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Chioncel, M.F.

Del Rio, J.C.

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Contact information: JRC-B7-NETWORK@ec.europa.eu

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RIO Country Report 2017

The R&I Observatory country report 2017 provides a brief analysis of the R&I system covering the economic context, main actors, funding trends & human resources, policies to address R&I challenges, and R&I in national and regional smart specialisation strategies. Data is from Eurostat, unless otherwise referenced and is correct as at January 2018. Data used from other international sources is also correct to that date. The report provides a state-of-play and analysis of the national level R&I system and its challenges, to support the European Semester.

Summary

Romania maintained a relatively stable macroeconomic situation, low inflation and external deficits despite the political instability. The real GDP growth accelerated in 2017, expanding by 5.8% in the first half of the year, driven by private consumption, tax cuts, and increase of the wages in both public and private sectors and low rates of inflation. Public investment contracted due to a slow uptake of new projects financed by EU funds under the 2014-2020 programming period. The high share of employment in agriculture, the industry dominated by traditional manufacturing sectors and low investments in modern equipment are factors undermining productivity growth. In 2016, the Romanian expenditure on R&D (GERD) was 0.48% of GDP compared to 0.49% in 2015 and 0.38% of GDP in 2014, the lowest value in the past years. Romania is a modest innovator. Competitiveness is affected by a weak R&I capacity coupled with a low demand for R&I due to the structure of the economy and the reluctance of firms to engage in these activities. The R&D investment in the business sector (BERD) increased from 0.16 in 2014 to 0.27% of GDP in 2016, yet remains significantly lower than the EU28 average (1.30% of GDP).

Challenges for R&I policy-making in Romania

Increase public R&I expenditure: The R&I system is chronically underfunded. With a GERD value per capita 14 times smaller than the average spent in EU28 (Eurostat, 2017), Romania had in the last ten years, one of the lowest, if not the lowest, GERD in EU28. The National Strategy for RDI 2014-2020 (NSRDI 2020), adopted on 21 October 2014, reaffirmed a 1% target for public GERD by 2020. However, since 2008, the R&I system has shown a trend of underfunding, lower than the targets assumed by national strategic documents. In November 2017, the ex-ante conditionality for RDI was acknowledged by EC as fulfilled. This will ensure the access to the ESIF funds dedicated to RDI through the relevant national operational programmes.

Significant brain drain generating lack of skilled human resources: Romania has one of the highest share of researchers working abroad (World Bank, 2014). Skills shortages exist in the ICT sector, health professionals, teachers (CEDEFOP, 2016a), skilled trades, engineering, transport and distribution (Manpower Group, 2015). The recent wages increases in health and education sectors provide marginal improvements. The current Programme of Government made the harmonisation and the increase of the wages in education and health sectors one of its priority. However, to date the staff remains underpaid, while the foreseen 2018 relevant measures have created significant controversies. The Government Ordinance OUG 32/2016 (and the Methodology adopted in August 2017) stipulates the exemption of the tax for personal income resulted from R&I activities, aiming to provide stimulus to staff involved in RDI activities.

Improve the governance of the R&I system at national, regional and institutional level. Ensure predictability and stability: The R&I governance is characterised by excessive and burdensome bureaucracy, predisposition to over-regulation, frequent legislative and institutional changes, lack of human resources. In less than two years period, five ministers held responsibility for RDI, under four distinct governments. The political changes affected the RDI policy and system, triggering delays, ad-hoc changes. Coordination mechanisms and organisms are set-up in theory; yet they may be deemed as insufficient in the absence of human resources, of political determination and culture willing to make them functional.

Enhance the efficiency of public expenditure in R&I and education: The limited funds for R&I are dissipated across a large R&I system which lacks funding schemes rigorously based on the results of the regular evaluation of the research and education performance. Implementation of the actions foreseen in the NSRDI 2014-2020 enables in theory monitoring and evaluation. The project (SIPOCA27), funded in August 2016 will deliver a methodology for the evaluation of the implementation of NSRDI 2014-2020, to be applied for the mid-term evaluation of the Strategy. The project will also make

operational a platform integrating the Registry of Researchers in Romania, the National Registry of Research Infrastructures, linked with the public information available on RDI projects. The National Roadmap for large research infrastructures was finalised in November 2017.

Improve the framework for private RDI investment and the collaboration with the public sector: The level of R&I funds invested by businesses is very low: 0.18% of GDP in 2015 (EU28 average in 2013: 1.12%). The highest proportion of these funds is spent on R&I performed by the business sector and a very small share (0.03% of GDP) is provided to the public sector. This indicates a low level of science-business collaboration and a weak commercialisation of public research results. The NSRDI 2014-2020 sets targets in terms of activating the business sector and increasing the economic impact, with a focus on the smart specialisation domains. This concerted action hopefully will create a momentum for the business to become involved in the RDI policy design and tailor it to support the economic needs. The business sector shows signs of an increasing interest in innovation, as revealed by the emergence of hubs, especially in ICT.

Main R&I developments in 2017

- [New coalition government in power](#)
- [The former National Authority for Scientific Research and Innovation \(NASRI\) is replaced by the Ministry of Research and Innovation \(Government Decision 13/2017\)](#)
- [Massive street protests](#)
- [The four RDI advisory councils were reorganized and reactivated in April 2017 \(MRI orders no 211,212,213,214/ 19.04.2017\)](#)
- [NSRDI is updated to include ALFRED \(Government Decision 81/2017\)](#)
- [New regulation regarding the functioning and organisation of the four RDI consultative councils](#)
- [The order regarding the approval of the procedure for granting the fiscal incentives for R&D activities was agreed \(Joint order Ministry of Public Finances 2326, MRI 2855/29.08.2017\)](#)
- [Increase of the income ceilings for the specialists involved in RDI projects funded by public funds \(Government Decision 751/2017\)](#)
- [The Infrastructures Roadmap is finalised \(September 2017\) and final version approved \(Order MRI 624/2017\)](#)
- [EC through official letter agrees that the R&I conditionality was fulfilled](#)

Smart Specialisation Strategy

The four smart specialisations (S2) aggregated at national level, by NSRDI, are: (1) bio economy, (2) ICT, space, security, (3) Energy, environment, climate change and (4) eco-nano-technologies and advanced materials. The project „SIPOCA 27”¹ implements a strategic orientation mechanism, aiming to identify smart specialisation niches through an active entrepreneurial discovery process (EDP). All seven regions developed their own RIS3, through an active EDP process. Most of the RIS3 include monitoring output & impact indicators and the relevant sources. The Regional Development Agencies (RDA), with the involvement of the regional RDI and economic stakeholders identified the projects which are submitted under ROP calls (to be closed in January 2018). All the identified smart specialisation fields in the seven regions match the S&T identified in the NSRDI 2014-2020 and the Strategy for Competitiveness.

¹ *Developing the Administrative Capacity of the Ministry of Research and Innovation to implement actions established in the National Strategy for Research, Technological Development and Innovation 2014-2020”*

Foreword

The R&I Observatory country report 2017 provides a brief analysis of the R&I system covering the economic context, main actors, funding trends & human resources, policies to address R&I challenges, and R&I in national and regional smart specialisation strategies. Data is from Eurostat, unless otherwise referenced and is correct as at January 2018. Data used from other international sources is also correct to that date. The report provides a state-of-play and analysis of the national level R&I system and its challenges, to support the European Semester.

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Authors

Mariana Chioncel, University of Bucharest (Bucharest, Romania)

Juan Carlos del Rio, European Commission, Directorate-General Joint Research Centre, (Brussels, Belgium)

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1 Economic context for R&I

Romania managed to maintain a relatively stable macroeconomic situation, low inflation and external deficits despite the political instability. The 4.8% GDP growth in 2016 was driven primarily by domestic demand (68% of GDP) fuelled by the fiscal relaxation² and wage increases³. The real GDP growth accelerated in 2017, expanding by 5.8% in the first half of the year, driven as in the previous year by private consumption, tax cut, increase of the wages in both public and private sectors and low rates of inflation. Public investment contracted due to a slow uptake of new projects financed by EU funds under the 2014-2020 programming period. GDP is forecast to grow by 5.7% at the end of 2017, 4.4% in 2018, and 4.1% in 2019. While private consumption is projected to decelerate in 2018 is expected to continue acting as the main growth driver, while investment is forecast to increase due to the implementation of EU funded projects.

The cut by an additional one percentage point of the standard VAT at the beginning of 2017, the Law repealing 102 non-fiscal rates are among the most important fiscal measures adopted in 2017. The minimum wage was increased by 16% from February 2017, while the wages in the health and education sectors were increased by 15% in January 2017 and by 20% in local administration from February 2017. The tax cuts had a negative effect on tax revenues, while the increases of public wages and social benefits increased the expenditure. Growth is expected to remain consumption driven, boosted by tax cuts and increases in public wages and pensions. The current account deficit is currently forecast to reach 3.1% of GDP by the end of 2017, and further deteriorate to 3.2% in 2018 and 3.4% in 2019. While the values are better than those forecasted in spring (3.5% in 2017), they are above the 3% of GDP reference value agreed in the post assistance programme (EC, The 2017 Spring forecast; The 2017 Autumn forecast). Between 2009-2015, Romania benefited from the assistance programme jointly run by the European Commission (EC), the International Monetary Fund (IMF) and the World Bank (WB). Post-programme surveillance to monitor Romania's capacity to repay the joint loan started in October 2015 and will continue until at least 70 % of the loan has been repaid, due in spring 2018. The overtaking of the 3% GDP deficit can trigger penalties.

