations is hindered due to the financial limitations.

Nevertheless, at this point some measures and programmes for bilateral cooperation commissioned by the SRA should be mentioned. SRA has concluded 40 bilateral agreements with EU and extra-EU countries. These bilateral agreements are the legal basis for the bilateral projects launched by the SRA every year. Approximately there are up to 15 such calls on a yearly-basis for bilateral cooperation with different countries. The bilateral cooperation[60] projects are not classical research projects, since SRA covers only travel and housing costs for participants, meaning that researchers have to cover their other costs from different other projects/programmes that are not part of the bilateral cooperation. The yearly amount of financial compensation varies from case to case, but it stops around €2,000 per year. These projects are at max. two-year projects.

In 2008 SRA changed its regulation on cooperation with researchers from third countries. But the only provision that matters regarding the exchange of researchers is that the national agency should receive the information on hosting researchers from third countries. There are no special national initiatives or financial compensations under this regulation for enhancing the incoming of researchers from third countries.

4.4 An open labour market for researchers.

4.4.1 Introduction

This (the 3rd) ERA priority is far the most developed among all priorities in Slovenia. Its development started already in the time of the socialist system and after Slovenian independence different measures have been introduced and developed to establish an attractive RDI environment in which the development of personal careers will be more than supported. At the end of 90s it was realised that there is a large gap between public and private RDI activities. That is why in 2001 the measure of Young researchers from business sector was launched, trying to bridge this gap and to strengthen the cooperation between the two RDI sectors. Albeit this measure was supported by the business and public RDI community, it was abolished in 2010 and merged with other measures in 2011 (e.g. KROP, see past EW reports). In 2010, Centres of Excellence and Centres of Competence were established, in part aiming also at the facilitation of mobility and training of researchers, but their co-financing ended in 2014.

All these measures were in line with the provisions set by NRDP 2006–2010 and later by RISS 2011–2020, which is still the most relevant document in the field of mobility and strategic approach to establish a friendly environment for researchers.

[60] See more at http://www.arrs.gov.si/en/medn/dvostr/index.asp (23rd November 2015)

However, there are two problems in the Slovenian RDI system, which strongly influence the developments within the system. The first is its high regulation and its closeness (here an important role has also the protection of the Slovenian language; see infra), while the second is the "non-attractive" and "non-stimulative" salary system, which was established after 2007 and its rigid and unable to cope with different every-day cases.[61]

The SORS and EUROSTAT (2015) data presents that in 2014 14,866 people (in FTE; 21,053 in head count or 1 % of the total population is employed in RDI) were employed in the RDI sector; among them 65 % in the business sector, 17 % in the government sector and 18 % in the higher education sector. 8,574 of them were researchers (58 %), while 33 % of them were technicians. Comparing to the 2013 data it is possible to see that the total number of employees in RDI sector decreased for 2.8 %, while the number of researchers decreased for 1.8 %. This trend occurred in all three sectors, but in was the most visible in the higher education sector, where the index of employees 2014/2013 stopped at the level of 95 (5 % decrease). Similar is the decrease also among the technical staff, which is still the largest in the business enterprise sector and the lowest in the higher education sector. Comparing to the previous years it is possible to see that the government and higher education sector are facing a decrease in the RDI human resources, while the government sector, after the increase especially due to the 2010/2012 tax relief is facing stagnation or a slight decrease in the last two years.

4.4.2 Open, transparent and merit-based recruitment of researchers

Slovenian researchers' labour market remains relatively closed due to the internal restrictions, i.e. salary limitations due to the classification of researchers (HEIs and PROs) as public employees, where salaries have to follow Public Sector Salary System Act and collective agreements for all public sector employees and specific collective agreements for RDI employees. In the case of HEI one of the requirements for the employment is also the active knowledge of Slovenian language.[62] All-in-all it can be said that albeit the Slovenian RDI labour market is officially deregulated, there are some formal and informal barriers to the recruitment of researchers.

The employment procedures of RDI staff are quite simple in the case of business enterprises, while quite complicated in HEIs or PROs. In the case of PROs and HEIs there should be a public call for a vacant post. The decision to employ a new employee has to be adopted at the level of the University office (rector) and university supervisory board or by the supervisory board of the PROs. The employment of strictly research staff is somewhat more relaxed and the faculty can enter into employment of new RDI personnel for the period of the duration of the project funding it managed to obtain. In case of PROs the selection process is similar and depends on available project funds.

In the case of HEIs and PROs the process starts with the publication of job vacancy on a relevant national online platform, since 2014 the PROs and HEIs intensified the publication of job vacancies also on relevant Europe-wide online platforms, including the EURAXESS portal. Vacancy announcements of public research and higher education institutions include the job profile, skills and competencies required, and eligibility criteria.[63] Together with job advert the relevant institutions publish the selection criteria.

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[61] As in many countries, in Slovenia researchers are part of the public sector salary-system, where the payments are regulated in accordance with the social contract between the employer (government) and public sector unions. With the crisis measures, all incentives in public sector were (temporarily) cancelled, so no variable payment is permitted. Additionally, SRA for the programmes and projects it finances applies so called "research hour" as the accounting unit, not the actual costs of personnel/material costs. This research hour is strictly regulated as per percentage dedicated to labour costs, material costs, amortisation and overhead and the project/programme team needs to spend the resources in accordance with the prescribed proportions. The most problematic issue deriving from this system is the labour costs for more labour intensive research (social science, humanities) of teams with senior researchers.

[62] By Law, teaching of compulsory courses can only be in Slovenian language.

[63] However, not all of the job vacancies are published in English.

They regulate a minimum time period between vacancy publication and the deadline for applying and offer institutions the right to receive adequate feedback and the right to appeal (Deloitte, 2012). The selection panel is set-up after the end of the time provided (its composition is not public)[64] by the advert and decides on the applications. The selection panel decides only on who the most appropriate candidate is. Whether there are two or more, they leave the final decision to the head of the department or to other relevant stake-holders. After the adoption of the final decision, the non-selected candidates are informed only that they have not been selected. They have the right to appeal and they have the possibility to look into their assessment made by the expert commission. However they are not allowed to have a look in other candidates' files. After the decision on the selection is adopted, the rector/head of the institute signs the contract with the selected person.

The described process is quite straight-forward in cases when all applicants come from the same University or PROs, but becomes more complicated when there is a candidate (or more) from different universities or PROs or even from abroad. When there is such case the first step after the submission of application is the process of verification of the habilitation standards. A special commission from the scientific field is appointed to decide whether the applicants qualify in accordance with the habilitation of the institution where they seek employment. After this decision has been adopted the candidate(s) who qualify are evaluated according to the procedure described above.

With regard to career development, in 2010, all Slovenian universities have established career counselling centres. Also, some of other higher education institutions have followed the example. The establishment was supported under the special public call of ex-Ministry for Higher Education, Science and Technology (today's MESS) with the co-financing from ESF.[65] The career centres organise various workshops for the students, contacts with potential employees and advisory service.

Although the RDI system in Slovenia can be as a whole assessed as open, transparent and merit-based, there are some barriers which should be eliminated to enhance the attractiveness of the national RDI system. Firstly, the system should become more internationalised. An important step forward in this direction could be the alleviation of the salary-system for foreign researchers, obtaining their own grant or external funds. Secondly, the RDI system should become more attractive to foreign and domestic researchers if the contracts would allow not only temporary but also a more stable, e.g. permanent type of contract. However this is constrained by the funding of RDI, mostly on a competitive-basis. Thirdly, the current economic crisis opened the issue of precarious workers in RDI sector, which was not really an issue prior to the crisis (people that are employed for 20 or 30 % or just for some months during the year). The decrease of employment in public RDI because of the austerity measures and the increase of temporary contracts, especially for younger researchers (based on the time-frame of projects) opened the debate on the future developments of the Slovenian RDI system as such and especially the possibilities for the increased international mobility. As in other EU countries, the main burden of the temporary contracts and precarious working conditions concerns the young(er) generation of researchers. The crisis caused increase in the outward flow of researchers, yet there is no systematic gathering of data to provide exact figures.

[64] In most cases the members of the selection panels are national experts. In the case of University of Ljubljana the selection panel is composed by three members: one being from the faculty which published the job advert, the next being from one of the faculties of University of Ljubljana, while the third should be employed outside the University of Ljubljana. However it is important that all the members of the selection commission have at least the same academic title as announced in the job advert (e.g. if the vacancy is for a professor, all three members of the selection commission should be full professors).

[65] More available at http://www.mizs.gov.si/fileadmin/mizs.gov.si/pageuploads/razpisi/Visoko_solstvo/Karierni_centri/Predstavitev_KC.pdf(15 February 2015).

