

Krzysztof Klincewicz  
Magdalena Marczevska

# POLISH SYSTEMS OF INNOVATIONS

– trends, challenges and policies



Wydawnictwo Naukowe  
Wydziału Zarządzania  
Uniwersytetu Warszawskiego



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Authors' affiliations:

Krzysztof Klincewicz – Faculty of Management, University of Warsaw  
Magdalena Marczevska – Faculty of Management, University of Warsaw

Reviewers:

Dr Tomasz M. Napiórkowski, Warsaw School of Economics  
Dr Katarzyna Szkuta, Joint Research Centre, European Commission

Editorial Supervisor:

Jerzy Jagodziński

Cover design:

Agnieszka Miłaszewicz

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# Introduction

## Context

Poland is an EU member state with 37.9m inhabitants as of 2016, accounting for 7.4% of the EU-28 population. Poland's GDP per capita expressed in purchasing power standards reached 68 % of the EU average in 2014. In 2014 and 2015, GDP growth in real terms was positive and amounted to 3.3% and 3.6% respectively (Eurostat, 2016).

In 2015, gross domestic expenditures on R&D (GERD) were €4,316.508m and since 2009, GERD have been constantly increasing (in 2009: €2,095.827m). The business sector was the largest R&D performer, its investment in R&D constituted 0.47% of GDP in 2015. (Eurostat, 2016). In 2014, R&D human resources amounted to 104,359 persons, full-time equivalent (FTE) with the total of 78,622 researchers included.

The number of active enterprises in Poland increased by 4% in 2014, compared to 2013 (from 1,771k in 2013 to 1,843k in 2014). As in previous years, SMEs dominated the market, and represented 99.8% of the total population of enterprises, employing 6,326.5k of employees (69.2% of all persons employed in non-financial enterprises). Microenterprises employing up to 9 persons represented almost 96% of SMEs, and the share of companies employing 10–49 persons stood at 3.2%, while firms with 50–249 employees constituted less than 1% of the total number of enterprises.

Since 2009, the number of entities with foreign capital has continued to grow. In 2009, there were 22,176 such companies, whereas in 2014: 26,464 companies (GUS, 2015g: 34). The role of foreign capital enterprises (including multinationals) in the Polish innovation system is substantial, but its relative importance has decreased compared to previous years.

Poland can be classified as a country with a relatively low labour productivity compared to other EU-28 countries. However, its productivity has reported a constant growth since 2008. According to Eurostat data, Poland's nominal labour productivity per person has increased from 61.2% of the EU average in 2008 to 74.3% in 2015. Real labour productivity per person has been growing



in Poland, its growth rate in 2015 amounted to 2.2% and was higher by 1.5% than in 2014 (Eurostat, 2016). Continuous TPF growth may suggest that Poland slowly improves its relative competitive position among other European countries.

## **R&I Actors – summary**

Polish R&I policies are co-ordinated by the inter-ministerial Council for Innovativeness, headed by the Minister of Economic Development and with the involvement of the Minister of Science and Higher Education. The Ministry of Economic Development sets the overall directions for economic development and innovativeness of the economy and oversees its own funding agency PARP that supports non-R&D based innovations, implementation of innovations and broader R&I ecosystem services, while the Ministry of Science and Higher Education focuses on policies related to scientific organisations and oversees R&D funding agencies: NCN focused on fundamental research and NCBR, financing applied R&D projects. NCBR is the core source of R&D funding for business enterprises and a key government agency distributing ESIF for R&I purposes. Among important R&D funders, The Foundation for Polish Science is a non-governmental organisation that strongly relies on public funding and ESIF in its funding schemes.

Public sector remains an important R&D performer, with key Higher Education Institutes (HEIs) belonging to this sector alongside a large number of Public Research Organisations (PROs). Other R&D performers include non-public Higher Education Institutions and Public Research Organisations business enterprises.

## **R&I Challenges**

### **Challenge 1: Increase the intensity of private R&D**

#### **Description**

The numbers of private sector R&D performers in Poland have been gradually increasing in recent years, alongside the overall value of BERD and its shares in GERD and GDP. In 2014, 2,814 business enterprises reported R&D expenditures (GUS, 2015d: I-1). However, these figures are still low in comparison to other EU member states, as there are over 200,000 business enterprises in Poland (GUS, 2016c: 42), and also distant from the R&D intensity targets defined by the government for the year of 2020 (BERD as 0.85% of GDP).

Another worrying tendency is the excessive focus of policy makers on state-owned enterprises, which at present perform particularly poorly in R&I. They have substantial growth potential, but are unlikely to induce major innovative changes in the Polish economy, which is dominated by privately owned firms.

### Policy response

The government expects the situation to change thanks to more R&D-friendly tax regulations, i.e. the adoption of the Act on Amendments of Some Acts with respect to the Support for Innovativeness in September 2015. The Act introduced the definition of R&D works and made them tax-deductible starting from 2016, thus establishing the basis for the inclusion of R&D expenditures in corporate financial books. It also eliminated previous, ill-conceived tax incentives for the acquisition of new technologies from external sources that were limiting the private propensity to carry out in-house R&D activities.

Moreover, active promotion of R&I support measures, offered by NCBR and PARP, raised the interests of the private sector, but many business enterprises only embark on formal R&D projects when they receive public co-funding. MNiSW prepared the White Paper on Innovations, setting ground for further legal reforms addressing the private sector innovativeness.

### Assessment

The actions taken in 2016 can be expected to trigger proportional increases in BERD, but the growth will be primarily induced by the public co-funding and not necessarily sustainable. At the same time, the R&I policy mix related to business enterprises seems strongly focused on absorption of funding instead of economic or innovative impacts. NCBR's funding schemes induced in 2015 only 22.3% of private co-funding, and many companies consider large R&D projects only when supported by grants. Some ESIF support measures that were originally designed as financial instruments or demand-side measures were offered in 2016 as grants, further disincentivizing the mobilisation of private capital. Despite the introduction of R&D tax incentives, R&D reporting by companies remains problematic, and the existing tax and accounting regulations might still discourage companies from classifying certain expenditures as costs of R&D, but the problems seem to have been acknowledged by the policy makers (in particular, planning to address it through one of actions outlined in the White Paper on Innovations).

## Challenge 2: Strengthen the cooperation between science and industry

### Description

The weak linkages between business sector and academia continue to be a challenge for the Polish R&I system. Quantifiable outcomes of science and industry cooperation are very limited, including low counts of joint private-public co-publications and co-patents, as well as shares of enterprises declaring cooperation with scientific organisations and shares of R&D expenditures of public science (HEIs and PROs) funded by business enterprises. A recent nation-wide survey confirmed negative attitudes of private sector representatives towards the public science sector and scientists (Maison, 2016: 14). The knowledge transfer outcomes remain unsatisfactory. The number of research projects carried out by PHEIs and PROs that were contracted by the industry remains persistently low (with business funding of research performed by academia amounting to 0.02% of the GDP in 2015, one of the lowest values in EU-28).

### Policy response

The current approach of the policy makers involves enforcing science-industry linkages, as many ESIF-based measures offer funding for HEIs/PROs only in collaboration with industrial partners. Multiple measures incentivize and enforce the co-operation, including R&D funding schemes (POIR 4.1.4, *SYNChem*, *STRATEGMED*, *BIOSTRATEG*, *TECHMATSTRATEG*), innovation vouchers (POIR 2.3.2), support for research infrastructures only in connection with their commercial uses (*PANDA 2* and POIR 4.2) and measures empowering researchers to work with industry (NCBR's *LIDER*, FNP's *TEAM TECH*). Approaches to defence R&D funding have also been improved, with dedicated measures attracting young researchers and Polish scientists working abroad. MNiSW amended the Act on Higher Education, simplifying the knowledge transfer pathways at universities and eliminating major bottlenecks. The Ministry plans a comprehensive reform of research institutes, and further adjustments of legal acts identified in the White Paper on Innovations.