In 2017, the annual average inflation is forecast to become positive (+1.1%) after two consecutive years of negative values, and to further grow to 3.0% in 2018. The urban-rural disparities and the ratio between the regions with the highest and lowest GDP per capita are particularly pronounced. (EC, 2015 - Regional policies and Europe 2020). The unified wage law enacted in summer 2017 is set to increase all public wages by 25% in January 2018, to cut the personal income tax rate from 16% to 10%, however compensated by the shift of social security contributions from employers to employees. The operationalization of these measures may represent a risk to the fiscal projections. Among other risk factors is the increase of the wages outpacing the productivity growth and more generally, the uncertainty regarding the government's policies.

The employment rate of people aged 20-64 was 66.3% in 2016, while in 2017 fell to its lowest levels in more than twenty years. However, the low levels of unemployment are coupled with one of the highest inactivity rate in EU of the working-age population and of youth (15-24 years) neither in employment nor in education and training. Poverty and social exclusion remain high.

Romania is a modest innovator. Competitiveness is affected by a weak R&I capacity coupled with the low demand for R&I due to structure of the economy and the reluctance of firms to engage in these activities (EC, 2017 Country Report: Romania). Romania has

² The cut by an additional 1% of the standard VAT rate at the beginning of 2017, the Law repealing 102 non-fiscal rates are among the most important fiscal measures adopted in 2017, with an economic impact.

³ The minimum wage was increased by 16% from February 2017, while the wages in the health and education sectors were increased by 15% in from January 2017 and by 20% in local administration from February 2017.

the second-lowest labour productivity in the EU, although on a positive side it showed a high pace of change. (EC, 2015 Country Report: Romania). However, the situation improves significantly when assessing the wage-adjusted labour productivity ratio⁴: professional, scientific and technical activities are on the third top position in EU. The IT, banking, automotive and consulting sectors show higher levels of productivity, mainly due to their competitive nature and the presence of many international players. Several factors are undermining the productivity. The share of employment in agriculture is the highest in the EU, the farmer population is aging and lacks training while the farm structure is not efficient for the productivity. The industry is dominated by traditional manufacturing sectors and shows low investments in modern equipment. The public sector neither encourages performance nor penalizes activity below standards⁵. The lack of alternatives in a poor job market generates a situation in which many employees are stuck with their jobs. Many companies are still struggling to find the equilibrium between revenues, cost and number of employees: some companies have people in excess, in some the employees are overworked and often become dissatisfied, tired and less productive. *'The minimum wage increased in Romania faster than labor productivity, affecting competitiveness, discouraging investments and the employees'*⁶ efforts to improve. The low quality of life⁷, the labour conditions, the mistrust in the judiciary system generated a social apathy which likely also affects the productivity.

1.1 Structure of the economy

In 2016, services with 65.9% of GDP value added have the highest share, followed by industry (26.7%), slightly lower than in 2015 and agriculture (7.6%) (World Bank, 2017)⁸. The share of "Public administration, defense, education, human health and social work activities" although it showed a sharp increase remains the lowest, while the share of employment in agriculture⁹ remains the highest in EU regardless its significant decrease, from 42.4% in 1995 to 26.6% in 2015. (EUROSTAT, 2017)

The industry has high potential for growth. However, the state-owned enterprises, dominating key economic sectors, such as energy and transport tend to underperform. The wholesale and retail trade repair of automotive industry has the highest share in the total turnover (40%), followed by manufacturing (28%). Romania has a growing automotive cluster with a network of suppliers and components manufacturers, many of them working in Joint Ventures with foreign partners. Turnover from innovation is among the lowest in EU, showing a decreasing trend since 2006. During 2012-2014, the share of innovative companies decreased with 7.9% while the share of employees in these companies with 12.3% compared to 2010-2012 (INSS, the latest available data).

The latest available data show that in 2011 a share of 40.75% of the total value added was concentrated in foreign controlled enterprises. (EUROSTAT, 2017)¹⁰ SMEs in Romania provide half of the total value added (49.9%) and 67.5% of total employment, slightly more than the EU average (66.8 %) (EC, 2016: Annual report on European SMEs 2015/2016). During 2010-2015, the value added in SME increased by 29% and is

⁴ labour productivity ratio is an indicator of labour productivity defined as value added divided by personnel costs which is subsequently adjusted by the share of paid employees in the total number of persons employed, or more simply, apparent labour productivity divided by average personnel costs (expressed as a ratio in percentage terms).

⁵ Coefficients such as stability (continuity in the same institution without any break) are used as financial incentives in some public institutions, as HE

⁶ IMF's president representative for Romania and Bulgaria, Alejandro Hajdenberg

⁷ the second highest share in EU of people at risk of poverty or social exclusion

⁸http://databank.worldbank.org/data/views/reports/ReportWidgetCustom.aspx?Report_Name=CountryProfile&Id=b450fd57

⁹ "Agriculture, forestry and fishing". Overall the country agriculture has the capacity to feed almost the double of its population, but it is underdeveloped and sluggish, with a farming structure that does not encourage productivity. Romania has 3.7 million agricultural holdings out of which a significant number of farms have an economic size less than 4000 €.

¹⁰ <http://ec.europa.eu/eurostat/tgm/table.do?tab=table&plugin=1&language=en&pcode=tec00024>

forecasted to grow by 8% annually. The main drivers of SME value added growth were the coal, mining supplements and petro-gas extraction sectors, which experienced an increase of more than 100% in 2010-2015, mainly due to the international investment in the national fossil fuel industry. This growth generated in return an increased demand for transportation and storage. Another SME sector performing particularly well in recent years is represented by the *administrative activities*, which benefited from increased demand from multinational companies establishing branches in Romania. (EC, 2016 SBA Fact Sheet - Romania).

Other notable aspects are the low number of top R&D spending enterprises, low average R&D spending of these enterprises, lower share of employment in High and Medium high-tech manufacturing, a larger share of enterprise births, lower GDP per capita, a higher growth rate of GDP, underdeveloped basic transport infrastructure, unstable regulatory framework, a lower and negative growth rate of population and lower population density. (EC, European Semester 2017).

1.2 Business environment

According to **Doing Business 2017**¹¹, Romania stands in 2016 on position 36 (1 position up from previous year) concerning the ease of doing business. Starting a business became more difficult by increasing the time needed to register for VAT, lowering its ranks in this dimension to 62 (2015: 45). Starting a business requires 6 procedures and 12 days (2015: 5 procedures and 8 days). The weakest dimensions such as getting electricity (rank 134) and dealing with permit for construction (95) remain poorly or not addressed. In November 2016, a new Law on permits for construction was passed, yet ranking has not improved. Another concern is the time needed to resolve insolvency procedures, which remains one of the longest in the EU (3.3 years).

According to **Global Innovation Index 2017**¹², Romania is underperforming in Human capital & research (the weakest sub-pillars expenditure on education as % GDP and per pupil) and Market and Business Sophistication. In entrepreneurship, Romania's performance is above the EU average (EC 2016 SBA Factsheet). Some indicators have increased others have worsened since the preceding year.

Romanian business takes limited advantage of the digital infrastructures and services in enhancing the efficiency and productivity, but also in reaching customers and online sales. Only 7.4% SMEs sell online and among these only 1.9% of SMEs sell online cross-border. The country, with an overall **Digital Economy and Society Index (DESI)**¹³ score of 0.35, is part of the catching up cluster and ranks the lowest in EU28. Romania ranks also the lowest in the EU when discussing the Integration of Digital Technology by businesses (EC, 2016 Digital Scoreboard)¹⁴. Responsive administration' understood as public administration being responsive to the needs of SMEs, improved since 2008. However, the interaction between SMEs and public authorities through an online platform is relatively low: in 2013 only 65% of SMEs interacted online with the authorities, compared with an EU average of 88% (EC, 2016 SBA Factsheet).

The country is still at a preliminary stage in the diversification and offer of financing resources. The venture capital (VC) investment is low and the VC market is underdeveloped, with few visible venture capital providers on the market. Access to financing for SMEs is limited due to both supply- and demand-side constraints, the SMEs

¹¹<http://www.doingbusiness.org/~media/WBG/DoingBusiness/Documents/Annual-Reports/English/DB17-Chapters/DB17-Mini-Book.pdf?la=en>

¹² <https://www.globalinnovationindex.org/gii-2017-report>

¹³ The Digital Economy and Society Index (DESI) is a composite index developed by the European Commission (DG CNECT) to assess the development of EU countries towards a digital economy and society, aggregating a set of relevant indicators structured around 5 dimensions: Connectivity, Human Capital, Use of Internet, Integration of Digital Technology and Digital Public Services.

¹⁴ <https://ec.europa.eu/digital-single-market/en/scoreboard/romania> Digital Economy and Society Index1 2016, Country Profile

being perceived as risky for banks. All the main strategic documents for the current policy cycle acknowledge the lack of financial instruments and suggest various complementary funding mechanisms.