In one of the few studies, conducting in this area is the research by Bevc and Ogorevc (2014) where it was established that the younger generations are more and more in favour of emigration and thus outward flow is increasing every year.[66]

The inflow of researchers is still rather limited, partly due to the restrained resources of Slovenian PROs and partly due to the current SRA financing system, where the research teams need to be specified in the application, leaving little room for additional employment once the project is won.

4.4.3 Access to and portability of grants

RISS 2011–2020 implicitly focuses on the importance of international cooperation and removal of (legal, political etc.) barriers, which hinder this. However, there is no official document, which would deal with this issue in a more specific manner, by listing activities that should be performed or with some other particularities.

The issue of international cooperation and portability of national grants is defined by the structure of the Slovenian R&D system, within which a condition *sine qua non* for applying for national grants is that the applicant has to be registered in the national database of all researchers (meaning SICRIS). When an applicant is registered in SICRIS, there are not obstacles to concur for national grants. In some cases, researchers and research organisations from abroad can apply for national grants if they are applying together with Slovenian researchers (sort of consortium). In these cases they obtain a non-permanent SICRIS code.

However, in the last years, some changes also occurred in the field of cross-border portability of national grants. Although the national innovation system does not allow changing the "residency" when a national grant is received without the consent of your home research institution, the new contracts for young researchers allow the portability of grants, for a maximum of one year, and only in the cases when the young researcher is going abroad to take advantages for its PhD study.

4.4.4 Doctoral training

Slovenia has a well-developed system of the doctoral training. However, with the Bologna system also Slovenia left the past provisions and adapted the doctoral training to the Bologna requirements. As such the period of the doctoral training was reduced from five to three-and-a-half years and the mentors received a greater responsibility (defined by the contract in some cases between the University, mentor and the candidate) for the successful end of the PhD study. Here it should be pointed out that the universities (in some cases faculties) are fully autonomous in performing their PhD scheme and study, once such is accredited with the National Quality Assurance Agency for Higher Education (http://test.nakvis.si/en-GB/Content/Details/8).

During the first years after the introduction of the Bologna PhD study (third cycle), the enrolment was relatively high since enrolment criteria were "lowered" in comparison to the old system, where a completed graduate level education was a pre-requirement. Slovenia however "translated" the pre-Bologna study levels to the new Bologna cycles so that previous undergraduate programmes were equalled with Bologna second-cycle. However in the last years the interest for the PhD study decreased –because for a 'typical' Slovenian paying at least €2,700 (the most expensive PhD costs yearly €4,200) per year (where an average salary is €1,000) is quite expensive.

[66] This research was funded as TRP and its financing ceased in 2013, in spite of growing tendecies towards brain drain in science community.

In 2010, the government introduced an Innovative Doctoral Scheme, co-financing doctoral students (OG 88/2010)[67] and supported it within OP on Strengthening Human Resources. The calls were issued until 2013 (for the 2012 generation; last call issued in February 2013. Since 2013 call for PhD study the study is financially fully on the candidate's shoulders. This resulted into a decreased level of PhD students (in 2009 there were 2,928 PhD students; in 2010 the number increased to 3,453; in 2011 it stopped at the level 3,430 students; in 2012 it decreased to 3,008; while in 2013 it was 'just' 2,644; SORS, 2015a,b,c).

The next instrument that should be mentioned here, because it is related to the PhD study, is the instrument of Young Researchers, established in 1985. The main idea of the measure has been to rejuvenate the R&D personnel in PROs and HEIs. Since today more than 5,000 candidates have participated in the programme.[68] According to the SRA web page (ibid.) the Young Researchers programme have three characteristics:

young researchers participate in research work during their postgraduate studies on basic research or applied research projects;

they have regular, fixed-term employment contracts;

SRA finances their salaries, social contributions, as well as material and non-material costs for research and postgraduate study.

In January 2015 the measure of Young Researchers was for the first time linked to the "block financing" of RGPs, which meant that the only eligible mentors were researchers, being members of RGPs. In late spring 2015 the results come out and the number of young researchers were distributed among different RGPs until 2020. Thus, we are now having a situation where there are complaints that some researchers not being members of the RGPs were discriminated since they were unable to compete for a post of a Young researcher mentor while on the other hand, the SRA presents such change as a beneficial one, because it stabilises the procedure of rejuvenation of researchers and at the same time it creates a system that is more transparent for the organisations, supervisors and also for SRA. At the time it is not clear what will be the developments in the future, but it is expected that maybe this system will not last long.

4.4.5 Gender equality and gender mainstreaming in research

The debate of gender equality in the RDI system in Slovenia seems a little bit obsolete when the data on women employment in RDI are taken into consideration. According to the statistical data provided by SORS, the level of women that are employed in the RDI sector rounds between 35–40 % of all RDI employees (in FTE). Nevertheless it should be taken into consideration that this is an average percentage and that an in-depth analysis can show some differences between different research areas. The same difference is visible when we differentiate among sectors in which women are employed; whether in the business sector the share of women in RDI activities is usually below 30 %, the share in the government and higher education sector RDI sometimes reaches more than 50 %.

Regarding the issue of the equal treatment of women in the RDI sector, there is no special document in Slovenia, dealing only with this topic[69]. There is, however, a special commission for women in science at the Ministry, which is quite active in promoting the status of women and pointing out the cases of discrimination. The commission played an important role in evaluating and limiting the discriminative procedures and activities that were present within the Slovenian RDI system.

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[67] The measure in a wide sense applies all conditions set by the scheme of Innovative doctoral training. But since there are different paths to enrol in the doctoral system, it is hard to apply all the required measures in the doctoral scheme.
[68] See more at http://www.arrs.gov.si/en/mr/predstavitev.asp (1st October 2015).
[69] Slovenia has passed in 2002 a special Law on equal opportunities of women and men. See more at http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO3418 (3rd March 2016).

The main task of the commission is to enhance the visibility of women in science, to remove barrier for their access to the highest posts in RDI and in the society.

Also, RISS 2011–2020 emphasises that "it is necessary to adopt measures for gender equality, to change legislation, and to focus attention to the role of gender in research, in pedagogic work, and in management of institutions" (RISS, p. 21). Parallel with declarative commitments Slovenia strongly support the measure "For Women in Science" that grants a scholarship for three researchers (women) from natural sciences and/or (bio) technology (including medical sciences). The call for this measure is opened on a yearly-basis and is conducted trilaterally by UNESCO, L'Oreal and Slovenian Scientific Foundation.

RISS 2011–2020 also commits Slovenia to "reduce vertical segregation, therefore, support from a decision making level for changes, and modernisation of research organizations (is needed). /…/ it is necessary to adopt measures for gender equality, to change legislation, and to focus attention to the role of gender in research, in pedagogic work, and in management of institutions" (RISS 5th priority, p. 21). In line with these declarative moments RISS calls for an Action Plan (Action Plan for Improving Career Opportunities for Researchers in all the Career Periods, and for Ensuring the Gender Equality Principle), which would lead to a better explanation of gender equality principles. The idea of RISS has been that the Ministry of Education, Science and Sport (MESS) and the Ministry of Economic Development and Technology (MEDT) should prepare this document together and propose it to the Government for adoption. Even though the adoption of the Action plan was planned for 2012/2013, until yet nothing has happened in the field.

Regarding concrete actions and activities conducted in the field of gender leverage, it should be noted that because in Slovenia, the gap between men and women is not markedly large, there are almost no policies targeting gender issue directly. Men and women are treated equally in all procedures, even in the maternity leave, which can be divided between a man and woman on the basis of their respective decision. Thus, after the end of the maternity/paternity leave, both (men and women) receive the same position. This is guaranteed by law.

Finally, measuring the prominence of the gender issue in Slovenia, there are no actions to promote the equal gender representation in the academic/research committees, even though RISS asks for some actions within this field. All in all, the positive discrimination on the basis of gender does not exist in Slovenia.

4.5 Optimal circulation and Open Access to scientific knowledge

The informatisation process of the RDI started relatively early in Slovenia. In 1982 RCUM (Computer centre of University of Maribor) was established, being the predecessor of the Slovenian e-infrastructure in the field of RDI. The digitalisation process was quite quick and the Ministry of Science decided to convey to IZUM (RCUM was renamed to IZUM) the digitalisation of Slovenian bibliothecal/librarian system. After the establishment of a database of all libraries and their units in 1999 (COBISS), IZUM made a step further for a scientific research, by establishing the so-called SICRIS, being a system that (according to the criteria of research excellence set by SRA) quantitatively evaluates the research performance and scientific excellence of Slovenian researchers.

4.5.1 e-Infrastructures and researchers electronic identity

RISS 2011–2020 is the key document related to e-infrastructure. As already explained in the introductory paragraph, the most important platform for the preservation of documentation is IZUM/COBISS. COBISS contains the key data on all materials available in public and some personal libraries. Regarding the measures for supporting the development of e-infrastructures, it should be explained that financing of COBISS is channelled through Slovenian Research Agency, especially by its infrastructural financing.