### Assessment

The understanding of the importance of effective science-industry co-operation is visible among the R&I policy makers, particularly in MNiSW. At the same time, certain policy actions remain contradictory to these directions, e.g. amendments to the Act on Research Institutes adopted by the Parliament in 2016, forging closer links between some of these institutes and sectoral ministries (while the reforms should rather strengthen their co-operation with industry), or proposals included in the draft Strategy for Responsible Development

to enforce the use of open licenses for some of the technologies developed by HEIs and PROs.

The public science system still focuses on “pure”, non-applied science. NCN eliminates all project applications that could offer practical benefits for the industry, and thus fundamental R&D in Poland is not trying to address important societal or economic challenges but merely generate research findings that would be publishable in major international journals. The division between NCN and NCBR, fundamental and applied research, remains a serious chasm in the Polish R&I system, and it is not surprising that NCBR has shifted its focus towards companies in recent years, offering only a small number of measures dedicated for scientists. Nevertheless, many scientists, particularly from the younger generation, consider applied R&D and industry co-operation as viable options for their academic careers.

### **Challenge 3: Increase the quality of the public research base**

#### **Description**

Poland scores low in the European Innovation Scoreboard, including a poor ranking position for research outputs and low shares of highly cited publications in comparison with other EU member states. Merely one third of Polish publications in 2013 were co-authored with foreign researchers (based on: Scopus database, RIO own calculations). Only two Polish universities – Jagiellonian University, Kraków and University of Warsaw – were included in the 2015 ARWU World University Ranking of 500 best universities (Shanghai Ranking, 2015).

#### **Policy response**

The policy makers demonstrated genuine interests in improving the public science organisations, albeit with mixed results. Legislative actions led to reductions in administrative burdens for HEIs, and new Act on Higher Education is being prepared with the involvement of academic stakeholders. NCN introduces new funding schemes, filling certain gaps identified in the R&I system, including funding for more smaller R&D projects by young researchers (*MINIATURA* and *SONATINA*) and networking between Polish scientists and foreign ERC grantees (*UWERTURA*). The establishment of the Office for Scientific Excellence, tasked with the support of ERC candidates, is also a commendable action. The Foundation for Polish Science launched a portfolio of well-designed support measures for top researchers at different career stages (support measures based on POIR 4.4), and NCN plans to imitate ERC’s project selection modalities, thus bringing the Polish science closer to the international standards.

## Assessment

Long-term plans for sectoral reforms of HEIs and PROs seem promising, prepared through inclusive stakeholder consultations, but legal changes introduced in 2016 seem to contradict these idealistic approaches. Positive initiatives related to the introduction of new R&D funding schemes, including support for smaller R&D projects, international networking, and schemes adopting standards known from ERC competitions be expected to trigger the increase in quality of the public research base.

## Challenge 4: Priority setting in the R&I system

### Description

R&I performers in Poland are guided by explicit signals regarding the thematic or functional preferences of R&I policy makers. In 2014, the Polish R&I governance was impaired by the lack of thematic R&I priorities, but at the end of 2015, the number of incommensurable thematic lists associated with specific funding schemes was overwhelming and sets of priorities were reciprocally inconsistent (e.g. National Research Programme with 7 broad thematic priorities for scientific research; National Smart Specialisations with 20 broad thematic concentrations related to industrial R&D; Regional Smart Specialisations, different in each of the 16 Polish regions, with varying levels of technological detail; several sectoral programmes of NCBR developed in partnerships with industry stakeholders for selected industries; themes of NCBR's strategic programmes; lists of prioritised sectors for export promotion, preferred FDIs and key innovation clusters).

### Policy response

In 2016, the complexity was not reduced but further expanded: in an effort to narrow down the list of 20 national specialities defined by KIS and combine them with specialities of 16 regions, NCBR generated an even longer list of 26 RANBs (Regional Science-Research Agendas). In another attempt at prioritisation, the draft Strategy for Responsible Development listed 8 out of 20 areas previously identified as national smart specialisations and declared them as more important than others, deserving dedicated, “fast-track programmes”. Moreover, the draft SOR included several other, confusing sets of priorities, identifying strategic sectors, horizontal technologies, sectors for international promotion, as well as strategic and flagship projects in some technological areas, while also declaring that the plans to continue “prioritisation of KIS and RIS”. On top of this, there

are no visible KIS or RIS monitoring efforts, and the Economic Observatory established in 2015 to continuously analyse Poland's smart specialisations seems inactive.

### Assessment

On the one hand, the willingness to clarify the priorities seem appropriate. On the other hand, it's uncertain whether future efforts focused on narrowing-down the list of priorities would involve stakeholders and be evidence-based, preferably in accordance with the entrepreneurial discovery processes. There are risks that the prioritisation might be defined in a top-down mode, disregarding stakeholders and entrepreneurial discovery processes, redirecting R&I funding to sectors or beneficiaries identified by the government.

## Methodology

The research described in this volume involves multiple methods, including source documents analysis (such as policy documents, evaluation reports, statistics and web content and other online resources) and statistical data analysis (primarily Eurostat statistics and data provided by the Central Statistical Office of Poland).

## Main insights

The Polish R&I system went through major changes in 2016, and the assessment of many important initiatives seems premature.

Key developments in the R&I system in 2016 included:

- Establishment of Inter-ministerial Council for Innovativeness, focusing on R&I policies, headed by the Minister of Economic Development;
- Announcing “#StartinPoland” programme – a comprehensive framework for various support measures targeting start-ups;
- Adoption of the Plan for Responsible Development outlining directions for Poland's economic and social policies;
- Publishing of the draft Strategy for Responsible Development;
- Publishing the White Paper on Innovations which identifies 58 actions, including changes that would affect 15 existing legal acts and are expected to be adopted in 2017.

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The book documents the legal, financial and institutional situation of the Polish innovation system as of December 2016.

# 1

## Innovation ecosystem

Poland is an EU member state with 37.9m inhabitants as of 2016, accounting for 7.4% of the EU-28 population. Poland's GDP per capita expressed in purchasing power standards came to 68 % of the EU average in 2014. In 2014 and 2015, GDP growth in real terms was positive and amounted to 3.3% and 3.6% respectively (Eurostat, 2016).

In 2015, gross domestic expenditures on R&D (GERD) were €4,316.508m and since 2009, have been constantly increasing (in 2009: €2,095.827m). The business sector was the largest R&D contributor, its investment in R&D constituted 0.47% of GDP in 2015. Its role has been constantly increasing since 2006, when its R&D investment amounted to 0.17% of GDP. Higher education sector's investments in R&D were 0.29% of GDP in 2015, while government spent 0.25% of GDP (Eurostat, 2016). In 2014, R&D human resources amounted to 104,359 persons, full-time equivalent (FTE) with the total of 78,622 researchers included.