The processes for business formation and operation have been streamlined, but complicated administrative procedures still constrain the delivery of services. Analysing the recent reforms related to doing business, most of them target the tax regulation, few the labour regulation and insolvency. The highest concern remains related to Rule of Law, the Freedom from Corruption and Labour Freedom. (EC, RO Country Report 2016).

2 Main R&I actors

Starting January 2017, the **National Authority for Scientific Research and Innovation (NASRI)**, responsible in the past years for R&I policy and for the coordination of the national R&I system was restructured as the Ministry of Research and Innovation (MRI). MRI is responsible for the overall implementation of the two main funding instruments of the National R&I Strategy: the National Plan for RDI 2015-2020 (NP3) and the Competitiveness Operational Programme (COP), Axis 1, for which acts as intermediary body. The NP3's execution was outsourced to a large extent to the **Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI)**, but also to the **Romanian Space Agency (ROSA)** and to the **Institute for Atomic Physics (IFA)**. The Consultative College for RDI, the National Council for Scientific Research, the National Council for Technological Transfer and Innovation, the National Council for Ethics of Research, Technological Development and Innovation have the role of consultative bodies, supporting the MRI in developing the RDI policies, monitoring their implementation and the compliance with the ethics rules in research. Various other Councils and Consultative Bodies with different roles provide support for different components of the RDI activity.

The RDI system consists primarily of 263 public RDI organisations and around 600 companies. Among the public organisations, 56 are public universities, 48 national RDI institutes, while 65 research institutes and centres belong to the Romanian Academy. The National Network for Innovation and Technological Transfer consists of 50 centres of technological transfer and information, business and technological angels and S&T parks.

In 2015, there were 102 accredited Higher Education Institutions (HEIs) (56 public and 46 private universities) and 583 faculties (403 public and 180 private). The number of academic staff decreased with 11% from 2009-2010 to 2014-2015. Although diverse as size and coverage of specialties, the universities are almost identical in their organizational structures and have very similar programs in the same subject, partly due to overly prescriptive accreditation regulations (Miroiu and Andreescu, 2010). The universities have full freedom to manage their research budget, to autonomously design research agendas and topics of research specialisation, yet limited due to the budget constraints. The HES although performs the lowest share of GERD (in 2016 only 0.05% of GDP, compared to 0.16% performed by PROs and 0.27% by business), yet it has the highest scientific output both in terms of ISI publications and patents.

The Romanian Academy has its own chapter in the national budget, distributing its budget across 65 research institutes and centres, self-claimed as performing 'fundamental research'. The Academy's public R&D budget for 2016 was set at around €64mn (compared to €100.7mn in 2014). Several branch academies – primarily the Academy of Agricultural Sciences and Forestry, and the Academy of Health Sciences, operate each of them around 25 institutes.

The very low BERD intensity in Romania had shown a decreasing trend in the last decade, with a light revitalisation in 2015 and 2016 (increasing from 0.16% of GDP in 2014 to 0.21% in 2015 and 0.27 in 2016). Only around 56.4% of the large companies have some innovative activity. The SMEs sector, mainly formed by subsistence enterprises, perform R&D activities to a limited extent: only 38.7% medium and 27.5 % small companies were labelled as having an innovative component. Although in 2017,

Romania does not have any company in the top 1000 EU R&D performers, in 2016 it entered for the first time the top with one company¹⁵ (EC, JRC Seville, R&D Scoreboard, 2017, 2016).¹⁶ In the period 2011-2015, the business sector had a 28% contribution to the total country patent activity.

Currently there are 45 clusters registered in the Romanian Cluster Association – CLUSTERO. Among the most important clusters and cluster agglomeration could be mentioned Auto Muntenia Competitiveness Pole and “Cluj IT Cluster”. The 'hubisation' trend has led to pre-acceleration and acceleration programmes, mainly in the ICT field.

The role of private non-profit (PNP) is marginal and the share of R&D funded and performed by PNP is almost naught. The extremely limited involvement of the private non-profit in R&I is a result of mixed factors: lack of tradition, little science awareness, the relative low importance of R&I compared to more acute problems that affect the society and its citizens and concentrate the attention of non-profit initiatives.

3 R&I policies, funding trends and human resources

Main R&I policy developments in 2017

<p>New coalition government in power (4th of January 2017)</p>	<p>After the parliamentary election of December 2016, Romania’s Social Democrat party (PSD), together with the Alliance of Liberals and Democrats holds the majority of the seats in Parliament. After weeks of uncertainty, on the 4th of January 2017, a new left-leaning coalition government, headed by S Grindeanu was approved by the Parliament.</p>
<p>Restructuring of the former National Authority for Scientific Research and Innovation (NASRI) as the Ministry of Research and Innovation.¹⁷ (January 2017)</p>	<p>The new government brought also some institutional changes for the R&I system. The new Ministry of Research and Innovation (MRI) replaced the National Authority for Scientific Research and Innovation (NASRI), which in the last years held the responsibility for drafting R&I policies and for the coordination of the national R&I system. The regulation regarding the organisation and functioning of the Ministry is set by Government Decision no. 13/2017. Mr. Serban Valeca was nominated as the Minister of MRI.</p>
<p>Massive street protests (January-February 2017)</p>	<p>As of 22 January 2017, significant protests took place across the country (gathering more than 200000 people in Bucharest), as a reaction to the Government Emergency Ordinance which changed the Criminal Code, decriminalizing major corruption offenses.</p>
<p>Article 4(3) of the Additional Act no.10/2017 of the financing Contract for management services of NPRDI introduces an explicit preference for the national evaluators.</p>	<p>The Additional Act stipulates that the international scientists can be selected in the evaluation panels only if no Romanian expert can be found (or are available). The role of foreign scientists in grant evaluations was diminished; however more than 100 foreign evaluators were used in panels during</p>

¹⁵ S.N.G.N. ROMGAZ, Sector Oil & Gas Producers

¹⁶ Renault Technology Romania with 3,200 engineers, Honeywell Romania (2500 employees), Infineon Technologies (semiconductors) with 300 employees and Continental Automotive with three R&D centres (Kaminski 2011; Dachs et al., 2014). Other multinational companies with R&D centres in the country include IBM, Adobe Systems, Freescale Inc., Alcatel-Lucent, Ubisoft, and Microchip Technology. (Andreescu, L., 2015).

¹⁷ Government Decision HG nr.13/2017 regarding the organisation and functioning of the Ministry of Research and Innovation

27th March 2017	competitions held in the 3 rd term of 2017.
The activity of the four RDI advisory councils is suspended. 30th January 2017	The RDI councils, which had barely begun their 4-year terms after a lengthy and open selection process during the 2016 technocrat government was suspended.
NSRDI is modified, through Government decree to include Alfred February 2017	The NSRDI 2014–2020 was modified through Government decree (81/2017) without the consultation of the scientific community to include the Advanced Lead Fast Reactor European Demonstrator (ALFRED) as national priority. ALFRED is set to be built at the Nuclear Research Institute in Pitesti-Mioveni, where the Minister Valeca was head of the scientific board before he joined the government.
The four RDI advisory councils were reorganized and reactivated in April 2017. New regulation regarding the functioning and organisation of the four RDI consultative councils ^{18, 19,20, 21} April 2017	The new regulations for the organisation and functioning of the four Consultative RDI councils and the nominations of the Councils' members are approved by Ministry Orders (<u>MRI orders no 211,212,213,214/ 19.04.2017</u>)
Strong reaction from the academic community, European University Association, regarding the dismissal of the RDI councils and foreign evaluators. April 2017	The academic community, the association Ad-Astra reacted to the decision suspending the activity of the RDI councils. ²² The heads of Romania's five biggest universities asked in a public letter for Valeca's dismissal. ²³ The European University Association (EUA) reacted with concern to the controversy related to the dismissal of the councils and of the foreign evaluators and issued a statement calling the latest changes a "worrying development". ²⁴ The Minister Valeca responds to the critics regarding the selection of the members of the RDI consultative council and specifies the criteria selection and the methodology involved ^{25,26} .
The order regarding the approval of the procedure for granting the fiscal incentives for R&D activities was agreed. 29th August 2017	The final form of the procedure for granting the fiscal incentives for RDI is approved. The signing of this Order is vital as a secondary legislation for determining how to pay RDI staff and filling the legislative gap that made it impossible to pay it in recent months. (Joint order Ministry of Public Finances 2326, MRI 2855/29.08.2017)
Increase of the income ceilings for the specialists involved in RDI	The Government approves the increase of the ceilings for the direct salary costs for the specialists involved in RDI projects

¹⁸<http://www.research.gov.ro/uploads/sistemul-de-cercetare/organisme-consultative/om-nr213-19-04-2017-cnccs-mo287.pdf>

¹⁹<http://www.research.gov.ro/uploads/sistemul-de-cercetare/organisme-consultative/om-nr212-19-04-2017-cccdi-mo287.pdf>

²⁰<http://www.research.gov.ro/uploads/sistemul-de-cercetare/organisme-consultative/om-nr214-19-04-2017-cnntti-mo287.pdf>

²¹<http://www.research.gov.ro/uploads/sistemul-de-cercetare/organisme-consultative/om-nr211-19-04-2017-cnccsdti-mo287.pdf>