Because of public funds, COBISS is available for all internet users, and in some cases, bibliographic note includes a link to the actual material, while in other cases, it is always clear which library has the needed material.

The IZUM/COBISS platform includes also a SICRIS system, which presents a detailed analysis of scientific achievements of individual researchers. One of the conditions for having a status of a researcher in Slovenia is to receive the SICRIS code. This code is a sort of identification for each researcher, since anybody with looking in SICRIS can find all materials, reports, publications and other research activities of the researcher.

In 2010 the SRA adopted also the idea of an e-identity for researchers, which is relevant for the researchers that want to apply at project calls. In five years almost all applications are done electronically and therefore the e-identity is not anymore an option, but a necessity.

Next to COBISS Slovenian research community enjoys some other digital research services. The most used in the field of SSH is the database of the Social Science Data Archive, which is the national archive for all national and international research in the field of Social Sciences. The Social Science Data Archive is resident at the Faculty of Social Sciences.

On the other hand in Slovenia there are two documentation centres, one being the European Documentation Centre at the Faculty of Economics, while the other is the United Nations Documentation Library at the Faculty of Law. Both institutions have a large depot of useful materials in the field of the European Union integration processes and United Nations policies and activities.

However, at this point some other e-infrastructures should be presented. At several higher education institutions different forms of e-learning have been introduced. The idea of the e-classroom was to encourage the e-learning through web systems. A similar apparatus is offered todays on all faculties which have a sort of e-enrolment system, sometimes called web-office, where students can receive all the necessary information regarding the process and activities in all courses/faculty programmes. Next to the web offices, an e-depository dLib (digital Library) should be mentioned. The idea of the dLib is to digitalise old papers, journals and other contents that can be useful for RDI activities. The dLib is supported by the National Library (NUK).

Taking into consideration the well-developed system of e-infrastructure in RDI it should be emphasised that the state has developed a strong security system for the identity validation (e.g. for applying for projects under the SRA umbrella) on one hand, but for open e-infrastructures as COBISS/SICRIS is should be noted that they are accessible from anywhere to everyone.

4.5.2 Open Access to publications and data

In 2015, Slovenia has accepted National strategy of open access to scientific publications and research data in Slovenia 2015-2020[70]. The strategy defines the open access to the publications, sets guidelines and principles on open access to scientific publications and data and sets political and legal basis on open access.

More than 35 Slovenian scientific journals are indexed in Directory of Open Access Journals (DOAJ) out of approximately 120 published. Researchers are still reluctant to publish in OA journals – because of the evaluation metrics they prefer hybrid journals of traditional publishers. The electronic versions of all publicly co-financed Slovenian subscription journals (approximately 65 titles) and final reports of research projects, financed by the Slovenian Research Agency, must be deposited into the Digital Library of Slovenia.

[70] More at http://www.mizs.gov.si/fileadmin/mizs.gov.si/pageuploads/Znanost/doc/Zakonodaja/Strategije/National_strategy_for_open_access_21._9._2015.pdf (16 February 2016)

There are five active interoperable repositories following the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH): Digital Library of Slovenia, Digital Library of the University of Maribor, ePrints.FRI, PeFprints and Digital Repository of University of Ljubljana at Faculty of Construction and Geology. Some of the research institutions publish Open Access monographs (e.g., Digital Library of the Educational Research Institute). The country does not have a national portal for Open Access monographs (OpenAIRE 2013). SSDA prepared the Action plan on establishment of Open Access system for research data generated through public resources in 2013[71] for the MESS and SRA, where they highlighted the benefits and the costs of such a system.

According to the study prepared by Science-Metrix[72] Slovenia is among the countries where researchers publish more in "Gold journals". One "interesting hypothesis is that researchers in [Slovenia] may use Gold journals because they more frequently allow publishing in languages other than English" (p. 25). However the problem of publishing in Gold journals is also the lower level of citations (ibid.), which can – not by purpose, but because of limited conscience of national language – limit also the research outcomes. Finally, such publications hinder also the development of ERA, as it was established by the Ljubljana process in 2008 (see Bučar, Jaklič and Udovič, 2010).

[71] More available at http://www.adp.fdv.uni-lj.si/o_arhivu/publikacije/odpp10_akcijski_nacrt (15 February 2015).
[72] More at http://science-metrix.com/files/science-metrix/publications/d_1.8_sm_ec_dg-rtd_proportion_oa_1996-2013_v11p.pdf (15 February 2015).

5. Framework conditions for R&I and Science-Business cooperation

5.1 General policy environment for business

Slovenia ranks as 51 country out of 189 that the World Bank Doing Business[73] indicator states, the business environment has not changed much in recent years in spite of constant announcements of the government(s) that this is their primarily target. Most business complaints relate to slow administrative procedures, especially in the field of obtaining building licences (more than 200 days) or registering property (more than 109 days). Also, something which has been a constant complaint of small and big business alike is payment discipline and insolvency issues, where the WB index noticed progress, but still many cases took longer than two years with about 50% rate of success in resolving insolvency. The smaller businesses experience difficulties in access to credit in spite of intensive reforms undertaken in 2013/14 of the banking system.

The initiative to introduce special restrictions for entrepreneurs who have failed and declared bankruptcy if/when they would wish to return to business did not pass through the legislation, so formally there are no obstacles for those who had experienced failure. Yet, in view of the strict selection of potential borrowers by the banks, such entrepreneurs are discriminated against and in practice have very difficult time to re-enter business world.

5.2 Young innovative companies and start-ups

The Slovenian Enterprise Fund continues with its measure of providing seed capital to young innovative ventures. In 2015, several different measures exist, depending on the business stage of the project. Young entrepreneurs can receive a subsidy to develop their ideas to the point of elaborating a sound business plan, which can be then used to obtain seed capital for the establishment of an enterprise. The key selection criteria are the innovative component as well as the internationalisation potential. The groups who wish to obtain subsidy have to apply for the annual Start-up competition (see details below) and if they pass the selection procedure, then they automatically go into the selection process at the SEF. The Fund has developed a support programme, which is called from idea to the market, so after seed money is received they continue with the support to enterprise even after their first five years, in cases where resources are needed for further internationalisation. The total funding per call amounts up to €480,000 (three calls annually for all stages) and the amount of subsidy ranges from €12,000 to €50,000 per project.

Initially started by the Factory of Ideas (a university of Maribor student incubator)[74] as a side event to annual conference on entrepreneurship, Start-up competition has grown to a major event of its own, supported by the SPIRIT, agency for entrepreneurship promotion and a full programme of support to young entrepreneurs, not just the competition itself[75]. Especially strong is the promotion of entrepreneurial skills, since the main award of winning the competition is financial support as a voucher for entrepreneurial training. The activity, especially the competition, receives extensive media coverage, thus further promotion of business idea is guaranteed.

Raising initial capital for a start-up on Internet (Kickstarter) is popular among young entrepreneurs, but little systematically collected data exists – mostly sporadic reports in the media on the success of some ideas.

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[73] Available at http://www.doingbusiness.org/reports/global-reports/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB15-Chapters/DB15-Country-Tables.pdf (1st October 2015)

[74] Available at http://www.tovarnapodjemov.org/ (1st October 2015).

[75] Available at http://www.tovarnapodjemov.org/Dokumenti/Startup_Slovenija_274.aspx (1st October 2015).

More activities in the area of entrepreneurship support and promotion are expected to be presented by the Ministry of Economic Development and Technology by the end of 2015, beginning of 2016. At that time also the first calls, based on support from ESF are expected. This was delayed due to the slow preparation of the Smart Specialisation Strategy, which was finally accepted by the EU Commission in the first days of November 2015.

The expectations are in the first month of 2016 the measure of a voucher system, already in place under previous financial period 2007–2013, as well as possible new instruments supporting knowledge sharing will be launched.

5.3 Entrepreneurship skills and STEM policy

The lack of human resources has not been identified as a problem in entrepreneurship in Slovenia. The scholarships on one hand and the restrictions on enrolment in social sciences and humanities on the other have resulted in increased enrolment in S&T education (up from 6,029 students to in 2004 to 7,779 in 2011 (SORS, 2015a,b,c). What has been identified by the government in 2015 was weakness in vocational training, both at high school level (problems with lack of practical experience) as well as at the higher education, where prevailing university programmes have insufficient skill component. Slovenia is undergoing an OECD evaluation of its education system (end of 2015/first months of 2016) as well as national assessment of the on-going National Programme of Higher Education. It is expected by the government that the evaluation process will give clearer guidelines on how to reform the education process to better meet the needs of Slovenian economy.

A positive experience in 2014 and 2015 resulted from the call, issued by the Slovenian Human Resource Development and Scholarship Fund, called *by creative way to practical experience*. The call targeted university students and offered the enterprises financial support for the engagement of a specific student group on a project basis. The company had to identify a specific problem they wanted the students to focus on. The students with their academic and business mentors spend a specified number of days working in the company, gaining practical experience and at the same time contributing their knowledge/creativity in a requested area. More than 1,000 students were involved, and if funds would allow, the numbers would be even higher.