**Table 1: Main economic indicators**

	<b>2010</b>	<b>2014</b>	<b>2015</b>
GDP per capita in EUR	9400	10700	11100
GDP growth rate	3.6%	3.3%	3.9%
Budget deficit as % of GDP	-7.5%	-3.4%	-2.6%
Government debt as % of GDP	53.1%	50.2%	51.1%
Unemployment rate as percentage of the labour force	9.7%	9%	7.5%
Value added of services as share of the total value added	63.79%	64.61%	NA
Value added of manufacturing as share of total value added	17.65%	18.62%	NA



**Table 1 (cont.)**

	2010	2014	2015
Value added of knowledge-intensive services as share of total value	29.91%	30.09%	NA
Value added of high and medium tech manufacturing as share of total value added	5.11%	5.39%	NA
Employment in knowledge-intensive service sectors as share of total employment	29.04%	30.45%	30.03%
Employment in high and medium high tech manufacturing sectors as share of total employment	4.56%	5.13%	NA
Employment in manufacturing as share of total employment	18.58%	19.1%	19.3%
Employment in services as share of total employment	56.88%	58.3%	58.33%
Share of foreign controlled enterprises in the total number of enterprises	0.42%	NA	NA
Business structure of the economy: Share of enterprises by size class			
250 persons employed or more	0.21%	0.20%	NA
From 50 to 249 persons employed	1.04%	0.94%	
From 20 to 49 persons employed	1.56%	1.49%	
From 10 to 19 persons employed	1.81%	2.20%	
From 0 to 9 persons employed	95.38%	95.17%	
Entrepreneurship performance indicator:			
• Firm births rate	13.81	NA	NA
• Firm death rate	10.58		
• Firms survival (3 years threshold)	58.84		
Labour productivity (Index, 2010 = 100)	100	109.4	111.6
Innovation output indicator	NA	20	NA
Summary Innovation Index	Rank: 28 Score: 0.3	Rank: 30 Score: 0.29	Rank: 29 Score: 0.29

Source: ESTAT (2016).

## 1.1. Structure of the economy

### 1.1.1. Sectoral structure

The basic measures of the structure of the economy are shares of individual industries in value added and employment. In the context of innovation system development, sectoral breakdown of business R&D expenditures (BERD) should also be taken into account.

Manufacturing and services jointly represent around 95% of the BERD, which is founded mainly by the private sector. Manufacturing of motor vehicles and manufacturing of basic pharmaceutical products and pharmaceutical preparations are the leading manufacturing sectors in Poland with regards to R&D spending. When it comes to R&D spending among the top sectors in services, there are: information and communication services, professional, scientific and technical activities and wholesale and retail trade, repair of motor vehicles and motorcycles. Since 2011, the importance of these service branches has been constantly growing (GUS, 2015d). Due to the R&D funding policy changes, the total BERD has increased, along with private founding, among others, becoming more important. Business R&D spending has been stimulated by the programmes offered by the National Centre for Research and Development (NCBR, pl. *Narodowe Centrum Badań i Rozwoju*) that encourage public-private partnerships and promote co-funding (e.g. SYNChem, CuBR).

From 2010 to 2014, the total value added of the manufacturing sector in Poland has been gradually increasing, from 17.65% to 18.62%. In contrast, lower, but relatively stable growth rates were reported in the EU-28 (15.53% in 2014). The value added of high-technology industries in the same years has also slightly increased in Poland, from 5.11% of the total in 2010 to 5.39% in 2014.

Manufacturing and services, in the services in particular such sectors as wholesale, retail trade and repair in the automotive industry, substantially contribute to the total gross value added (GVA), compared to other sectors. Among important sectors with relatively high contribution to GVA, there are also: construction, public administration and defence, professional, scientific and technical activities and real estate activities. Nevertheless, construction and real estate activities are not important in terms of BERD (GUS, 2016c, 2016a).

With regards to manufacturing, the top four sectors in terms of GVA in 2014 include: manufacturing of food, beverage and tobacco products, manufacturing of fabricated metal products except machinery and equipment, manufacturing of

motor vehicles, trailers and semi-trailers and manufacture of rubber and plastic products (GUS, 2016c, 2016a).

When measuring the structure of the economy by employment shares of individual sectors in total employment, manufacturing has a relatively high and stable share in employment (19.3% in 2015). In the service sector the highest shares in employment were noted in wholesale and retail trade, transport, accommodation and food service activities (22.5% in 2015) and in public administration, defence, education, human health and social work activities (20.4% in 2015) (Eurostat, 2016).

A comparison of sectoral structures broken down respectively by BERD and GVA shows that R&D intensive sectors offer only limited contribution to the GVA. It supports the conclusion that low-tech sectors still play dominant roles in the structure of the Polish economy.

### **1.1.2. Firm organisation and entrepreneurship performance**

In 2014, the number of active enterprises in Poland increased by 4%, compared to 2013 (from 1,771k in 2013 to 1,843k in 2014). As in previous years, SMEs dominated the market, and represented 99.8% of the total population of enterprises, employing 6,326.5 thousand of employees (69.2% of all persons employed in non-financial enterprises). Microenterprises employing up to 9 persons represented almost 96% of SMEs, and the share of companies employing 10–49 persons stood at 3.2%, while firms with 50–249 employees constituted less than 1% of the total number of enterprises. Almost 20% of SMEs had their headquarters in the Mazowieckie region, where the capital of Poland is located. The smallest number of such entities was recorded in: Podlaskie, Lubelskie and Opolskie regions. The largest share of SMEs was involved in activities concerning trade and repair of motor vehicles (27%) and construction (12.5%). Trade (46.4%), manufacturing (22.4%) and construction (9.5%) companies recorded the biggest share of SMEs revenues (GUS, 2015h). In terms of R&D performance, mainly large companies and enterprises controlled by foreign capital perform such activities (GUS, 2015d).

New firm creation trends seem to be negative. In 2013, the number of newly registered companies decreased compared to the previous year by more than 10.3k to 268.4k. More than 80% of these firms use their own funds to cover the costs of running the business. Compared to the population of enterprises registered in 2012, this share has decreased by 1.6%. The use of bank loans and loans from family and friends also decreased. This can be explained by the broader use of subsidies and other support measures among companies (GUS, 2015f: 29).

The first-year survival rate for enterprises established in 2013 was 73% for one person companies, whereas for corporations (legal persons) 79%. The lowest survival rate was registered among companies operating in the field of finance and insurance. Approximately one third of the initial population of companies that started the business in 2009 was still active after five years.

On average, more men than women decide to undertake economic activities in the form of business enterprises. 58.3% of companies created in 2013 were registered by male founders. However, the proportion of women-owners was higher in companies engaged in healthcare (76.7%), other service activities (73.4%) and administrative and support activities (71.3%). In addition, in education, professional, scientific and technical and real estate activities, women accounted for over 50% of the population of new entrepreneurs (GUS, 2015f).

Some of the companies are created as a form of self-employment to perform work which could also be performed on the basis of employment contracts. The self-employment rate in Poland is still higher by more than 5 percentage points than the EU average. However, since 2010 there has been a slight decrease in self-employment rate in Poland (in 2010 – 22.98%, in 2015 – 21.23%) (OECD, 2016a).

Since 2009, the number of entities with foreign capital continues to grow. In 2009, there were 22,176 such companies, whereas in 2014: 26,464 companies (GUS, 2015g: 34). One of the indicators that allows to define the role of foreign entities in the national innovation system is their participation in R&D activities. According to data provided by the Central Statistical Office (GUS, pl. *Główny Urząd Statystyczny*), the percentage of foreign capital enterprises performing R&D activities in relation to the total number of companies performing R&D in Poland has been constantly falling, from 23.2% in 2011 to 19.1% in 2014 (GUS 2015c: 68). All in all, the role of foreign capital enterprises (including multinationals) in the Polish innovation system is substantial, but relatively smaller compared to previous years.

### 1.1.3. Integration in global value chains

Poland is strongly embedded in global value chains (GVC) with respect to the supply, manufacturing and logistics activities, as well as shared service centres. In particular, it refers to the chains created and managed by German, British and French companies (NBP, 2016c: 70). Poland reported considerable upgrading in GVC due to stronger increased participation as a buyer of foreign value added than as a seller value added (World Bank, 2015). On the one hand, Poland still focuses its specialisation on traditional, raw resource-based industries, while on the other hand, its services gradually earn an important

position in GVC production (Grodzicki, 2014). According to the World Bank, ICT and aerospace service sectors show potential to support economic upgrading in GVCs. The advantages of Poland in terms of integration in GVCs include high language skills and attractiveness for higher-skilled services jobs (World Bank, 2015).