²²<http://civitas.dogaru.net/nu-reorganizarii-organismele-consultative-ale-ministerului-cercetarii-si-inovarii/>

²³<http://www.hotnews.ro/stiri-esential-21739116-cele-mai-mari-cinci-universitati-din-romania-cer-demisia-ministrului-cercetarii-dupa-modificarile-facute-acesta-domeniu.htm>

²⁴<http://www.eua.be/activities-services/news/newstitem/2017/05/30/eua-statement-on-the-recent-developments-in-romania-regarding-the-research-policy-framework>

²⁵<http://www.research.gov.ro/ro/articol/4552/minister-comunicare-mesajul-ministrului-serban-valeca-la-reac-tiile-unei-par-i-a-mediului-universitar>

²⁶<http://www.research.gov.ro/ro/articol/4540/minister-comunicare-referitor-la-materialul-critic-aparut-in-presa-privind-modul-in-care-s-a-desfasurat-reorganizarea-organismelor-consultative-ale-mci>

projects funded by public funds October 2017	financed by public funds, however without the alteration of the public funds for RDI (50 euro / hour for activities that involve a high level of creativity and / or experience and leadership / management skills; 35 euro / hour for activities requiring in-depth knowledge of methods of analysis and synthesis; 25 euro / hour for activities involving knowledge of analysis and synthesis; 15 euro / hour for support activities. (Government Decision 751/2017)
The Infrastructures Roadmap is finalised (September) and final version approved in November 2017 21.11.2017	The Roadmap for research infrastructures is finalised and approved by Ministry Order. The SIPOCA 27 project, coordinated by MRI, through the involvement of 84 national experts, grouped in 7 panels in the areas of smart specialization and national interest in SNCDI 2014-2020, have identified and evaluated the proposals for large RI that have been included in the National Roadmap for RI. (Order MRI 624/2017)
EC through official letter agrees that the R&I conditionality was fulfilled 22.11.2017	The last RDI related condition included in the ex-ante conditionality for R&I – the existence of a multi-annual plan for budgeting and prioritization of investments under Competitiveness Operational Programme (the Roadmap for infrastructures) was fulfilled.

R&I funding trends

In 2016, the Romanian expenditure on R&D (GERD) maintained its intensity, 0.48% of GDP compared to 0.49% in 2015, when it increased from its lowest value in the past years (0.38% of GDP in 2014), In the period 2012-2013, total R&D intensity decreased due to the simultaneous decrease of both public and private support. This was followed by an increase over the period 2013-2016. External funding, although is a minor source, increased from 0.04% of GDP in 2009 to 0.09% of GDP in 2015.

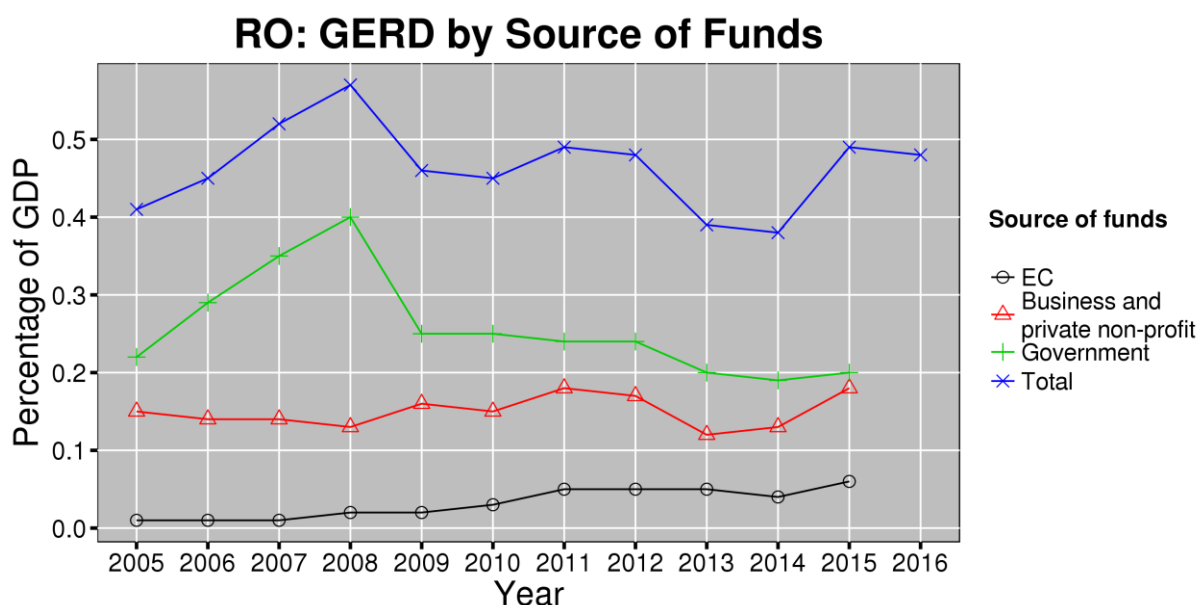


Figure 1 Breakdown of sectorial contributions to total GERD funding.
Data source: Eurostat, November 2017.

3.1 Public allocation of R&D and R&D expenditure

The 2009 financial crisis severely hit Romania and this had large repercussions on public investment in RDI. Government funding did not recover after the crisis and in 2015 it was still under its 2009 level (0.2% compared to 0.25%). The government budget appropriations or outlays for research and development (GBAORD) showed a slight increase to 0.26% in 2015 (compared to 0.21% GDP in 2014), further increasing to 0.28% in 2016 still well below the European average. The 2016 State Budget Law indicated an increase of the public investment in R&D by approximately 30% compared to the estimated final budget implementation in 2015. However, the final execution of the budget showed a much lower increase (around 16%). Although a 30% increase was committed for 2017 by the new left leaning government, the 2017 Law of Budget provides only for 1.8% increase compared to 2016 budget for RDI.

Currently, there are few R&D fiscal incentive programmes in Romania: the 150% deduction on qualifying R&D expenses, the accelerated depreciation on qualifying R&D assets, and a tax exemption for personnel income resulting from research projects (approved in August 2016, subsequently followed by the methodology). However, given the complex methodology associated to the latest, there is concern that its usage and its impact will be limited, while the R&D tax regulations for companies entangle financial risks due to the relative difficulty in identifying and classifying R&D activities correctly (Deloitte Romania Corporate R&D Report, 2014).

3.2 Private R&D expenditure

The R&D investment in the business sector (BERD) although showed an increase from 0.16 in 2014 to 0.27% of GDP in 2016, it is still significantly lower than the EU28 average (1.30% of GDP). The level of funding provided by business in terms of GDP fluctuated around 0.16% (fluctuation of +/- 0.05% of GDP) between 2009 and 2015. This indicates that companies did not engage in or did not expand their RDI activities.

RO: BERD by Source of Funds

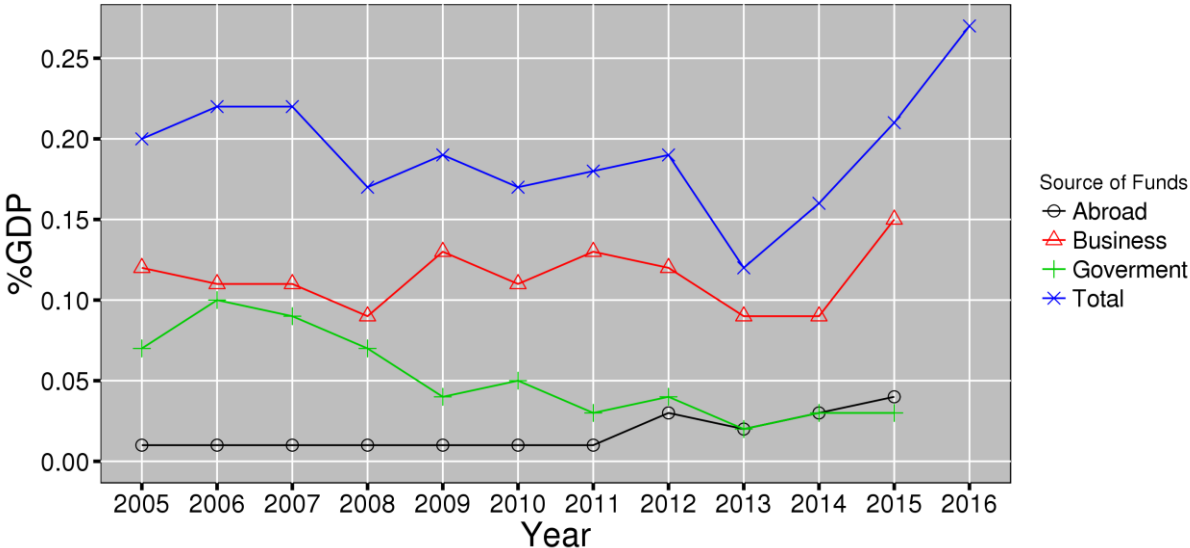


Figure 2 Breakdown of sectorial contributions to total BERD funding. Data source: Eurostat, November 2017.