An overall assessment of the Slovenian education system can present the following conclusions: in Slovenia all levels of education have insufficient systematic entrepreneurship training; entrepreneurial training is only occasionally included in the curricula by some schools as an elective and not compulsory content. In the case of higher education, entrepreneurship skills are not systematically covered, especially at the S&T faculties. However this lack can be bridged by the elective courses which students can enrol in at other departments/faculties due to the Bologna system. Thirdly, especially the social sciences faculties have the intention to equip students with transversal (better said horizontal) capacities, while in S&T and natural sciences faculties the teaching process still bases on vertical knowledge-acquiring. Finally, students/graduates who would like to develop their own business venture, have the possibility to rely on SEF measures, but also on some 'unofficial' measures/activities, such as business angels etc. All universities have their incubators, which should support entrepreneurial ideas of their students, but due to the irregular support to the incubators their ability to do is rather varied.

5.4 Access to finance

According to Invest Europe (former EVCA)[76], Slovenia belongs to the group of countries with very low private equity activity (less than 0.2% of total flows, and no figure for the % of GDP) as well as low amount of venture capital. While many new forms of financing are appearing (like business angels and crowd-funding) overall they account for a small share of investment funds.[77] There is no special tax policy to stimulate either business angel activity or venture funds. Even though a Business Angels club was established, very little is reported on their activities,[78] since their web page includes no information. The main source of capital remains bank loans and for the young entrepreneurs already mentioned schemes of the Slovene Enterprise Fund (loans, credits, bank guarantees).

As already mentioned in 3.5.1, SID is also supporting business activity with supplementary financial services[79] in the form of long-term specific credit lines through commercial banks, where interest rate is subsidised, loans with the status of state aid as part of the measure of financial engineering for the promotion of technological and developmental projects as well as bridge financing in cases of delay of disbursement of project financing.

It is often heard in entrepreneurial circles that access to finance is one of the major barriers to growth of SMEs and especially start-ups, yet on the other hand several intermediaries cite the lack of good projects and creative ideas are the major barrier to growth. Also, some of the research on entrepreneurial activity in Slovenia (GEM, 2014, 2015) found that many small entrepreneurs have limited ambition/ skills to scale up their activity and have thus selected the option to remain small.

5.5 R&D related FDI

Even though Slovenia offers 100% tax subsidy for R&D expenditures, this is not specially mentioned on the web pages dedicated to the potential investors.[80] Also, no data is maintained systematically on R&D investments through FDI: there are occasional figures: mostly reported by the business media and not official figures.

There are no policies adopted at the state level, which would be aimed at attracting R&D intensive FDIs, even though one could speculate that Slovenian R&D field is of interest to potential foreign investment since the share of abroad as source of funding of R&D activities in Slovenia is growing. But Slovenia is relatively slow in attracting all kinds of FDIs, especially if compared with some other Central and Eastern European countries.[81]

Still, one major FDI acquisition took place in the Slovenian history in the RDI intensive sector: the second largest company in pharmaceutical industry, Lek, was in 2002 bought by Sandoz and most of the generic research continues to be carried out in Slovenia. There are also some other FDIs that partially involve also transfer of technology and investment in RDI in the manufacturing sector. Among better known investors are: Aviat Networks, Belimed, Bosch Siemens, Danfoss, Deloitte, Geberit, Goodyear, GKN Industries, Grammer, Grieshaber Logistik, Gruppo Bonazzi, Henkel, IBM, Intesa Sanpaolo, Johnson Controls, Microsoft, Mobilkom, Novartis Pharma, Odelo, Palfinger, Reiffeisen Bank, Renault, S&T, Société Générale, Sumida, Unicredit Bank, Wolford, Yaskawa etc.

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[76] Available at http://www.investeurope.eu/media/385581/2014-european-private-equity-activity-final-v2.pdf (1st October 2015)

[77] The data included in the Invest Europe Report does not include Slovenia as an individual country, but puts it under«other CEE countries«.

[78] Available at http://www.poslovniangeli.si/en#/en/Contact (1st October 2015).

[79] See more on http://www.sid.si/en-gb/Financing (28th December 2015)

[80] Available at http://www.investslovenia.org/business-environment/incentives/ (1st October 2015).

[81] Available at http://www.investslovenia.org/business-environment/fdi-in-slovenia/inward-investment-flows-stock/ (1st October 2015).

No secondary data exists on the break-down between the green and the brown field FDIs, but due to the increased privatisation strategy of the current government, most of the FDI in 2015 was through acquisitions.

5.6 Knowledge markets

The Slovenian Intellectual Property Office (SIPO)[82] is an autonomous body within the Ministry of Economic Development and Technology. It is responsible for the field of industrial property and copyright, with main tasks of carrying out of proceedings for the grant of patents and supplementary protection certificates for medicinal and plant protection products, and proceedings for the registration of industrial designs, trademarks, topographies of integrated circuits and geographical indications, with exception of those relating to agricultural products, foodstuffs, wines and other products obtained from grapes or wine, keeping of registers of industrial property rights and the preparation of legal regulations in the field of intellectual property. SIPO provides a range of information services, such as standard information about Slovenian and foreign patents, trademarks and industrial designs, searches in SIPO databases, searches for similar or identical trademarks, CETMOS (Central European TradeMark Observation Service) – new information service, expert opinions of foreign patent offices on novelty and inventive step, selective dissemination of information and trademark monitoring, preparation of portfolios of industrial property rights, first information on IP as well as organisation of seminars and trainings.

Basic acts regulating the field of intellectual property are:

- Industrial Property Act,
- Copyright and Related Rights Act,
- Act on Protection of Topographies of Integrated Circuits,
- Employment Related Inventions Act, and several international treaties, which Slovenia is bound with.[83]

The promotion of intellectual property rights seldom enjoyed systematic support. Still, in 2010, Slovenia introduced innovation voucher with the purpose to provide support for patenting costs to high tech small firms. Even though initially the value of individual voucher was not particularly high (between €3,000 and €20,000), the measure was well received. Yet, since 2013 no more voucher support had been available.

The issue of intellectual property protection was one of the top problems, experienced by the CEs and CCs, due in part also to their specific legal status. The funder expected them to be legal entities on their own, while the participating organisations, be it from public R&D sector or from business sector, wanted to participate in sharing the potential benefits of IPRs. The Ministry of Higher Education, Science and Technology assisted some CEs to agree on rules with regard to IPRs, similar to EU practice.

Slovenia has no policy or instruments in place for developing knowledge markets for patents and licencing. That the area is important and needs to be supported had been recognised in RISS, yet it remains to be seen if in operationalising the programmes and measures under the next financial perspective 2014–2020 some new instruments are going to be introduced in this area. The only activity worthwhile mentioning in relation to this is annual Innovation Forum, where selected companies and individual inventors present their inventions with intention to find prospective investors. The organizer of the Slovenian Innovation Forum is SPIRIT Slovenia, a public agency with the financial support of the Ministry of Economic Development and Technology. Implementation of the event in 2015 is entrusted to the Centre of Excellence CO BIK in cooperation with Coinvest, Internet Week and Hekovnik.[84]

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[82] More at http://www.uil-sipo.si/sipo/office/tools/home/ accessed (31st December 2015)
[83] More at http://www.uil-sipo.si/sipo/office/about-us/basic-acts/ (31st December 2015).
[84] Available at http://www.slovenia-innovation.si/sfi/en/about-slovenian-innovation-forum (20th October 2015).

5.7 Public-private cooperation and Knowledge transfer

5.7.1 Indicators

Funding: BES-funded/publicly-performed R&D

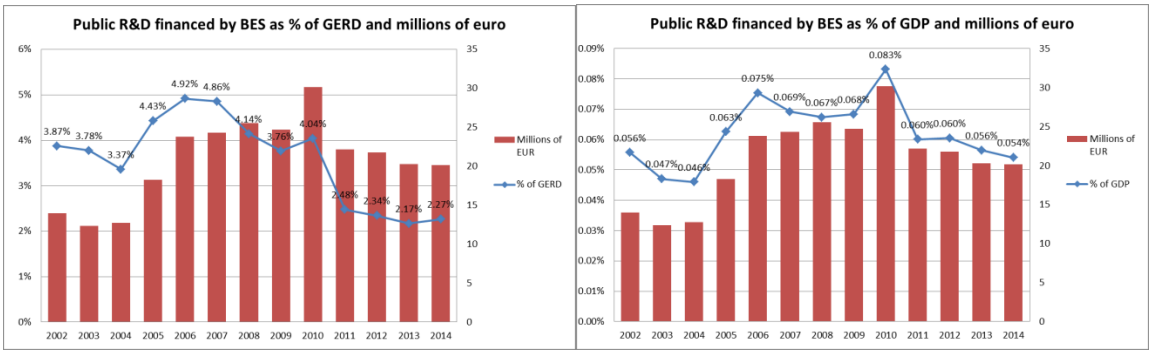

Figure 15 BES-funded public R&D in SLOVENIA as % of GERD (in €m) and % of GDP

The level of the Slovenian business enterprise (BES)-funded public R&D expenditure as a percentage of GERD increased until 2006-2007, and then started to decrease with some minor fluctuations in the years that followed. In absolute terms, the indicators reached a peak in 2010, which coincides with a change in the methodology used by the national statistical authorities to collect R&D data. Then dropped in 2011, when there was a significant increase in the absolute number of researchers attracted by the BES (from 3 887 to 5 407), which may have triggered more intramural expenditure to the detriment of the extra-mural, including the funding to HEIs and PROs.