#### 1.1.4. Productivity

Poland can be classified as a country with a relatively low labour productivity compared to more developed EU-28 countries. However, its productivity has reported since 2008 a constant growth. According to Eurostat data, Poland's nominal labour productivity per person has increased from 61.2% of the EU average in 2008 to 74.3% in 2015. Real labour productivity per person has been growing in Poland, its growth rate in 2015 amounted to 2.2% and was higher than in 2014 (1.5%) (Eurostat, 2016). The level of labour productivity differs among regions in Poland. In 2014, the highest level occurred in Mazowieckie region, while Lubelskie region was among the regions with the lowest productivity rate. The situation differs also among sectors. For example, productivity in agriculture is below country average, whereas in service sectors, such as wholesale and retail trade, professional and scientific activities, real estate or information and communication, exceeds the average.

In the period of 2006-2015 Poland reported an average annual growth of 1.4% in TFP (total factor productivity), and the TFP in 2015 was 1%. Despite the continuous slowdown in the TFP growth in Poland, its average performance in 2006–2015 remained the best among the Central and Eastern Europe (CEE) countries. In the examined period, the slowest TFP growth of -0.2% appeared in 2012, while the fastest on 3.4% in 2007. Comparing Poland's TFP growth to the results achieved by EU-15 countries (average growth rate in 2005–2014 was 0.1%), it can be noted that Poland recorded on average more rapid TFP increase. Moreover, it was the only EU country that avoided recession and reported the smallest variations in TFP of 3.6 percentage points (Próchniak, 2015; 2016).

TFP contribution to economic growth in Poland, in the whole period of 2006–2015, was on average 28%, whereas in 2005-2007 it was 49%, in 2008–2010 25% and 2011–2013 19% (Próchniak, 2015: 181). In most CEE countries it ranged between 40% and 80% in 2006–2015 (Próchniak, 2016: 145). This confirms the decreasing role of TFP in the economic growth of Poland.

Continuous TFP growth may suggest that Poland slowly improves its relative competitive position among other European countries.

## 1.2. Business environment

**Table 2: Main business environment indicators**

	2010	2014	2015
Country position in Doing Business WB	72	28	25
Product market regulation (OECD)	NA	NA	NA
Ease of getting credit (WB GII)	NA	rank 16 score 75	rank NA score 75
Survey on the Access to Finance of Enterprises (SAFE) Share of companies which identified access to finance as one of their most important	NA	NA	0.08
Venture capital indicators (EVCA) Venture capital investment as % of GDP (seed, start-up and later stage)	0.002	0.006	0.007
Innovative enterprises as a share of total number of enterprises CIS data 2012 (%)	23 (2012)		
EC Digital Economy & Society Index rank (DESI)	NA	22	22

Sources: ESTAT (2016); OECD (2016); World Bank (2016); EVCA (2016).

### 1.2.1. Ease of doing business / barriers to entrepreneurship

The annual World Bank report “Doing Business 2016”, measuring the ease of doing business in 189 economies, has ranked Poland in 25<sup>th</sup> position, with 11 EU member states ranked higher (World Bank, 2016a). It is a major improvement, considering the fact that in 2009 Poland was ranked the 76<sup>th</sup> with Greece being the only EU member state ranked lower. Compared to last year’s report (2015), Poland has moved three places up in the ranking. It is worth pointing out that the World Bank introduced some changes in the research methodology. According to previous methodology, Poland in 2015 edition of “Doing Business” occupied the 32<sup>nd</sup> place, according to the new, updated data – the 28<sup>th</sup>.

The favourable rating in the World Bank report reflects the year-to-year improvement in the implementation of transparency of legislative process, including the rules for making new laws with access to information about projects on the Internet, the simplification of court procedures, extension of rights to secure creditors and the introduction of an electronic system for filing and paying VAT and transport tax. The latter brought also some negative consequences – increase the level of taxation. It caused the increase of both, transport tax rates and contributions to the National Disabled Fund paid by employers.

Starting a business in Poland takes on average 30 days, costs 12.20% of income per capita, requires compliance with 4 specific procedures and paid-in minimum capital of 11.40% of income per capita. Poland is ranked 85<sup>th</sup> on the ease of starting business (World Bank, 2016b). In 2015, an average business had to make 18 compulsory tax payments and to spend 286 person-hours doing it. These indicators remained worse than EU average of 11.68 tax payments and 189.16 person-hours. Also time and cost of resolving insolvency (cost of recovering from debt as a percentage of the debtor's estate) compared with the EU average of 2.01 years and 10.25 were higher by almost 1/2 and 1/3 (EC, 2016c).

According to 38% of entrepreneurs surveyed by the Ministry of Economy in the second half of 2014, the level of taxes and fees imposed under the provisions of applicable laws was still considered to be the most significant barrier to entrepreneurship. In comparison to the previous year, the 2014 result was by 2 percentage points higher. Low turnover constituted a barrier for 16% of respondents. Other 5% of respondents pointed towards the complexity of the legal regulations. It can be seen as a major improvement comparing to previous years, when it was the third most frequently reported barrier (MG, 2015d). Other important barriers to the development of entrepreneurship in the second half of 2014, listed by around 10% of firms, were: waiting time for payment from contractor, competition from large enterprises, competition from small and medium-sized enterprises, bureaucracy and labour costs. These barriers were also confirmed by the Global Competitiveness Report 2015–2016 published by the World Economic Forum, where the top five problematic factors for doing business included complexity of tax regulations, restrictive labour regulations, tax rates, inefficient government bureaucracy and access to financing (Schwab, 2015: 298).

In November 2016, The Ministry of Economic Development presented a new regulation package concerning the relations between the government and business enterprises – “Business Constitution” (pl. *Konstytucja Biznesu*) (MR, 2016k). The document includes principles that all public offices will have to take into account when dealing with companies (e.g. presumption of honesty of entrepreneurs, entrepreneur-friendly interpretation of the law, the principle of proportionality). Other regulations include, among others, the introduction of an exemption from inheritance and gift tax consequences of the transfer of enterprises, changes in the taxation of company cars used for private purposes, exempt from the payment of social security contributions for new entrepreneurs, and the creation of a discussion and cooperation forum for ministries and representatives of entrepreneurs. The documents contain a lot of vague statements and few specific solutions. It seems to be the general plan of the future business law reform in Poland.

### 1.2.2. Access to finance

In terms of enterprises' access to finance, Poland's overall performance is above the EU average. SMEs can relatively easily access small loans and public financial support. Financing provided by banks is also available (EC, 2016c). There are three types of new, preferential loans created by the government to facilitate access to finance for SMEs. The first one has been designed to finance technological innovations for SMEs, the second one to set up a business, and the third one, to support businesses employing unemployed jobseekers. The structure of the sources of financing new investments by enterprises has changed since 2013, when 59.6% of enterprises used their own funds and 20.5% financed it with credit. In the third quarter of 2014, 47.6% of firms used their own funds, and 28.6% supported themselves with credit. Between the end of the year 2013 and 2014, the value of credits granted to large companies has increased by 6.3% that resulted in the exceptionally high volume of credits granted: 260.1b PLN<sup>1</sup> (€62.2b) (MG, 2015d). A credit in the current account was the most popular type of credits among Polish enterprises, and nearly 20% of enterprises used this type of financing in 2014. The second most common external source of financing investments was leasing, with the growth of the total value of assets financed this way by 13% YOY in 2013 and more than 21% YOY in 2014 (MG, 2015d).