The limited innovation performance is, to some extent, explained by the structure of the Romanian economy, which has a prevalence of low- and medium-technology sectors (wearing apparel, leather, textiles, consumption goods, agro-food, basic metals) and, mainly, by the reluctance of firms to engage in R&I activities. On one side, multinational companies mainly develop these activities at the headquarters and not in the host

countries, and, on the other side, SMEs consider them as financially too risky (out of the total of more than 650.000 enterprises, less than 2%₀ are developing R&D activities). When looking at the contribution of the various sectors to the total gross value added (GVA), manufacturing is by far the most important sector, with automotive industry in the first place, followed by the services associated sector (wholesale and retail trade repair). Construction, real estate activities and transportation occupy also an important place. The shares of other sectors in GVA are close to or below 5% and the leading services sectors in terms of BERD are contributing to a lesser extent to the GVA. (EUROSTAT, 2017)

3.3 Supply of R&I human resources

Given the scarcity and the unpredictability of the RDI funding, the national research labour market remains poor. In 2016, the share of the Human Resources in Science and Technology (HRST) in the total active population (27.6%) was the lowest in EU28. The distribution of total HRST full time employed by sector of performance was 29% in business, 35% in government and 36% in HEIs in 2014. The share of female researchers is above the EU average (46.23 vs. 33.4 % in 2015).

Romania, with the public expenditure for education just above the half of the level stipulated by the Law of Education (6% of GDP) had the lowest investment in education in EU28 (the EU28 average is 5.27%) and the lowest expenditure per pupil/student, with a nominal value smaller than 1/3 of the EU average. It ranks fairly well regarding the number of graduates in science, mathematics and computing, engineering, manufacturing, construction (14.9% of the total compared to 19.1 in EU28). Between two thirds and three quarters of the students studied law or economics in the period 1997-2013 (INSSE 2015).

The number of new doctorate graduates dropped to 0.3 in 2014, compared to the relatively high values during the period 2009-2013 (1.1 new doctorate graduates per 1000 population aged 25-34 compared to 1.3 EU28 average). The drop is mainly generated by the finalisation of the PhD programmes covered by the generous fellowships financed by structural funds in the policy cycle 2007-2013. However, the increase of the number of PhD graduates in the period 2007-2013 is not reflected in the increase of the number of researchers, which tends to remain with small fluctuations around 23000. The number of researchers per thousand of population is only 1.38, the lowest in EU 28 (EU28 average is 5.36) (EUROSTAT, 2017). The high share of PhD graduates in soft disciplines and the low share in natural science, the last year plagiarism cases in which high-ranking politicians embattled plagiarism allegations raised concerns regarding the PhD schools. Many argue that the notorious plagiarism cases of high rank politicians, mainly if not exclusively in soft fields, are just the top of the iceberg, many of the PhD thesis allegedly facing similar scientific doubts. The way the cases of plagiarism had been instrumented was a reflection of a country with deep political divides, where politics interfere in areas which should be beyond political discretion.

The NSRDI 2014-2020 sets as goal to double the number of researchers, with a 45% share in the business sector. The main hindering factors in the attainment of the target are related to the persistent low and unpredictable funding of the RDI system, the low attractiveness of research careers and, most of all, to the enterprises' reluctance in developing their own R&D personnel and activities, in spite of the recent fiscal incentives and the improvements in the IPR legislation. There are signs that the education system is disconnected from the labour market, while the PhD holders supply exceeds the capacity of absorption by the chronically underfunded R&I system.

Romania continues to face substantial challenges, both for increasing the number of researchers and for reducing the serious brain-drain phenomenon. The country already has a significant number of skilled professionals working abroad while its best graduates continue to be recruited by top world universities and do not return. Those who have chosen to return or to remain, lack prospects and face significant obstacles in a system

lacking predictability. The misuse of the brains became the paradigm 'better brain drain than brain waste'.

4 Policies to address innovation challenges

4.1 Challenge 1: Increase public R&I expenditure

Description

The R&I system is chronically underfunded. Romania, allocates the lowest GERD per capita in EU28, 14 times smaller than the average spent in EU28 (Eurostat, 2017). On the positive side the nominal value of GERD (in national currency) shows increasing trend starting 2015, in the context of stable inflation and GDP growth, while the R&D funded by business (BES) as % of GDP increased from 0.13% in 2014 to 0.18% in 2015. Romania had also a low participation in FP7 (€6.4/capita compared to €17.8 in EU13 and €95.2 in EU15 (Stairway to Excellence Facts & Figures, 2015).

Policy response

The National Strategy for RDI 2014-2020 (NSRDI 2020), adopted on 21 October 2014, reaffirmed a 2% GERD target (1% public and 1% private) by 2020. Its main financing instrument, the National Plan for RDI 2015-2020 (NPRDI 2015-2020) financed from national funds, is designed on the basis of this target and multiannual planning. Nine operational programmes, with a total amount of €30.84 billion ESIF and €5.63 billion national contribution provide funding during the 2014-2020 cohesion policy cycle. An ESIF share of 3.43% is allocated to R&I. While the overall absorption of SF was low in the 2007-2013 policy cycle, the significantly higher absorption for the R&I sector (117%) was acknowledged by EC, which supplemented with €110m the budget for the RDI relevant operational Programme (*COP, PA1*).

Assessment

Since 2008, the R&I system has shown a trend of underfunding relative to the targets assumed by the national and EU strategic documents and underperforms in comparison to EU28. The NPRDI 2015-2020 was approved with a significant delay (July 2015) and the first calls were opened later than envisaged (2016). The 2016 Law of State Budget provided for 30% increase of the RDI investment. However, the estimation for 2016 indicates that the executed budget increased only with 16% compared to 2015. The 2017 Law of Budget provides only for 1.8% increase compared to 2016. The current increase rate of RDI public expenditure will make the 1% public GERD target unattainable. While Romania ranks the 4th highest in EU28 in terms of total ESIF volume, it stands on the 12th position regarding the ESIF allocated for R&I. Given the scarcity of the national R&I funds, the low share of ESIF allocated for R&I indicates the relative low importance of RDI on the political agenda. The actual absorption of EU funds for the 2014-2020 programme began only in May 2016, 2.5 years after the start of the programming period.

While all national governments have committed in strategic documents the GERD targets assumed by the NSRDI, the empirical evidence shows that this is rather political rhetoric decoupled from political will and implementation. The lack of science awareness increases the vulnerability of the RDI budget to economic constraints. The RDI line in the state budget has been regularly affected by the budget annual adjustments. However this has triggered the reaction only from scientists themselves, a minority with little power of influence.

4.2 Challenge 2: Significant brain drain. Lack of skilled human resources. Mismatch between skills demand and supply

Description

Romania has one of the highest share of researchers working abroad (World Bank, 2014). Due to the significant brain drain (starting even from final years of high school), skills shortages exist in many sectors: the ICT sector, health professionals, teachers (CEDEFOP, 2016a), skilled trades, engineering, transport and distribution (Manpower Group, 2015). According to Global Innovation Index 2017, Romania is underperforming in Human capital & research.²⁷ The labour force continues to shrink, as the population is ageing and emigration remains high. International surveys point to severe deficiencies in basic skills among Romanian teenagers (EC, Country Report 2017). The poor performance of education, vocational training and lifelong learning systems, unattractive working conditions and higher wages abroad contribute to labour shortages (EC 2015c). The number of researchers per capita is around ¼ of the EU average, while the GERD per capita is 14 times lower than the EU28 average.

Policy response

A new Law of Salaries in the public system was implemented starting August 2016. The wages in the health and education sectors increased by 15% from January 2017. The party coalition in power made in its Programme of Government the harmonisation and the increase of the wages in public sector one of its priorities. Further wages increases were promised starting July 2017, yet subsequently assumed as unfeasible for the education and medical systems and postponed. The Government Ordinance OUG 32/2016 (August 2016) stipulates the exemption of the tax for personal income resulted from R&I activities, aiming to provide stimulus to staff involved in RDI activities. The complex legal framework raised controversies and was finally agreed in August 2017. Yet, to date, it is implemented. In October 2017, a government decision raises the salary ceiling for the specialist working in RDI projects financed by public funds, yet since increasing the public funds for RDI.

Assessment

The August 2016 law had limited impact as it provided corrections to minimise the discrepancies for the same level of experience for same positions in the system. The January 2017 increase and the already postponed July 2017 increase will not be able to provide the stimulus for reactivating these sectors. Significant wage increase are scheduled to be applied starting 2018, yet already under significant debate since the unions claim that while the gross salaries will increase by 25%, the net may barely increase by 4% in the context of positive inflation and due to the shifting of the responsibility of the social benefits from employers to the employees. The staff in HEIs, education, research and medical system remains heavily underpaid in EU28 comparison and with other national groups (judges, local administration, police, army) working in the public system. This generates lack of satisfaction, staff fluctuation and migration. The RDI input is the lowest in EU28, yet the scientific performance for career progression in many S&T fields is evaluated against criteria *'to which academics in top world ranked universities may not comply'*, while academic salaries are among if not the lowest in EU. National rules apply for the higher academic positions. The frequent changes of the regulation generated a system extremely heterogeneous and inconsistent with itself, across fields, academic positions, many of the current high rank academic staff being below the criteria against they evaluate their younger colleagues or compared to peers from other fields. Advancing to a higher academic position is not a promotion based on the mere fulfilment of the requirements, but is conditioned by the creation and successful

²⁷ the weakest sub-pillars expenditure on education as % GDP and per pupil

competition on the position open to anyone complying to the rules. In the context of significant reduction of the number of students and Bologna restructuring, in many fields the schemes are frozen, with little or no chance of career progress. This further hinders the attractiveness of the research and academic careers.