The indicator expressed as a percentage of GDP showed some fluctuations, to reach its peak in 2010. Since 2011 (BES)-funded public R&D expenditure a percentage of GDP started to decline.

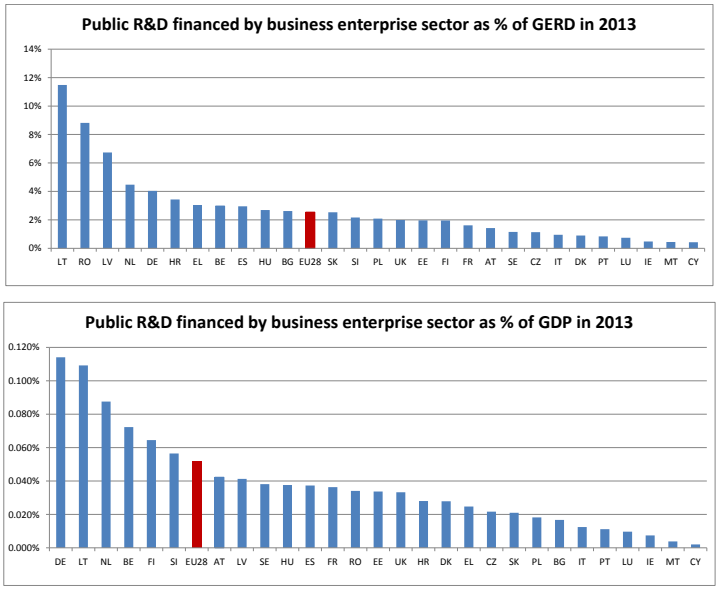

Figure 16 BES-funded public R&D as % of GERD and as % of GDP in 2013 in Member States[85]

The two charts in Figure 16 show the values of BES-funded public R&D in all EU-28 as percentages of GERD and GDP respectively.

[85] 2013 was chosen as the latest data series providing a full comparison within EU-28.

Slovenia's levels are slightly above (when expressed in percentage of GDP) or slightly below (when expressed in percentage of GERD) but still close to the EU-28 average. The most remarkable change, depicted on the graphs above in the drop in the funding in 2011: from €30m to €22m. When expressed in percentage of the total R&D expenditure, this drop is even much more visible: the increase of the GERD lead to a decrease of the share of privately funded public R&D also in relative terms. The GERD increase was due to the higher BES expenditure, which did not affect positively the private funding to the public sector.

A possible explanation could lie in the increased number of researchers and their redistribution between private and public sector which is in favor of the BES. This probably led to the fact BES has developed strong enough research capabilities internally and does not rely heavily on public R&D. All this implies that business channels more funding to intramural R&D and less to PROs. Another reason is offered by the OECD Innovation Policy Review in Slovenia, 2012: "*There is a palpable disconnect between the performance of Slovenia's academic research system and other knowledge-generation and economic sectors, despite many individual linkages and projects. Not only does this disconnect exists – a fact well recognised by government, university and industry representatives – it seems to be reinforced by resistance to change in parts of the research community and other obstacles. Addressing this disconnect is a major strategic objective of the "Audacious Slovenia" documents (RISS and NPHE), which include proposals specifically directed at fostering linkages between the university sector, public research institutes and industry.*"[86]

[86] See more at OECD Innovation Policy Review in Slovenia, 2012 – p.122

Funding: Structural funds devoted to knowledge transfer

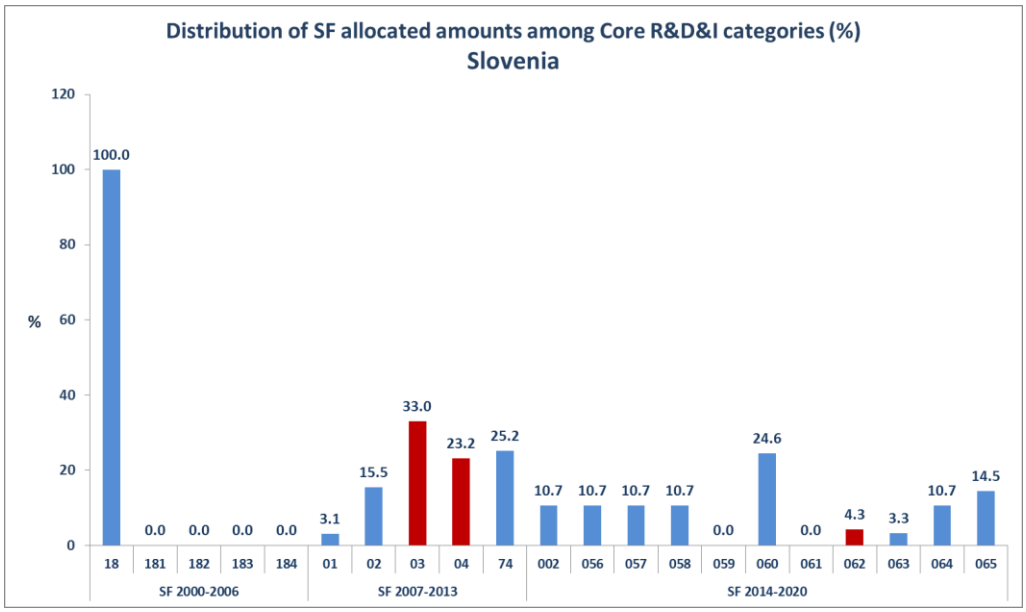

Figure 17 Structural Funds for core R&D activities 2000-2006, 2007-2013 and 2014-2020[87]. We use the categories: 182 (2000-2006), 03 and 04 (2007-2013) and 062 (2014-2020) as proxies for KT activities.

Slovenia has allocated only 3% of its structural funds for core R&D activities to "Technology transfer and university-enterprise cooperation primarily benefiting SMEs" (compared to 56.2% in 2007-2013 and 0% for the 2000-2006 programming period). It is significantly lower than the EU average of 15.7% (the EU average was 26.1% for 2000-2006 and 30.1% for 2007-2013).

[87] Figure 17 provides the Structural Funds allocated to Slovenia for each of the above R&D categories. The red bars show the categories used as proxies for KT. Please note that the figures refer to EU funds and they do not include the part co-funded by the Member State. The categories for 2000-2006 include: 18. Research, technological development and innovation (RTDI); 181. Research projects based in universities and research institutes; 182. Innovation and technology transfers, establishment of networks and partnerships between business and/or research institutes; 183. RTDI infrastructures; 184. Training for researchers.
The categories for 2007-2013 include: 01. R&TD activities in research centres; 02. R&TD infrastructure and centres of competence in specific technology; 03. Technology transfer and improvement of cooperation networks; 04. Assistance to R&TD particular in SMEs; 74. Developing human potential in the field of research and innovation.
The categories for 2007-2013 include: 01. R&TD activities in research centres; 02. R&TD infrastructure and centres of competence in specific technology; 03. Technology transfer and improvement of cooperation networks; 04. Assistance to R&TD particular in SMEs; 74. Developing human potential in the field of research and innovation.
The categories for 2014-2020 include: 002. Research and Innovation processes in large enterprises; 056. Investment in infrastructure, capacities and equipment in SMEs directly linked to Research and Innovation activities; 057. Investment in infrastructure, capacities and equipment in large companies directly linked to Research and Innovation activities; 058. Research and Innovation infrastructure (public); 059. Research and Innovation infrastructure (private, including science parks); 060. Research and Innovation activities in public research centres and centres of competence including networking; 061. Research and Innovation activities in private research centres including networking; 062. Technology transfer and university-enterprise cooperation primarily benefiting SMEs; 063. Cluster support and business networks primarily benefiting SMEs; 064. Research and Innovation processes in SMEs (including voucher schemes, process, design, service and social innovation); 065. Research and Innovation infrastructure, processes, technology transfer and cooperation of enterprises focusing on the low carbon economy and on resilience to climate change.