Several programmes have been launched to improve the access to finance. Among such initiatives, there is the Programme of credit guarantees for SMEs up to the amount of €7.1b (30b PLN) granted by the Bank of National Economy (BGK, pl. *Bank Gospodarstwa Krajowego*) through commercial banks, which has been offered since March 2013 and is expected to be discontinued in December 2016. The main objectives of the programme are to increase the access to bank credit among SMEs and to protect them from consequences of instability on financial markets caused by the global crisis. Moreover, in 2013, the European Investment Bank started offering credit guarantees for Polish innovative SMEs in collaboration with bank Pekao S.A. The support instrument for micro-enterprises and SMEs that implement innovative technological solutions, i.e. the Technology Credit Programme, was also continued by the Bank of National Economy, between July 2014 and June 2015. This programme included the provision of credit facilities by cooperating commercial banks.

The first publicly supported fund of funds investing in venture capital (VC) / private equity (PE) funds in Poland is the National Capital Fund (KFK, pl. *Krajowy Fundusz Kapitałowy*), established in July 2005 with the aim of filling in the equity gap on the Polish SME market. Its portfolio consists of 17 capital

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<sup>1</sup> Monetary data presented in the report were converted from PLN to Euro using the average annual exchange rate, published by NBP: 1€ = 4.1843 PLN (2015).



funds, and their focus is on high potential innovative enterprises performing research and development activities, with 171 completed transactions as of July 2016 and the aggregate portfolio capitalisation of 983m PLN (€234.9m).

In June 2016, the government announced the launch of a new programme supporting innovative start-ups, named “#StartInPoland”. Its objective is to create the largest venture capital investment platform in Central and Eastern Europe and provide expert and finance support to innovative enterprises.

The Ministry of Economic Development in the draft Strategy for Responsible Development (SOR, pl. *Strategia na rzecz Odpowiedzialnego Rozwoju*), which was published in July 2016, announced plans to introduce new measures aimed at financing development project at regional level. These measures include: creation of regional business angel networks, promotion of mentoring in the process of business plan implementation by young entrepreneurs and providing incentives for specialized entities to establish venture capital funds (MR, 2016e: 168).

There are also corporate venture programmes run by several large companies, including KGHM and media group TVN.

Crowdfunding is another possible way to finance entrepreneurial initiatives and enjoys a relative popularity in Poland. As of July 2016, there are more than 25 crowdfunding platforms (Collaborative Economy Center, 2015), including PolakPotrafi.pl – the first Polish crowdfunding initiative that now gathers 2,448 projects worth a total of 13.9m PLN (€3.3m). Main crowdfunding platforms in Poland include Wspolnyprojekt.pl, Wspieramkulture.pl, Wspieram.to, and Odpalprojekt.pl. Polish entrepreneurs also use the world's largest funding platforms, such as Kickstarter or Indiegogo (Granicki et al., 2015: 25). The Ministry of Economic Development, in response to market needs related to the promotion of innovation and investing in start-ups, has started to work on the introduction of new legal form that will be appropriate for start-up companies, called simple joint-stock company (pl. *prosta spółka akcyjna*) (MR, 2016). The proposed concept aims to achieve the following basic objectives: the ease of setting up a company (including the use of digital infrastructure), small capital requirements, possibilities to use various forms of investment (including crowdfunding), reconciling the interests of the founders and investors, as well as fast and uncomplicated liquidation of the company. The date of introducing this legal form is not set yet.

### 1.2.3. Digital infrastructure and services

Poland's performance in terms of digital infrastructure and services is below the EU average. Poland adopted the Operational Programme Digital Poland for 2014–2020 (POPC), with the budget of around €2.2b aiming at providing common access to the high-speed Internet, introducing public e-services, increasing the level of digital competences of the society and providing technical

assistance. Nevertheless, its improvement is slower than the improvement of the EU as a whole (EC, 2016b; MIR, ERDF, 2014). Poland's overall score in DESI 2016 is 0.43, what ranks the country 22<sup>nd</sup> out of 28 EU member states and puts it to the “falling behind” cluster along with Bulgaria, Cyprus, Czech Republic, Greece, France, Hungary and Slovakia (EC, 2016a). On the one hand, fixed broadband coverage value in Poland is the lowest in EU, being at 86% of the EU average, on the other hand, the use of mobile broadband is ranked 6<sup>th</sup> among the EU countries (EC, 2016b). This discrepancy proves that there is a demand for fast Internet and on the supply side there is still room for improvements. In terms of the digitalisation of business, including the use of Cloud services, social media, data hosting, CRM and accounting software, Poland is still ranked below the EU average with only 12% of ICT specialists employed and 10% of companies selling online (EC, 2016b). Nonetheless, among priority axes of POPC 2014–2020, the digitalisation of enterprises is not even mentioned.

Strategic plans for the country's digital development is included in the recently published draft of the Strategy for Responsible Development (SOR). Dedicated measures are proposed in SOR in order to boost industries linked to smart specialisations and support the development of high technology new products and services, in particular in the area of ICT (MR, 2016e: 56). Relevant strategic projects described in the document, which are intended to be implemented by 2020, include:

- “Paperless Poland” – aimed at ensuring the diffusion of digital documents, the introduction of comprehensive e-procurement and e-invoicing;
- “Cashless Poland” – aimed at ensuring the dominant share of non-cash transactions in trade;
- “The National Broadband Plan” – offering nation-wide access to high speed Internet;
- “Open Public Data” – aimed at improving the quality and volumes of data publicly available on the portal [danepubliczne.gov.pl](http://danepubliczne.gov.pl).

“E-pionier” support measure introduced by the National Centre for Research and Development in July 2016 is another example of a scheme, which aims to support the digital transformation of the Polish public sector. The support is intended to create ICT-based tools solving specific problems of economic or social importance, as flagged up by the public authorities. It will be implemented in co-operation with specialised accelerators, which will be responsible for matchmaking public institutions with interdisciplinary teams, including those comprised of programmers (NCBR, 2016). According to DESI 2016, even though Digital Public Services in Poland are ranked 0.56, slightly above EU average of 0.55, and at the same time higher than for other DESI dimensions, the use of e-Government services remains generally low. Poland has moved down in the ranking from 12<sup>th</sup> to 15<sup>th</sup> place compared to the year 2015.

### 1.3. Public sector innovation

**Table 3: Public sector innovation indicators**

Researchers and technicians working in government as share of total R&D personnel	81.6 (2014)
Online availability of public services – for citizens and businesses (Estat)	27 (2015)
E-Government Development Index (UN) rank	36 (2016)
Government procurement of advanced technology products (WEF)	89 (2015)
Enterprises with procurement contract for domestic and/or foreign public sector (CIS 2012)	8.9

Sources: ESTAT (2016); OECD (2016); World Bank (2016); EVCA (2016).

#### 1.3.1. Public sector modernisation agenda

The online presence of Polish public services has increased considerably, from 20% in 2006 to 78.75% in 2010, but it is still lower than the EU average of 84%. Along with these changes, the quality of public services, policy design and implementation have also increased from 0.58 in 2000 to 0.71 in 2010 (EC, 2013). In 2014, Poland was classified in the high EGDI group, scored 0.6482 and was ranked 22<sup>nd</sup> out of 28 EU member states (UN, 2014).