The allocation of the number of students in public universities (free of charge) is not based on foresight and labour market demand studies, but rather correlated with the number of academic staff and students' demand. There are no available studies assessing the graduates' path. However, the employment rate (69.3% in 2016) of graduates of tertiary education is one of the lowest in EU. In the context of skills shortages, this indicates a mismatch between skills demand and supply. The research market has not expanded and is still unable to absorb the PhD holders, many of them becoming candidates for diaspora.

The country shows lack of long term strategy, ability to match the supply to the demand, capacity to retain the large number of skilled professionals, formed for free, capacity of prognosis and forecast, tailoring for needs, skills and abilities, capacity to sustain the human resources needed to provide a consistent reform of the complex knowledge triangle system.

This persistent loss of the high level professionals, in whom the country invested, while failing to provide a flexible, coherent education to the bulk of young population, may be on long term the most damaging systemic challenge of the entire economy.

4.3 Challenge 3: Improve the governance of the R&I system at national, regional and institutional level; ensure predictability and stability

Description

The R&I governance is characterised by excessive and burdensome bureaucracy, predisposition to over-regulation, frequent legislative and institutional changes, lack of human resources or having the expertise to cover evaluation, foresight activities. The midterm evaluation of the NSRF 2007-2013 and NP2007-2013 highlights that *'little is said about the actors that should employ and implement these tools and particularly their qualification and readiness, hence the functioning of ministries, agencies, advisory bodies; research institutions, particularly universities, the National Institutes, not least the Romanian Academy.'* (Technopolis, 2012) The EC Recommendations since 2013 (including in 2017) reinforces that the weak capacity of the public administration to develop and implement policies remains a core challenge for Romania: *"Romania's administrative and policy-making capacity has been suffering from opaque processes and decision-making, little recourse to quality evidence, weak coordination across sectorial policies and widespread corruption"* (EC 2017 Country Report). In less than two years period, five ministers held responsibility for RDI, under four distinct governments. The political changes affected the RDI policy and system, triggering delays, ad-hoc changes.

At individual R&D institution level, there is low tradition, limited availability of human resources, expertise and funding to provide strategic management for RDI.

Policy response

Various coordination mechanisms and institutional frameworks were set up in 2015/2016 to ensure the coherence of R&I interventions, complementarities and synergies in the programming and implementation of Structural Funds. In its chapter on system governance, the NSRF 2020 provides for the establishment of a National Council for Science, Technology and Innovation Policy (NCSTIP) with the aim to ensure the coordination and correlation of RDI policy with sectoral and regional policy.

An essential role in the project evaluation process and in other essential aspects of the RDI in Romania, is played by the consultative councils of the MRI. In August 2016, public

calls for the selection of the members of the RDI advisory councils were opened. At the end of 2016, members of the RDI councils from the national and diaspora scientific community were nominated for a four years mandate. In January 2017, the four RDI advisory councils just starting their activity after a lengthy and open selection process were suspended by the new government. In April 2017, new members were nominated by Ministry Order. No Romanian scientists working abroad are included in the newly appointed councils and some of the best-ranked universities claim to be underrepresented apparently for political reasons.

The NSRDI 2014–2020 was modified in January 2017 to include the Advanced Lead Fast Reactor European Demonstrator (ALFRED) as national priority.

Policy Assessment

The RDI system should perform in a stable framework based on the multi-annual budget and priorities, regardless the political changes. However, it remains vulnerable to political interference. In 2017, many of the calls for RDI competitions have been launched with delay, evaluations and funding were postponed, overall lowering the access to RDI competitive funding. There is significant concern expressed by the scientific community that the 2017 disruptive changes may deepen the difficult issues in Romania's research system, which already suffers from a chronic lack of funding, predictability and stability. The heads of Romania's five biggest universities asked in April 2017 in a public letter for Valeca's dismissal.

There is no visible evidence of the reform of the public administration, which should provide for a stable, politically independent administrative apparatus, restructured to include expertise and activities which are not currently covered but strongly needed. To date the NCSTIP has not become functional. Some coordination mechanisms and organisms are set-up in theory. However, they may be deemed as insufficient in the absence of human resources, of political determination and culture willing to make them functional. The Romanian public sector currently deals with a multitude of strategies, which are not clearly connected through a hierarchical system & mechanism, monitoring and evaluating the implementation with transparency. *"There is room for better coordination between all ministries and actors concerned at national and regional level, there is need to build a 'shared language' and approach between all levels of governance"*. (OECD, 2016)

4.4 Challenge 4. Enhance the efficiency of public expenditure in R&I and education; improve monitoring and evaluation

Description

The limited funds for R&I are dissipated across a fragmented and large R&I system which lacks funding schemes rigorously based on the results of the regular evaluation of the institutional research performance. The core funding for public universities has been mainly correlated with the number of students enrolled (per-capita scheme) and some indicators related to performance. Until 2017, HEIs had as the only source for RDI activities, the project based competitive funding open to all RDI stakeholders, in comparison with the Romanian Academy which has its own budget line and PROs which had access to NUCLEU program, formally labelled as competitive but strongly debated as awarding institutional funds on a non-visibly competitive basis. The 2011 HEIs and PROs classification exercise was heavily contested. As a result, although the classifications were planned to be carried out yearly, no other exercise was undertaken and its impact on funding was minimal. Several other deficiencies further limit the impact of the low RDI budget. Recent investments increased the quality of research infrastructures. Yet they were often lacking a long term strategic approach, or not responding to national strategic priorities. Often investments have been duplicated at territorial level, underused due to the lack of adequate skilled human resources and subsequent funds for maintenance and for relevant research activities (Curaj A., 2015).

The regulatory framework within the previous National Strategy for RDI 2007-2013 provided for transparent monitoring and evaluation. However, the evaluation of NP2 was abandoned given that the targets were correlated with a budget three times larger than the one finally allocated, while the evaluation of the RDI strategy was not even planned.

Policy response

The regulatory framework of NP3, COP, PA1 in theory ensure mechanisms for transparent monitoring and evaluation. Some periodic evaluations are performed both for PROs and HEIs. The National Council Funding Higher Education has been proposing, for the past three years methodologies for an 'Institutional Development Fund' (IDF) to be granted to the highest-scoring HEIs. The financing methodology was piloted in 2015, yet maintaining the methodological principles of previous years. In 2017, public funds to HEIs included the Institutional Development Fund. The fund targets the best HEIs and has been allocated on a competitive basis.

The SIPOCA27 project led by MRI, funded in august 2016, has to deliver a methodology for the evaluation of the NSRDI 2014-2020, to be applied for the mid-term evaluation of the Strategy. Progress has been made, the methodology was under testing during the second half of 2017 and a revised version will integrate the conclusions and will be applied for the mid-term evaluation, scheduled to start in 2018. The SIPOCA project will also make operational a platform integrating the Registry of Researchers in Romania (brainmap.ro), the National Registry of Research Infrastructures²⁸ and linked with the information publicly available regarding RDI projects financed by public funds. The platform will provide for a monitoring system of the R&I ecosystem, aggregating data on RI, researchers and results at the level of research organisations, domains, regions and programmes. The National Roadmap for large research infrastructures was approved in November 2017.

In 2017, the role of foreign scientists in grant evaluations was virtually eliminated.

Policy Assessment

The system remains underfunded and highly polarised, with a limited number of actors concentrating the output. Its performance is low and the research is not aligned to the economic needs. The number of ISI publications has increased gradually, however, indicators of excellence²⁹ show that the research may be disconnected from the international research trends. NSRDI 2014-2020 stipulates that performance principles will apply for institutional funding. However, the prospects of implementation and its relevance to funding are not clear. The HE financing arrangement has been criticized for dissipating funds among too many universities, in the absence of appropriate mechanisms for rewarding the quality of teaching and research. The inefficient allocation of public money, 'complement' the chronic underfunding of the HEIs. The 2017 IDF may enable a prioritization of funding relative to performance.

The monitoring mechanisms for POC 2014-2020 in theory enable a good monitoring, yet its efficiency will be assessed during the first evaluation. To date the monitoring module of the electronic system used for the administration of structural funds dispersed through OPs and its design serves all the OPs, with no specificity for RDI. The bureaucratic workload remains high. The PN3 provides for the continuing monitoring and periodic evaluation. The recent changes that eliminate foreign evaluators and members of the diaspora in the RDI advisory councils created significant concern among the academic community regarding the lack of international scrutiny of research funding.³⁰

²⁸ www.erris.gov.ro

²⁹ such as the percentage of scientific publications among the top most cited publications worldwide, participation in FP7/H2020

³⁰ <http://www.nature.com/news/romania-s-science-reforms-prompt-boycott-1.22107>

The SIPOCA 27 project solves in theory on short term the need for an evaluation mechanism. Nevertheless, the project will be finalised by 2018 and scheduled to provide only mid-term evaluation results. It includes also the impact evaluation on the national smart specialisation (S2) fields. Some difficulties are already evident. The evaluation methodology is designed after the launch of the NSRF 2014-2020. The S2 fields are defined very broadly, covering most of the economy and the funding instruments and the relevant input/output indicators are not specific for individual S2 areas. Many of the RDI programmes have been launched with delay which may deem the 2018 evaluation difficult and the interpretation of the results risky.