Cooperation: Share of innovative companies cooperating with academia

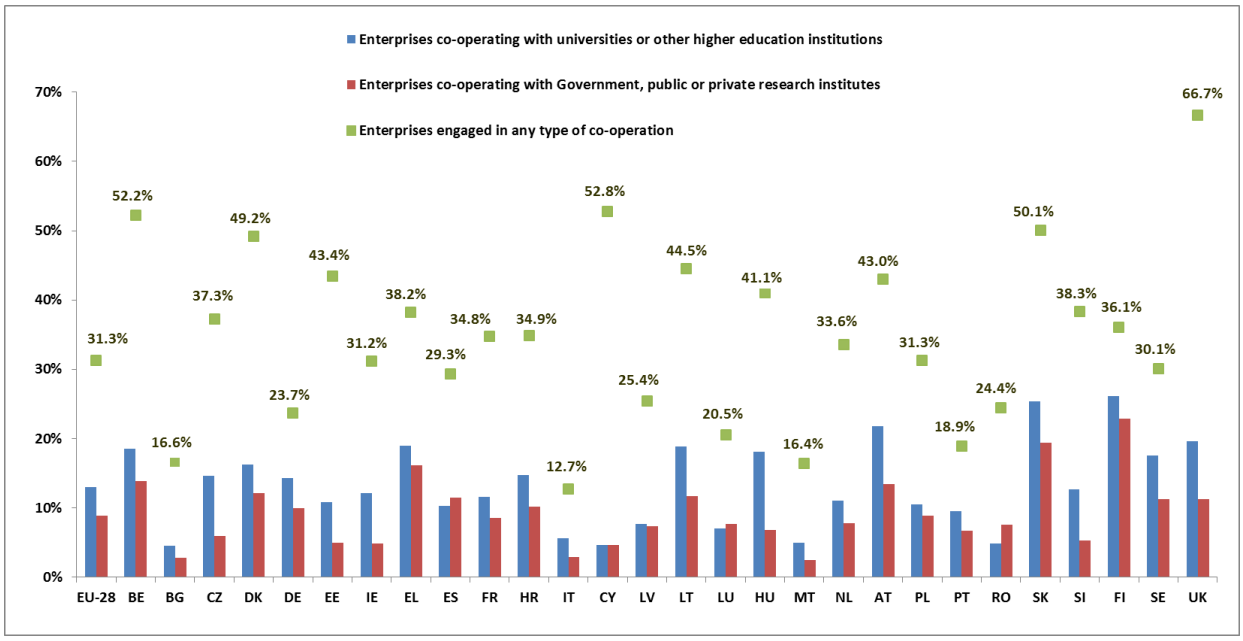

Figure 18 CIS survey 2012 – share of enterprises cooperating with academia

Figure 18 depicts the level of cooperation activities of innovative companies in the EU-28, according to the CIS 2012. In Slovenia more than 38% of the innovative companies are engaged in any type of cooperation, more than the EU average of 31%. Yet, only one third of them (i.e. 12.7% of total sample of innovative companies) cooperate with universities and higher education institutions compared to almost 15% in Croatia and 22% in Austria. Fewer (5.3%) cooperate with government or public or private research institutes (compared to 10.2% in Croatia and 13.4% in Austria). A simple comparison with the EU average rate of cooperation (13% of innovative companies that work with higher education institutions and 8.9% with government or public or private research institutes), shows the space for intensifying cooperation between innovative Slovenian enterprises and public research.

Cooperation: Technology Transfer Offices (TTOs), incubators and technological parks

Slovenia has 4 science parks, the biggest being Ljubljana Technology park, where more than 250 enterprises are located. University incubators were introduced in 2004 at the three main (public) universities. Yet sporadic funding in the past has led to relatively unimpressive activity, at least in the area of business incubation. Technology transfer offices have been established by some universities as an attempt to stimulate cooperation of HEI with business sector, but little systematic record on their impact exists. They are to be supported by the universities themselves and the business they generate[88]. There is few data on the functioning of the above which makes it difficult to assess their impact on KT. Also, some PROs have special offices for technology transfer- the most known one the office at Institute Jozef Stefan.

[88] See more at http://www.mednarodni-odnosi.si/cmo/CIR/CIR4National System of Innovation in Slovenia.pdf (3rd March 2016).

There are 8 Centres of Excellence (CoE) and 7 Competence Centres (CC)[89]. The evaluation of CoE and CC showed that in many instances, both instruments proved a valuable surrounding for knowledge transfer. In their annual reports, both COs as well as CCs report on significant partnerships resulting in joint patents and new codified knowledge (non-technical innovation)[90].

Cooperation: Share of public-private co-publications

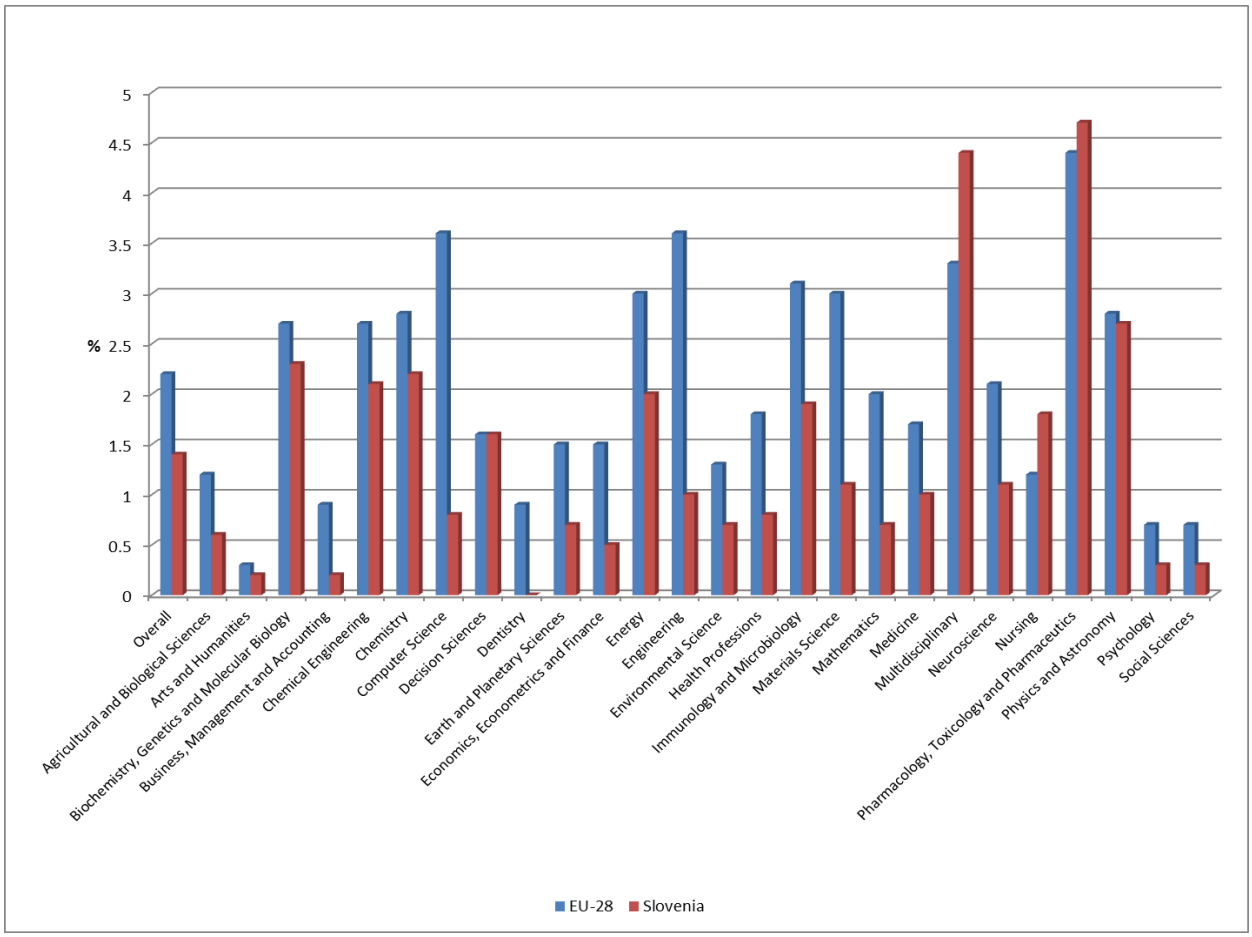

Figure 19 Public-private co-publications by field 2003-2013 in Slovenia[91]

The Figure 19 shows the 2003-2013 average percentage of academia-industry co-publications by field in Slovenia compared to the European average. Data indicate that the percentage of co-publications has almost not changed in the last ten years (1.4% average for 2003-2013), with 1.6% of academia-business publications in 2013. Moreover, in 2013 Slovenia had 39.3 public-private co-publications per million of population compared to 29 for the EU-28 (and 9.9 for Croatia and 74.5 for Austria)[92]. The domains with highest percentage of co-publications (excluding multidisciplinary publications) are pharmacology, toxicology and pharmaceutics; physics and astronomy and biochemistry, genetics and molecular biology.