The draft Integrated eGov Programme (pl. *Program Zintegrowanej Informatyzacji Państwa*) is a document describing the government's efforts to provide high-quality digital public services. The aim of the programme is to create a coherent, logical and efficient state information system, providing e-services at national and European level in an effective way, in terms of quality and cost. The programme foresees integration of existing and new IT systems in public administration followed by the elimination of redundant functions. Implementation of the programme will be carried out by taking systematic actions in the following fields: government readiness to cooperate with society and support for the development of civil society, designation of standards and conditions for creating safe and effective e-government, e-services, and digitalisation of offices (MC, 2016). There are several programme components that are planned to be introduced, including: “eID” – a system of identification and authentication of citizens, “EZD” – document management system for public administration, and creation of a unified portal that allows to access a variety of public e-services (MR, 2016e: 200).

As of 2016, Poland has developed the e-government infrastructure that include ePUAP portal (providing administrative services to the public via electronic communications channels), national e-Health projects (such as

Electronic Platform for Collection, Analysis and Sharing of Digital Medical Records), Geoportal (a single access point that allows to find and access spatial data for the territory of the country), Central Registration and Information on Economic Activity (CEIDG, pl. *Centralna Ewidencja i Informacja o Działalności Gospodarczej*), e-Court, Mortgage register, eDeclarations (such as Electronic submission of personal income tax returns, VAT declaration submissions), E-customs programme and Public Information Bulletin (MC, 2016). Nevertheless, only 27% of individuals in 2015 used the Internet for interacting with public authorities in Poland. Less than 20% used Internet for downloading and sending official forms to public authorities or obtaining information from public authorities (EC, 2016d). Among the key factors affecting the common use of e-services are: low maturity of services, limited user friendliness, lack of public awareness regarding the opportunities offered by the e-government, the lack of relevant skills and the trust deficiencies (ARC Rynek i Opinia, 2014). Moreover, the Ministry of Digital Affairs, on the basis of experience of the administration, declares that there are also other problems of e-government that include: the lack of coherent action of the public administration, delays in offering citizens a universal electronic identification system, differences in access modalities to various digital systems, and inadequate legal solutions delaying the rapid progress of digitalisation and technology (MC, 2015).

The government is currently working on a new solution called Obywatel.gov.pl. The launch of the platform is planned for 2016 but the BETA version is already available. The platform will be a user-friendly gateway to all types of public administration servers on the Internet with an intuitive search engine. Creating the platform is a step towards encouraging people to use e-government services.

The transparency of policy making and open government data policy is moderate in Poland (EC, 2015b). Even though the open government data website DanePubliczne.gov.pl was revamped in May 2015 in order to enable convenient search and use of the data, citizens still encounter numerous problems with obtaining or using public information. The use of eGovernment services is still low (around 20% of Internet users use eGovernment). The ease of access to data gathered by public services is one of Strategic Action Priorities of the Minister of Digital Affairs in computerisation of public services (EC, 2016d: 14).

### 1.3.2. Public sector innovation culture

Poland, in comparison to other EU countries, does not introduce many public sector innovations using co-design or co-creation approaches. The most recent example of such approach concerns the preparation of proposals for a comprehensive reform of the higher education sector. In 2016 the Ministry of Science and Higher Education announced a competition called “Legislation 2.0”

(pl. *Ustawa 2.0*) aiming at preparing drafts of the new Act on Higher Education that would be proposed in parallel by three selected teams of experts (MNiSW, 2016r). Following the announcement, the Ministry established a jury of scientists to choose the winners of the competition. In May 2016, the Ministry, along with the jury, selected the winning teams and granted each of them 300k PLN (€71.7k) for their projects, tasking them also to carry out broad public consultations. The final proposals are expected to be completed by the end of 2016. Their release will be followed by series of debates and conferences in order to facilitate public consultation. Later, these three alternative proposals will contribute towards the draft that will be subject to legislative work and the political responsibility for its content will remain with the Ministry (MNiSW, 2016q). This example shows, on the one hand, the openness of the government to the dialogue with stakeholders and a new approach to drafting the law. On the other hand, however, it rises some concerns about the problems of involving scientists as designers of policies that they themselves would benefit from, difficulties in implementation of three divergent proposals of the reforms, and last, but not least, a long timeline for the preparation of new regulations for the HEI sector (more on this topic in: section 4.1.3).

As far as the implementation of digital services in Poland is concerned, policy actions and initiatives aiming at developing the e-Government used to be managed separately by different branches of government in an insufficiently coordinated manner (Mackiewicz, 2015: 256). Rarely have these become joined-up actions with citizens or business. Example of the latter scenario may be the introduction of a child subsidy programme called Family 500+, in which the successful cooperation with banks established a new channel for submission of applications by citizens using the existing e-banking platforms. Thanks to this good experience the Minister of Digital Affairs started to think more broadly about the future cooperation with business.

There are also several public sector innovations that are registered in the Observatory of Public Sector Innovations published by OECD. The examples of such initiatives include: Publicly Available Register of Data, which allows the government to collect, organise and share environmental information provided by local, regional and central government institutions in Poland (it is a part of a larger website, [ekoportal.pl](http://ekoportal.pl)) and the Foreigners' Forum, a programme of cooperation with NGOs launched by the Mazovia region aimed at exchanging opinions and information, as well as establishing partnerships and cooperation in the field of pre-integration and integration activities (OECD, 2016b).

In 2010–2014, the EUROREG research team from the University of Warsaw carried out the project called “Learning Ministries” (pl. *Ministerstwa Uczące Się*). Its objective was to develop a toolkit for diagnosing and supporting organizational learning in public administration. It was also aimed at strengthening the processes of modern knowledge management in departments of Polish ministries. The

research team conducted research in various Polish ministries and published several reports describing their diagnosis. One of the findings confirms that Polish public administration is not open to great extent to cooperation with the environment surrounding it, including stakeholders. The cooperation remains also limited at the inter-institutional and intra-institutional levels. In order to promote a culture of innovation and knowledge in the public sector, the sector's openness to various stakeholders seems to be crucial in the case of Poland (Możdżeń et al., 2014: 91–94).

In 2016, the Ministry of Science and Higher Education launched an online system ELA (National System Monitoring Economic Careers of Higher Education Graduates, pl. *Ogólnopolski System Monitorowania Ekonomicznych Losów Absolwentów Szkół Wyższych*), presenting statistics about economic situation of graduates from individual study programmes at specific HEIs in Poland (<http://absolwenci.nauka.gov.pl>). The system is an interesting policy innovation, automating the data collection processes and using objective economic data not opinion surveys. It collects ID numbers of graduates from all HEIs in a given year and queries the database of the Polish Social Insurance Institution to verify the amount of social security contributions paid for each graduate and other employment-related statistics, compiling anonymised, aggregate reports for annual cohorts of graduates divided by HEI and type of studies. First reports were published in May 2016, covering graduates from 2014. In the future, systematic collection of these reports could help evaluate the relevance of individual study programmes for the labour market and offer important information for HEI management.

Multiple support measures have been launched as pilots to experiment with different available modalities and focus areas. NCBR has been testing numerous instruments in 2012–2014 and used these experiences in designing the specific measures offered based on POIR. Some of these approaches were however identified as problematic in the NCBR audit, carried out by MNiSW (MNiSW, 2016n) and the willingness of NCBR to experiment with new tools and frameworks might be significantly impaired in the coming years. PARP maintains “inno\_LAB” – Centre of Analysing and Piloting New Instruments, based on the earmarked funding from POIR 2.4.1, and the first measure piloted in this framework was “ScaleUP” for technology accelerators working with large state-owned enterprises to support innovative start-ups.

## 1.4. Civil society innovation

Social innovations in Poland are usually considered in the social entrepreneurship and social economy context. The role of such initiatives is constantly gaining importance (Klimczuk, 2015). Each year, there are more entities

supporting social innovations and initiatives aimed at its development and promotion. Such initiatives include the creation of the Social Innovation Fund by the City of Łódź in 2013, activities of Pomeranian Science and Technology Park with a department that focuses on providing support for new ideas in social activities that address the needs of the residents of Gdynia, the Ashoka's programme in Poland and many workshops, events and conferences organised annually. Most of these initiatives are local or regional projects.