The very low expenditure in education is further aggravated by the effectiveness of the investment. On one side the system still struggles to equip the bulk of the students with the skills responding to the needs of a modern economy and to provide the adequate frame for mass education (school abandon remains high, PISA results low, tailored and vocational training limited (EC, Country Report 2017)). On the other side, the system takes pride for the top results in international science competitions. Yet, the country does not show interest at the end of the education cycle in efficiently using the high professionals created and 'exported' for free. Politically footprint decisions in pre-and post-election periods often provided for increased financial support to the students, who often migrate or work in areas irrelevant to their training. Yet the HEIs system often lacks training resources and the staff remains underpaid. This inefficient allocation of public money, with limited return to the society, complement the chronic underfunding of the education system.

There is a clear need to increase the efficiency and effectiveness of public investments in RDI and education, enhance the evaluation and monitoring mechanisms at all levels: projects, programmes, institutions, professionals.

4.5 Challenge 5. Improve the framework for private RDI investment and the collaboration with the public sector

Description

The level of R&I funds invested by businesses is very low: 0.18% of GDP in 2015 (EU28 average in 2013: 1.12%). The highest proportion of these funds is spent on R&I performed by the business sector and a very small share (0.03% of GDP) is provided to the public sector. This indicates a low level of science-business collaboration and a weak commercialisation of public research results.

While private sector is in general reluctant to take financial risks arising from R&D, in Romania financial instruments to mitigate the risk are hardly available. The total share of venture capital investments is the lowest in the EU28. The structure of the economy also limits the potential for innovation of the private sector. According to the 2017 EU Community Innovation Survey only 12.8% of Romanian firms have innovation activity, but not necessarily research-based. (EUROSTAT, 2017)³¹

The innovation and technology transfer infrastructures in Romania have developed in the last years to some, yet, limited extent. The EC reports highlight the need to increase the investment in R&I and ensure closer links between research, innovation and industry by prioritising R&I activities that have the potential to attract private investment.

Policy response

The National RDI Strategy 2014-2020 sets targets for increasing the economic impact of the research activities and for activating the interest of business in research, with a

³¹ Innovation statistics http://ec.europa.eu/eurostat/statistics-explained/index.php/Innovation_statistics#Innovation_in_SME.E2.80.99s_and_in_large_enterprises

particular focus on the smart specialisation domains. Some instruments implemented under NP3³² and OP Competitiveness (PA1)³³ provide direct support for R&I activities performed by innovative companies; other NP3, OPC, ROP instruments provide support for economic agents taking advantage of the S&T expertise and infrastructures in public research institutes, either through collaboration or externalisation of research activities to the public RDI system; other instruments provide support for the creation and development of knowledge and technology transfer broker offices and partnerships. OPC provides also specific financial instruments, mitigating the risk for RDI activities³⁴. Targeting all the SMEs, the 'SME initiative' programme with an allocation of €100m from the ERDF facilitates the access to finance for Romanian SMEs.

The NSRDI 2014-2020 integrates smart specialisation priorities. The strategic orientation mechanism implemented by SIPOCA27 and the process of designing and implementing the RIS3 create the framework for dialogue between RDI public, private and RDI policy makers and administration through an active entrepreneurial discovery process.

Policy Assessment

The government has identified the main causes of the low investment of business in R&I and these are addressed by the 2014-2020 R&I policy mix. The main national RDI programmes promote a wide variety of instruments providing support to all stages of innovation, to the industrial research and to the RDI private-public partnerships. Various instruments support the creation of knowledge and innovation transfer (KIT) centres, development of platforms for demand-supply and exploitation of the research in new products and processes, which can be deployed to the market. All the main strategic documents for the current policy cycle acknowledge the lack of financial instruments and promote various complementary funding mechanisms for stimulating RDI activities in firms, such as state guaranteed loans for RDI projects and risk capital. Some of the instruments deploying the relevant policy have been delayed, while most of them are at an early stage of implementation. Therefore the impact of the implementation cannot be yet assessed.

The efforts to involve businesses in the policy making process were limited in the past and even when done often did not reach the expected level of participation. Recently, efforts were undertaken by regional and national authorities to engage the business sector in the identification of the smart specialisation priorities as niches of regional/national advantage. This concerted action hopefully will create a momentum for the business to be active in the RDI policy design and tailor it to serve economic needs. The business sector shows signs of an increasing interest in innovation, as revealed by the emergence of hubs, especially in ICT.

³² innovation vouchers, experimental projects – demonstration/proof of concept, technology validation and transfer to industry

³³ innovative technological projects, innovative spin-offs and start-ups, innovative newly created enterprises, investment for RD departments in enterprises

³⁴ credits, guarantees and risk capital measures

5 Focus on R&I in National and Regional Smart Specialisation Strategies

The NSRDI 2014-2020 focuses on S&T priorities selected on an evidence-based smart specialisation aware foresight exercise, including regional perspectives. The four smart specialisations (S2) aggregated at national level were: bio-economy, ICT, energy and environment and eco-technologies. The set of specialisations was subsequently expanded by political decision in the adopted form of the NS 2020 to include: space and security, energy production, climate change, and advanced materials, and also health and national cultural identity and assets as priorities of national interest. Support for S2 areas is ensured through a policy mix covering a broad range of activities.

With the aim to support the preparation of the calls under Regional Operational Programmes (ROP), Priority Axis 1, 'Technology transfer' initially scheduled to be opened in April 2017, all seven regions eligible for cohesion funds had to develop by March 2017 a concept note which provides a detailed explanation regarding the economic sectors and type of services for which the Technologic Transfer Offices (TTO) could be funded. For the regions which did not have RIS3 at that time, the concept note had to identify also the S2 priorities. The regional "concept notes" were based on a common methodology and had to involve the entrepreneurial discovery process. The project „SIPOCA 27"³⁵ implements a strategic orientation mechanism, aiming to identify smart specialisation niches through an active entrepreneurial discovery (ED) process.

Three main RDI funding instruments address the S2 domains: (1) COP/Priority Axis 1, (2) ROP/Priority Axis 1, Technology transfer and (3) the NP3. The two OPs funding RDI target exclusively the S2 domains (COP at national level, ROP at regional level). Most of the NP3 provide support for excellence, implicitly, but not exclusively targeting the S2 areas. There are no specific RDI instruments targeting individual S2 domains.

New policy developments

The ROP, Axis 1 (total budget: EUR194.12 m) launched the guides for public consultation in June 2017 and opened the competition call in July 2017³⁶.

Progress on implementation

All seven 'less developed' regions finalised their own concept note. The regions updated the economic specialisation profiles, undertook a SWOT analysis of the economic and innovation potential of the individual region and identified the regional RDI niches with the support of ED workshops. The common approach was to start by considering the regional concentration already materialised in clusters, and focus on narrower niches of the national S2 priorities. The complementarities and matching between the regional and national smart specialisation fields are summarised in the Annex 1.

The North East and North West Regions benefited from the support provided by EC, DG-JRC through the "Lagging Regions" pilot project³⁷. One of the important outcomes is the start of the dialogue with the business sector in a participatory manner, the collaboration between the central governing authority for R&I, RDAs and EC. Among the critical issues identified by the RDAs were the lack of interest from the private sector and the lack of RDI data at regional level. One of the critical issues is that the RDAs are very heterogeneous in terms of resources, most of them with limited RDI policy design capabilities.

³⁵ *Developing the Administrative Capacity of the Ministry of Research and Innovation to implement actions established in the National Strategy for Research, Technological Development and Innovation 2014-2020*

³⁶ to be closed in January 2018

³⁷ The project aims to provide support for a coherent, coordinated approach for the RIS3 design, develop and enhance engagement of relevant stakeholders

Monitoring mechanisms and the feedback loop

At national level, the SIPOCA 27 project, coordinated by MRI provides for the design of a methodology for the evaluation of the impact on the four national S2 priorities and Health. The methodology will be used for the mid-term evaluation (scheduled to start august 2018). The project also supports the country commitments towards the EC, regarding the update and reorientation of the Smart Specialisation fields. Regional reports were produced by independent experts with the aim to assess the regional economic dynamics and identify regional economic fields which have the potential for growth. The project also sets a technological radar to identify international scientific trends which are subsequently used in the entrepreneurial discovery regional workshops as means to identify specific S2 niches, aligned to international trends. Eight regional and four national EDP workshops will facilitate the dialogue with representatives from all relevant RDI and economic stakeholders. The workshops aim to identify competitive niche areas which could better position the regions in the global value chains, create synergies among regional actors around common visions and update the smart specialisation areas at national level by identifying overlapping regional interests & strengths in certain niche areas. Two EDP workshops were organised so far: in the North-East Region³⁸ and Centre Region.³⁹

All seven regions developed their own RIS3. Most of the RIS include in the strategy the monitoring output & impact indicators and the relevant sources. The RDAs, with the involvement of the regional RDI and economic stakeholders identified the projects which are submitted under ROP calls. The schematic diagram of the regional smart specialisation and national ones are represented in the diagram below.