[89] See more http://www.arhiv.mvzt.gov.si/en/areas_of_work/science_and_technology/centres_of_excellence_and_competence_centres/ (3rd March 2016).

[90] RIO Country Report 2014: Slovenia.

[91] The share of public-private co-publications is derived from the Scival platform and is based on Scopus data (September 2015). SciVal ® is a registered trademark of Elsevier Properties S.A., used under license. The data on public-private co-publications is not fully compatible with the data included in the IUS, due to differences in the methodology and the publication database adopted.

[92] RIO elaboration based on Scopus data.

Cooperation: Inter-sectoral mobility

Slovenia is above the EU-28 average of 47% of researchers employed in business. Starting from 2011 the number of researchers employed by business gradually increased to reach 54% in 2013. This is not surprising in view of the fact BES has been improving its performance and fostering its investment in R&D, transforming into researchers' attractive environment. However, only a small fraction of Slovenian PhDs are employed by industry; 90% work in government or higher education (Republic of Slovenia, 2011, p. 18)[93]. It should be also mentioned that in terms of R&D personnel, Slovenia performs way better than most of EU countries with its 2.07% (headcount) of the total workforce employed in R&D (2012)[94]. More2 study reports on a relatively high researchers' intersectoral mobility in Slovenia (37% compared to 30% of the EU-27 average) but the flows are larger to the government/public sector (19%) than to industry (14%) or private non-profit (10%).

Cooperation: Patenting activity of public research organisations and universities together with licensing income

The Knowledge Transfer Study allows benchmarking the Slovenian performances with the other surveyed countries as well as with the EU average.

According to the European Knowledge Transfer Indicator Survey 2011 and 2012 in Slovenia some patent applications from the public sector are filed (0.9 per 1 000 research staff) and granted (1 per 1 000 research staff), but the country is rather underperforming in this indicator. The same could be observed when it comes to number of license agreements per 1 000 of research staff – Slovenia is at the bottom of the ranking with 0.6. The results indicate Slovenia ranks among the least performing countries when it comes to licensing income from the patents and research agreements.

Cooperation: Companies

There is no available data on the total number of spin-offs in Slovenia. The results from the European Knowledge Transfer Indicator Survey 2011 and 2012 reveals that Slovenia with the score of 0.1 per 1 000 research staff was not among the most successful star-up launchers and is far from the EU average of 1.7.

5.7.2 Policy measures

In accordance with the RISS 2011–2020, knowledge transfer is defined as one of the strategic missions of PROs. In order to attain this objective, it is necessary to enhance the interaction between the education, science and business sector and accelerate the transfer of the results of scientific research to business via contractual cooperation, the sale and licensing of intellectual property and the establishment of new companies (RIS3, 2014: 17). Several instruments have been put in place in Slovenian RDI system to promote knowledge transfer, including the establishment of special institutional set-up, like centres of excellence and competence centres, where cooperation between public sector research organisations and business sector could flourish. Yet most of them are no longer receiving any financial support from the government.

The Centres of Excellence is a measure within the framework of the scientific and technology policy of Slovenia aimed at promoting the concentration of knowledge at priority technological areas and horizontal linking along the entire chain of knowledge development, which is realised on the basis of strategic partnerships between the private sector and academia. This comprehensive inter-disciplinary research and development programme emphasises the horizontal objective of promoting the transition to an energy-efficient economy with low greenhouse gas emissions or strongly promoting the transition to a low-carbon society.

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[93] More at OECD Innovation Policy Review in Slovenia, 2012 (3rd March 2016).

[94] Eurostat: Total R&D personnel and researchers by sectors of performance, as % of total labour force and total employment, and by sex.

The Competence Centres are defined as development and research centres that are managed by partners from industrial sector and link industry and public research sector; they focus on the promotion of the development capability and the application of new technologies in manufacturing new competitive products, services and processes at priority areas of technological development. This function is complementary to that of the centres of excellence; together they constitute an autonomous whole in the area of research and development.

The evaluation of CO and CC (MESS, 2014) showed that in many instances, both instruments proved a valuable surrounding for knowledge transfer. In their annual reports, both COs as well as CCs report on significant partnerships resulting in joint patents and new codified knowledge (non-technical innovation). In spite of legal difficulties in establishing spin-offs from PROs, it is expected that through cooperation with business sector several innovations which were developed especially in CCs will be introduced commercially. The IJS has participated in several spin-offs, which found their place in Ljubljana's Technology Park (e.g., Optec laser manufacturing was a spin-off, later sold to Canon).

The Ministry of Economic Development and Technology had a special support measure which focused on promotion of mobility of researchers from public sector to private companies to strengthen the R&D capabilities of business sector. This is the programme "Young researchers from business sector"[95] – established for linking together business and PROs and for stimulating researchers from business to obtain a PhD. The main purposes of the measure are:

- To rejuvenate the human capital in S&T.
- To employ more researchers in the business sector and following to increase business research groups formation.
- To link basic research with business needs that will foster innovation and research and increase competitiveness of enterprises.
- The measure is based on the Young Researchers' measure, which was modified in 2001 with a special window provided exclusively to junior researchers from business sector. Yet in 2014 and 2015, the Ministry lacked the resources to finance this measure. It is expected that a similar measure will be reintroduced once the Structural funds of the on-going financial perspective are released.
- In 2009 an informal network of Slovenian experts for technology transfer was created (SI.TT). This is a useful development but may require further elaboration and the formalisation of alliance and network structures as in the TTOs in more developed, such as CONNECT (United States), MaRS (Canada) and TTN (Singapore)[96].
- In RIS3 document several measures were planned to further promote knowledge transfer (RIS3, 2014: 17–18):
- Creation of a uniform national system of technology and knowledge transfer;
- Support to the intellectual property licensing and protection
- Support to development and contractual cooperation
- Promotion of the creation of spin-off companies
- Promotion and education concerning the transfer of knowledge and technologies and the importance of the intellectual property system and its entrepreneurial role.

[95] More at http://erawatch.jrc.ec.europa.eu/information/country_pages/si/supportmeasure/support_mig_0017 (3rd March 2016).

[96] See more OECD Innovation Policy Review in Slovenia, 2012.

While no special award system is in place which would promote cooperation between public research sector and business sector, indirectly the level of cooperation can contribute to the individual's standing according to SRA. The monitoring system of individual researchers includes a section where so called socio-economic relevance is being measured: the indicator being the amount of funds generated from non-budget sources (international funds, business sector). Since the position of individual researcher in this system is important for applying for new projects, indirectly the researchers with good track record of cooperation with business sector can benefit significantly.

Open innovation is being discussed at various fora (for example PODIM, annual conference on innovation), but no systematic analysis exists on how much such concept is practiced among Slovenian enterprises. Also, no active measures to support open innovation have so far been introduced.

5.8 Regulation and innovation

There is no special government department in charge of innovation, even though RISS 2011–2020 stressed the need to empower Slovenian Technology Agency to be on par with SRA. Through later changes in the government structures, the sector for entrepreneurship promotion and technology at the MEDT should also be overseeing the innovation policy and monitor the regulation on innovation, should such exist.

Ever since the evaluations of the innovation policy by OECD and ERAC no further central evaluation of the impact of the effects of regulation on innovation was carried out. The assessment of RISS needs to be prepared by the government till the end of 2015 and it is expected that some of assessment will address innovation regulation and policy as well.

5.9 Assessment of the framework conditions for business R&I

RISS 2011–2020 was the first legal document where the RDI policy were treated together and merged into a single framework. This was at the time considered as a major break-through which would also allow for more systematic supply and demand-side policies and instruments. However the later dissolution of the single ministry, changes in the organisational structure of RDI and the slow implementation of RISS 2011–2020 have resulted in a situation that Slovenia now lacks a comprehensive innovation policy. There is nearly non-existent policy coordination and, as already mentioned very limited if any, systematic evaluation.

The most developed system of support measures for business sector RDI was in place during 2008–2013, also due to the availability of EU structural funds. While there was some overlap in terms of similar support measures implemented by different agencies, the business sector had enjoyed both R&D tax subsidies as well as subsidies from TIA for joint strategic research projects, joint development-investment projects and young researchers from business sector, from PAEFI for technology parks and several voucher schemes and from SEF direct investment grants to start-up enterprises in technology parks and incubators, several types of guarantees, including the guarantee for loans for technological projects, equity finance line for SMEs, co-financing (subsidies) of new technical equipment in SMEs. On top, the MHEST (now MESS) ran a scheme of CEs and CCs, where both instruments involved also business sector and Ministry of Economy financed the formation of development centres.

With the end of the financial perspective 2007–2013 and budget cuts, practically all of the support measures have ceased to be financed by the government. Only SEF managed to maintain its programme. TIA and PAEFI, merged in SPIRIT, maintain only promotional activities (annual innovation forum) and some support for intermediary institutions.