Among the entities that support and promote social innovations there are: Local Activity Support Centre CAL (pl. *Centrum Wspierania Aktywności Lokalnej CAL*), the Unit for Social Innovation and Research "Shipyards" (pl. *Pracownia Badań i Innowacji Społecznych „Stocznia”*), the Foundation for Social Innovation Workshop (pl. *Fundacja Warsztat Innowacji Społecznych*), Center for Business Ethics and Social Innovation established by Kozminski University. Medialabs and fablabs also play a significant role in supporting social innovation and generating further innovations (e.g. MediaLab Chrzelice, Medialab Gdańsk, Medialab Katowice).

#### 1.4.1. Citizen science initiatives

Citizen science initiatives have been present in Poland since 2011, when a Polish language version of a project encouraging volunteers to observe the sky and inform about planets and the degree of stars' visibility Planet Hunters, a Zooniverse project, was launched (Szprot, 2014: 99). As of 2016, Zooniverse has 1 million users, amongst whom there are 100 thousand Poles (Centrum Nauki Kopernik, 2016). In Poland, the Scientific Committee on Oceanic Research (pl. *Komitet Badań Morza*) and the Institute of Oceanology (pl. *Instytut Oceanologii*) of the Polish Academy of Sciences along with the Regional Fund for Environmental Protection and Water Management in Gdańsk (pl. *Wojewódzki Fundusz Ochrony Środowiska i Gospodarki Wodnej w Gdańsku*) support citizen science initiatives organizing four actions with 13 projects. Their projects are based on observations collected by project participants, who create a public database on a given topic, with the help of scientific institutions. Scientists proposed various research questions and are trying to give the answers based on the data gathered by individuals participating in the projects. Recent projects topics include: the environment surrounding the sea, water and traveling. Other examples of Polish citizen science initiatives include: projects implemented under the Monitoring of Birds of Poland and the project *Otwarte zabytki* (*Otwartzabytki.pl*) run by "Centrum Cyfrowe Projekt: Polska".

As of 2016, among the members of the European Citizen Science Association (ECSA), which is set up to encourage the growth of the citizen science movement in Europe, there are two Polish organizations (ECSA, 2016): the Institute of

Nature Conservation of the Polish Academy of Sciences in Cracow (pl. *Instytut Ochrony Przyrody Polskiej Akademii Nauk*) and the „Fix The City Foundation” (pl. *Fundacja Napraw Sobie Miasto*). The Foundation aims at creating and promoting tools to interact, co-design and co-manage urban spaces (Napraw Sobie Miasto, 2015).

#### 1.4.2. Role of non-profits in supporting innovation

There are several non-profit organisations supporting innovation in Poland, but their role in the Polish innovation environment remains limited.

The Foundation for Polish Science (FNP, pl. *Fundacja na rzecz Nauki Polskiej*) is one of the most important non-governmental, non-political and non-profit institutions that provides R&D funding. The Foundation supports scholars and research teams in all fields of science, provides funds for modernisation of research facilities and helps in commercialisation of scientific discoveries and inventions. Nevertheless, its budget includes funds obtained from European Structural and Investment Funds (ESIF) and state donations.

Companies can benefit from a number of funding opportunities, mainly based on public funds, offered by non-public sector intermediaries. These include business support institutions (pl. *Instytucje Otoczenia Biznesu*), which in 2014 incorporated 681 entities, such as: technology parks (42), technology and business incubators (94), technology transfer centres (42), innovation centres (47), capital funds (103), regional and local loan funds (81), credit guarantee funds (58), business angel networks (7), training and consulting centres (207) (Bąkowski and Mążewska, 2015: 10–11). Some of these organisations operate in the form of non-profit institutions. For example, loan funds and credit guarantee funds play an important role in supporting the development of entrepreneurship at the local level in Poland. Most of them operate as non-profit organisations and reinvest their earnings in the implementation of their statutory objectives.

There are also several non-profit foundations, such as the Foundation of Innovative Initiatives (pl. *Fundacja Inicjatyw Innowacyjnych*) supporting growth and innovativeness of Polish high-tech SMEs or the Foundation for Innovation and Knowledge (pl. *Fundacja Innowacja i Wiedza*) established to encourage entrepreneurship and disseminate knowledge essential for the innovation economy support.

An interesting example of innovativeness is an initiative of the association “Jagiellonian Club” (pl. *Klub Jagielloński*), which in November 2015 launched a mobile application “Pola” that helps people identify consumer products originating from Poland. “Pola”’s mobile application allows consumers to scan barcodes of retail products and consult an online database to verify whether their producers rely on domestic or foreign capital, and maintain manufacturing



facilities in Poland. The developers prepared a ranking algorithm assigning points based on several criteria, such as the origin of capital and place of manufacturing. It also gives points to companies that perform R&D activities in Poland.

### 1.4.3. Mediating structures

The Polish landscape of mediating structures consists of two influential start-up foundations (Startup Hub Poland, Startup Poland), around thirty co-working spaces located in the biggest cities (such as Reaktor in Warsaw, COLAB in Cracow), multiple online platforms (for instance: [www.mojepanstwo.pl](http://www.mojepanstwo.pl), [www.u24.pl](http://www.u24.pl)), and a network of incubators operating in academic centres (Academic Entrepreneurship Incubators, AIP, pl. *Akademickie Inkubatory Przedsiębiorczości*). In 2016, AIP had 50 offices with conference rooms and workplace located in 24 cities and was the biggest network of start-ups incubators in Poland. The Foundation Startup Poland is a grassroots organisation founded by entrepreneurs, which aims at creating better conditions for Polish start-ups, deepening a dialogue with the public administration and recommending measures to stimulate technological entrepreneurship in Poland. It is the largest community voice of Polish new technology-based companies (Startup Poland, 2014). Its recent achievements include publishing in 2015 the first Polish report covering the results of a nation-wide survey of start-up companies and drawing attention to their important role in the economy (Skala et al., 2015). Startup Hub Poland contributes towards developing new technologies in Poland and facilitates access to start-up communities, laboratories, financial market and professional networks.

The Polish Business and Innovation Centres Association (SOOIPP, pl. *Stowarzyszenie Organizatorów Ośrodków Innowacji i Przedsiębiorczości w Polsce*) is also an important mediating structure. It is a non-governmental institution which aims at shaping business environment and supporting innovation, entrepreneurship and regional development. It is an active participant of public consultation concerning important strategic and programming documents at regional, national and European Union level. It represents the interests of the representatives of the business environment in Poland.

When it comes to open access platforms and activities in Poland, there are many examples of relevant, bottom-up initiatives. The Centre of Open Science CeON, managed by the University of Warsaw, is one of them. It is a platform aggregating open access journals and free online publication databases. It allows open access to repositories, including CeON Repository, “Open the Book” repository, the Virtual Library of Science, the Repository for Open Data RepOD, and CeON Aggregator (Niegódko, 2016). The Federation of Digital Libraries,

managed by the Poznań Supercomputing and Networking Centre, is another example of initiative supporting open access. It aims at digitizing contents from Polish libraries, along with scanning of scientific publications. Both described initiatives rely on voluntary self-archiving of publications by researchers.

## 1.5. Supply of human resources

In 2014, there were 153.5k of people employed in R&D in Poland, 104.4k measured in full-time equivalents (FTE). In comparison to 2013, these numbers have increased by 5.4% and 11.3%, respectively. Poland has relatively low position in terms of R&D employment in the EU. In 2013, it occupied the 25<sup>th</sup> position in the EU in terms of employment in R&D in FTE per 1,000 persons employed, whereas it was placed the 23<sup>rd</sup> in a similar ranking of researches employed in R&D.