Evidence of impact

Given the very early stage of the implementation of OPC and NP3 programmes, no monitoring and evaluation progress reports are available. The Regional Operational Programmes, Priority Axis 1, 'Technology transfer', which will support the implementation of RIS3, has opened the calls for competition in July 2017 (to be closed in January 2018).

³⁸ The proposed niche areas were Nanotechnologies for antitumor therapies; Biodegradable sensors; Sustainable agriculture: accelerating germination and growth through a stratification process; Fluorescent substrates for the pre-diagnosis of rare lysosomal diseases

³⁹ In the Center region, the proposed niche areas are: Software applications for transport as a service (TaS); Simulation and testing services for autonomous driving; Integrated systems based on sensors for autonomous vehicles; Customizable industrial computer vision

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Abbreviations

COP	Competitiveness Operational Programme
ED	Entrepreneurial Discovery
EIF	European Investment Fund
ELI-NP	Extreme Light Infrastructure
ERDF	European Regional Development Fund
ERRIS	Engage in the Romanian Research Infrastructure System (platform)
ESIF	European Structural and Investment funds
EU15	The 15 Member States of the European Union as of December 31, 2003
EU28	The 28 Member States of the EU
FDI	Foreign Direct Investment
FTE	Full-time equivalent (researchers)
GBAORD	Government budget appropriations or outlays for research and development
GD	Governmental Decision
GDP	Gross Domestic Product
GERD	Gross domestic expenditure on R&D
GVA	Gross Value Added
HEIs	Higher Education Institutions
HRS	Human Resources in Science and Technology
ICT	Information Communication Technology
IDF	Institutional Development Fund
KIT	Knowledge and Innovation transfer
KTO	Knowledge Transfer Offices
MNC	Multinational company
MNER	Ministry of National Education and Research (Ministerul Educatiei Nationale si Cercetarii)
MRI	Ministry of Research and Innovation
NAPP	National Agency for Public Procurement (Agentia Nationala pentru Achizii Publice)
NASRI	National Authority for Scientific Research and Innovation (Autoritatea Nationala pentru Cercetare Stiintifica si Inovare)
NCIE	National Council for Innovation and Entrepreneurship (Consiliul Național pentru Inovare și Antreprenoriat – CNIA)
NCSTIP	National Council for Science, Technology and Innovation Policy

NCSTP	National Council for Science and Technology Policy
NES	National Strategy for Export
NP2	National Plan for Research, Development, and Innovation, 2007-2013
NP3	National Plan for Research, Development, and Innovation, 2015-2020
NRP	National Reform Programme (Programul National de Reforma)
NS2020	National Strategy for Research, Development, and Innovation, 2014-2020 (Strategia Nationala de Cercetare, Dezvoltare si Inovare)
NSPP	National Strategy on Public Procurement (Strategia Nationala de Achizitii Publice)
OP	Operational programme
OPC/COP/P	Operational Programme Competitiveness/ Competitiveness Operational Programme/ Programul Operational Competitivitate
POSCCE	Sectoral Operational Programme on Increasing Economic Competitiveness (Programul Operational Sectorial Cresterea Competitivitatii Economice)
POSDRU	Sectoral Operational Programme Development of Human Resources
RDA	Regional Development Agency
R&D, R&I	Research and development, Research and innovation
RDI	Research, development and Innovation
RA	Romanian Academy (Academia Romana)
ReNITT	Romanian network for innovation and technological transfer (Reteaua Nationala pentru Inovare si Transfer Tehnologic)
RI	Research infrastructure
ROP	Regional Operational Programme
S2E	Stairway to Excellence
SF	Structural Funds
SOP-IEC	Sectoral Operational Programme on Increasing Economic Competitiveness (Programul Operational Sectorial Cresterea Competitivitatii Economice)
UEFISCDI	Executive Agency for Higher Education, Research, Development and Innovation Funding (Unitatea Executiva pentru Finantarea Invatamantului Superior, a Cercetarii, Dezvoltarii si Inovarii)
VAT	Value Added Tax
VC	Venture capital

Factsheet

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
GDP per capita (euro per capita)	6100	6200	6600	6700	7200	7500	8100	8600		
Value added of services as share of the total value added (% of total)	52.9	51.84	48.98	57.58	57.27	59.04	61.18	61.77		
Value added of manufacturing as share of the total value added (%)	23.33	25.67	28.33	22.61	23.04	23.65	22.27	22.56		
Employment in manufacturing as share of total employment (%)	18.68	17.5	17.98	17.42	17.6	18.18	17.9	18.61		
Employment in services as share of total employment (%)	40.13	39.61	40.96	41.55	41.8	42.1	45.27	46.26		
Share of Foreign controlled enterprises in the total nb of enterprises (%)	5.22	6.43	2.82	6.14	5.79	6.47	5.93			
Labour productivity (Index, 2010=100)	102.2	100	101.1	112.4	117.7	121.3	128.3	135.1		
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	1.05	0.94	1.23	1.09	1.14	0.3	0.35	0.19		
Summary Innovation Index (rank)	27	27	28	27	28	28	28	28		
Innovative enterprises as a share of total number of enterprises (CIS data) (%)				20.7		12.8				
Innovation output indicator (Rank, Intra-EU Comparison)			24	23	23	22				
Turnover from innovation as % of total turnover (Eurostat)		14.3		5.4						
Country position in Doing Business (Ease of doing business index WB)(1=most business-friendly regulations)						37	37	36	36	45
Ease of getting credit (WB GII) (Rank)						7	7	7		
Venture capital investment as % of GDP (seed, start-up and later stage)	0	0	0	0	0.002	0.002	0.001			
EC Digital Economy & Society Index (DESI) (Rank)						28	28	28	28	
E-Government Development Index Rank		47		62		64		75		
Online availability of public services – Percentage of individuals having interactions with public authorities via Internet (last 12 months)	7	8	7	31	5	10	11	9	9	
GERD (as % of GDP)	0.46	0.45	0.49	0.48	0.39	0.38	0.49	0.48		
GBAORD (as % of GDP)	0.29	0.28	0.27	0.22	0.21	0.21	0.26	0.28		
R&D funded by GOV (% of GDP)	0.25	0.25	0.24	0.24	0.2	0.19	0.2			
BERD (% of GDP)	0.19	0.17	0.18	0.19	0.12	0.16	0.21	0.27		
Research excellence composite indicator (Rank)	24	27	25	25	28	28				
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country		4.01	4.85	5.16	4.48	4.81				
Public-private co-publications per million population	7.93	9.16	9.26	5.47	5.59	4.16	2.26			
World Share of PCT applications	0.03	0.02	0.03	0.03	0.03	0.03	0.04			
Global Innovation Index				48	55	54	48	42		

Data sources: various, including Eurostat, European Commission and International scoreboard data

Annex 1. The match between the S2 areas at regional and national level

National	Bio economy	ICT, space, security	Energy, environment, climate change	Eco-nano technologies and advanced materials	Health
1.N-W region⁴⁰					
Agro-food, cosmetics and Industry of metals	x				x
Furniture		x	x	x	
Health			x	x	
Paper, plastic	x			x	
Production technologies				x	
ICT		x	x		
2.N-E Region⁴¹					
Agro-food	x			x	
Bio-technologies	x				
ICT (big data, eHealth)		x	x		
Energy and environment			x		
Apparel & textile				x	
Health & Tourism	x				x
3.CENTER⁴²					
Automotive and Aeronautic industry			x	x	
Agro-food	x			x	x
Textile and leather		x		x	
Sustainable construction	x		x	x	
Forestry, wood and IT and creative industries	x		x	x	
IT and creative industries		x			
Pharmaceutical industry and Balneal tourism	x			x	x
Balneal tourism	x		x		x
4.South East⁴³					
Maritime engineering and Apparel & textile			x	x	
Apparel & textile				x	
Agro-food and fishery	x		x		
Biotechnologies	x		x		
Eco-technologies			x	x	
Tourism					x

⁴⁰ <http://www.nord-vest.ro/s3/>

⁴¹ http://adnorddest.ro/user/file/news/17/RIS3_Nord-Est_05_12_2017.pdf

⁴² http://www.adrcentru.ro/Document_Files/StrategiaSpecializareInteligenta/00002531/vbp08_1.RIS3_sep_2017.pdf

⁴³ http://www.adrse.ro/Documente/Planificare/Comunicat_presa_Strategia_Specializare_Inteligenta_Regiunea_S_E.pdf

ICT		x			
5. South Muntenia⁴⁴					
Construction of vehicles			x	x	
Agriculture and food	x				
Tourism and cultural	x				
Bio economy	x		x		
Smart cities			x	x	
High technology products					
6. West					
Automotive industry				x	
Agro food	x				
Construction			x		
ICT		x			
Textile	x				
Tourism	x				x
7. South West Oltenia					
Industrial engineering and	x	x	x	x	
Energy and environment	x	x	x		
Innovative medicine	x	x	x		x
Agriculture and food	x	x	x		
Tourism and cultural heritage		x	x		

⁴⁴<http://www.adrmuntenia.ro/strategia-pentru-specializare-inteligenta-a-regiunii-sud-muntenia-pentru-perioda-static/892>

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