The frequent changes of the government/ ministers have resulted in weak innovation policy, where previous support measures are no longer available and new measures are awaiting the next round of structural funds. Due to the delays in the preparation of the OP and still unfinished RIS3 it is difficult to assess how the government plans to support business sector research and innovation, besides the tax subsidy. At various fora ideas that in the next programming period Slovenia will move from subsidies to providing more favourable credit was launched, yet with no specific instruments in place at the moment it is difficult to confirm this trend.

6. Conclusions

6.1 Structural challenges of the national R&I system

The structural challenges remain the same as they were during the last five years. The first issue is the sustainability of the level of RDI financing, especially from the public resources. As already explained, during the last five years the budget outlays for RDI decreased significantly and the trends and provisions for the next two years are not advantageous for the field of RDI, in spite of small increase of resources planned for 2016. Even though business sector has managed to maintain its level of investment in R&D, the public sector R&D organisations have experienced serious cuts in their budgets.

The next challenge, identified also in the previous reports, as well as by the external institutions (such as the European Commission), is the insufficient coordination and streamlining of the RDI and innovation policy, including appropriate governance structure and organisational set-up of the support infrastructure. Partly due to the separation of the science and technology, each being the responsibility of a different ministry, but also due to the consequent staff changes in MEDT, the lack of coordination seems to remain unresolved issue. In addition, the Government Office for Development and European Cohesion Policy is an important player with its responsibility over Smart Specialisation, which will require additional cooperation for its smooth implementation. The implementation section of RIS3 (2015) provides for a new body, headed by the three secretary-generals of the three ministries: MESS, MEDT and GODC to coordinate the implementation of RIS3. This might be an opportunity to build coordination body for all matters in RDI policy.

What is a question for special analysis is the weak link so far between investments in RDI and the overall performance of the business sector. The insufficient effectiveness of investing in RDI in the case of Slovenia was identified in IMAD's Development Report (2014). While theory acknowledges certain time lag between investing in new knowledge and technology and turning this into economic growth, it seems that Slovenian business sector is rather segmented in terms of investing in RDI with still several segments of industry not sufficiently active in innovation to make major contribution to value added and to the competitiveness of the country. To fully answer the question on R&D investment effectiveness one would need to carry out sector-level analysis as well as micro-level entrepreneurial activity analyses. A few research attempts in this field show that there is a linkage between those investing above average in R&D are also above average in value added, employment and export creation (Jaklič et al. 2012, Burger et al. 2014)

Related to this is another concern, related to decrease in public financing of R&D. PROs and HEIs are adjusting to lower financing by cutting their investments in research infrastructure and to certain extend also in labour force, but if the financial crunch continues in the future, more drastic cuts will be needed. This may have negative effect on research output and add to the brain drain already on the increase. Only the research teams with modern research infrastructure in public sector are attractive for the business sector[97], but with the outdated equipment and reduced manpower researchers in public sector risk that their capacities will lag further behind research frontier and will thus loose competitiveness both in international research cooperation as well as partners in the research projects with business sector. This may further deteriorate already insufficient links between the public R&D and private sector.

[97] This was amply demonstrated in business sector cooperation in CEs, where ability to access top research equipment was seen as a major advantage for business sector to join the CEs. (Bučar et al., 2014)

Challenge	Policy measures/actions addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
Sustainability of the level of R&D financing, especially from the public resources[98]	Continued decrease of public resources for RDI; Lack of vision and understanding of RDI on part of political parties to reverse the negative financing trends.	If present trends continue, many of the positive elements of NIS may be lost
Insufficient coordination and streamlining of the RDI and innovation policy including governance structure and organisational set-up of the support infrastructure	Formation of a new body to supervise the implementation of RIS3.	Too early to assess, since the body is only going to be established in early 2016.
Links between RDI investment and economic growth	Analytical work of some groups (IMAD) explaining time lag and innovation capacity, but no specific measure detected yet.	The rate of return is proposed as an important indicator of success of the planned support measures for financial perspective 2014-2020.

6.2 Meeting structural challenges

The exposed structural challenges cannot be strengthened individually, but collectively, since they are interlinked and influence each other. The first step, which is especially in the eyes of public R&D organisations most necessary, would be to stop the decrease of investments for RDI from the public funds. The budget outlay for 2016/17 is showing only a modest reversal trend.

The next step is to enhance the cooperation among MESS, MEDT, GODC and their agencies within the field of RDI. A joint, coordinated policy which could also extent to forming single/ joint RDI measures implicitly linking the PROs and private enterprises, would effectively contribute to innovation policy. Finally, the most important strategic document in the field, RISS 2011 – 2020 should receive the necessary attention of the government and its implementation should be encouraged. Because of the frequent changes at the ministries, responsible for R&D&I, the RISS 2011 – 2020 has not been implemented as expected. While the gap of slow implementation of the strategy for the past four years would be difficult to catch, the organisational and legal changes that RISS 2011 – 2020 proposed would still significantly improve the effectiveness of RDI sector in Slovenia and resolve many of the identified structural challenges.

[98] There are expectations that the availability of resources from ESIF will reduce this decline in budget allocation, but on the other hand, the RIS3 is addressing only some sectors and a selected level of research (applied and developmental).

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Abbreviations

MESS	Ministry of Education, Science and Sports
BERD	Business Expenditures on R&D
CC	Competence Centres
CESSDA	Council of European Social Science Data Archives
CERIC	Central European Research Infrastructure Consortium
CERN	European Organization for Nuclear Research
CMEPIUS	Center Republike Slovenije za mobilnost in evropske programe izobraževanja in usposabljanja (Center of RS for Mobility and European Educational and training Programmes)
CE	Centre of Excellence
COBISS	Cooperative On-line Bibliographic System & Services
COST	European Cooperation in Science and Technology
DARIAH	Digital Research Infrastructure for the Arts and Humanities
ERA	European Research Area
ERA-NET	EU scheme for networking of research activities conducted at national or regional level
ERAC	European Research Area and Innovation Committee
ESF	European Social Fund
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EUREKA	Intergovernmental organisation for market-driven industrial R&D
FAIR	Facility for Antiproton and Ion Research
FP	Framework Programme
FTE	Full time equivalent
GBAORD	Government Budget Appropriations or Outlays for R&D
GDP	Gross Domestic Product
GERD	Gross Expenditures on R&D
HEIs	Higher Education (Institutions)
HORIZON2020	EU R&D programme for 2014-2020
IMAD	Institute for Macroeconomic Analysis and Development
ISCED	International standard classification of education
IZUM	Institute of Information Sciences
MEDT	Ministry of Economic Development and Technology
NIS	National Innovation System
NPHE	National Programme of Higher Education
OP	Operational Programme
PAEFI	Public Agency for Entrepreneurship and Foreign Investments
PCT	Patent Cooperation Treaty
PROs	Public Research Organisation(s)
RDI	Research, Development and Innovation

RGP	Research Group Programme
RI	Research Infrastructure
RISS	Research and Innovation Strategy of Slovenia
RIS3	Smart Specialisation Strategy
SEF	Slovenian Enterprise Fund
SHARE	Survey of Health, Ageing and Retirement in Europe
SICRIS	Information System on Research Activity in Slovenia
S&T	Science and Technology
SRA	Slovenian Research Agency
SDS	Slovenian Development Strategy
SORS	Statistical Office of the Republic of Slovenia
SMEs	Small and Medium-sized Enterprises
SPIRIT	Public Agency of the Republic of Slovenia for the Promotion of Entrepreneurship, Innovation, Development, Investment and Tourism
SSDA	Social Science Data Archives
SSH	Social Sciences and Humanities
TIA	Technological Agency of Slovenia

List of Figures

List of Tables

Annex 1 – List of the main research performers

Agricultural Institute of Slovenia

Educational Research Institute;

Geological Survey of Slovenia

Institute for Hydraulic Research

Institute of Metals and Technology

Institute for Ethnic Studies

Institute for Economic Research;

Jozef Stefan Institute;

Institute of Contemporary History;

National Institute of Chemistry;

National Institute of Biology;

National Building and Civil Engineering Institute

Scientific Research Centre of SASA

Slovenian Forestry Institute

Urban Planning Institute

Annex 2 – List of the main funding programmes

Name of the funding programme	Timeline	Budget, 2014	Target group
Research Group Programmes	3 to 6 years	€55.6 million	Nation-wide RDI sector
Targeted Research Programmes	2 to 3 years	€0.61 million	Nation-wide RDI sector
Basic and applied research programmes	2 to 3 years	€24 million	Nation-wide RDI sector

Annex 3 – Evaluations, consultations, foresight exercises

Evaluation of Centres of Excellence and Centres of Competence (authors Maja Bučar et al.). Ljubljana, 2014.

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doi:10.2791/869835

ISBN 978-92-79-57766-6