In the period of 2011–2014, the share of employment in high- and medium high-technology manufacturing sectors in total employment has constantly been rising, from 4.78% to 5.13% and remained above the EU-28 average. Employment in knowledge-intensive sectors, expressed as a share of total employment, remained below the EU-28 average, but has slightly increased from 28.87% in 2011 to 30.45% in 2014.

In 2014, the supply of human resources in science and technology amounted to 4.8k of people. In the analysed year women constituted 58.5% of this group.

According to the forecasts prepared by Cedefop, between 2015 and 2020 employment is expected to rise slightly, not exceeding its pre-crisis level. In 2025 it is expected to be a little lower than it was in 2015. The employment growth forecasted for Poland is slower than for the EU as a whole, where average employment is expected to reach its pre-crisis level in 2020 and maintaining growing trend until 2025 (Cedefop, 2015a; Cedefop, 2015b). In the analysed period, in Poland, job growth is forecasted in the following sectors: distribution and transport, business and other services and construction. High demand is forecasted for high level professional occupations in science, engineering healthcare, business and teaching, and service and sales workers (Cedefop, 2015b: 1).

The percentage of highly-qualified workforce will increase, according to forecasts. By 2020, around 67% of Poles in the age of 30 to 34 are expected to have high-level qualifications. By 2025, in Poland around 34% job opportunities is forecasted to be for professionals, whereas in the EU-28 high-level occupations are expected to reach 24% (Cedefop, 2015a: 4).

There were 1.469m students in 2014 in Poland (5.2% less than in 2013) and women accounted for 58.1% of all students. The share of women among

the population of students was relatively stable between the academic years of 2010/2011 – 2014/2015. When it comes to STEM (Science, Technology, Engineering and Mathematics) students, who constitute 28.7% of all students, the share of women is much lower: in 2014, it was 41.6% (GUS, 2015c). Moreover, the share of women studying at technical universities has been increasing steadily since 2007/08, when it amounted to 30.7% of the total number of students. As of 2014/15, women account for nearly 37% of the students of technical universities. This trend is gradually strengthening (Perspektywy.pl, 2016). Nevertheless, women participating in PhD programmes in technology and engineering only accounted for little more than 10%.

The gender balance seems to be a bigger issue when it comes to researchers. Even though the share of women among newly promoted PhDs between 2010 and 2014 exceeded 50%, it is much lower in the case of awarded habilitation degrees (40% in 2014) and professor's titles (33.7% in 2014).

In terms of policy directions, Poland seeks to promote gender equality. There are several provisions in the Polish Labour Code that prohibit discrimination of women in the labour market access. To help women maintain their work-life balance, the Code offers additional protection for pregnant women, and those on maternity leaves.

In order to support female researchers, there are special ways of calculating the maximum age while applying for young researchers' grants, which exclude the duration of maternity and child care leaves when defining the age of eligibility of applicants. These rules have been adopted by both R&D funding agencies, NCN and NCBR. Similar rules apply also to students and PhD students, who can extend their study periods on this basis (as stipulated by the ordinance of the Minister of Science and Higher Education, 2011).

Polish women scientists can benefit from several dedicated programmes and competitions. "New Technologies for Girls", organised by Intel Technology Poland and the Educational Foundation "Perspectives" offers professional support, financial assistance and internships for high school female graduates and female students of technical universities. The Foundation L'Oréal and UNESCO offer scholarship programme named "Women and Science". In February 2016, the Association TOP500 Innovators and the Educational Foundation "Perspectives" launched a new mentoring programme "Girls go start-up!" dedicated to women scientists and young women entrepreneurs. The aim of the project is to promote women engagement in STEM studies, support them with knowledge about start-up creation and help to accelerate their ideas. Moreover, the Conference of Rectors of Polish Technical Universities manages a programme and a promotional campaign named "Girls on technical universities". The initiative "LeadersIN" launched in June 2016 by the Polish branch of the Vital Voices in cooperation with various enterprises (including Bank

BPH, Citi, Coca-Cola HBC, Dell, Deloitte, Google, JLL, MetLife, Microsoft, Rothschild and T-Mobile) is dedicated for women managers. The programme addresses the need to increase the number of women leaders and ensure their professional advancement. As of 2016, the number of women-oriented initiatives has been growing. It is worth noting that the majority of such initiatives are run by non-government entities.

**Table 4: Supply of human resources**

	2010	2014	2015
New doctorate graduates (ISCED 6) per 1000 population aged 25–34	NA	0.44	NA
New graduates in STEM per 1000 population	2.59	2.79	NA
Number of researchers per thousand of population	2.65 (2011)	3.03	NA
Share of women researchers	38.29 (2012) 37.79 (2013) 37.23 (2014)		

Source: ESTAT (2016).

## 2

### R&D and innovation structure and actors

The chapter discusses the structure of R&I system in Poland, including the roles played by specific R&I funders and R&I performers. It explains the impacts of increased government funding for R&D and the growing importance of competitive project and institutional funding. It further presents problems encountered by public science organisations and business enterprises, and the limited extent of public-private R&I co-operation. This overview will set the stage for chapter 3, analysing specific innovation challenges in Poland.

**Table 5: Main R&D indicators**

Indicator/inputs & outputs	2010	2012	2014	2015	EU average (2014)
GERD (as % of GDP)	0.72%	0.88%	0.94%	1	2.04%
GERD in national currency (m PLN)	10,416.2	14,352.9	16,168.2	18,060.7	NA
R&D funded by abroad % of GDP	0.09%	0.12%	0.13%	0.17%	NA
R&D funded by EC (% of GDP)	0.06%	0.10%	0.1%	NA	NA

Source: ESTAT (2016).

#### 2.1. Government

Polish R&I policies are co-ordinated by the inter-ministerial Council for Innovativeness (pl. *Rada do spraw Innowacyjności*), headed by the Minister of Economic Development and with the involvement of the Minister of Science and Higher Education (see more: section 4.1.1 of this report). As presented in Annex 5, Ministry of Economic Development (MR, pl. *Ministerstwo Rozwoju*) sets the overall directions for economic development and innovativeness of the economy, while Ministry of Science and Higher Education (MNiSW, pl. *Ministerstwo Nauki i Szkolnictwa Wyższego*) focuses on policies related to scientific

organisations. This division of tasks is however more complicated, as MNiSW oversees R&D funding agencies: NCN (National Science Centre, pl. *Narodowe Centrum Nauki*) focused on fundamental research and NCBR (National Centre for Research and Development, pl. *Narodowe Centrum Badań i Rozwoju*), financing applied R&D projects. NCBR is the core source of R&D funding for business enterprises and a key government agency distributing ESIF (European Structural and Investment Funds) for R&I purposes. MR oversees its own funding agency PARP (Polish Agency for Enterprises Development, pl. *Polska Agencja Rozwoju Przedsiębiorczości*) that supports non-R&D based innovations, implementation of innovations and broader R&I ecosystem services. Both MR and MNiSW offer also supports schemes that are directly implemented by ministries not subordinate agencies, but in 2016, some rationalising measures were taken to streamline the portfolio and implementing modalities. Among important R&D funders, Foundation for Polish Science (FNP, pl. *Fundacja na rzecz Nauki Polskiej*) is a non-governmental organisation that strongly relies on public funding and ESIF in its funding schemes.

The main sources of R&D funding are listed in the annual science budget, elaborated by MNiSW and adopted by the government and the Parliament. The budgetary plan includes both national funding and relevant ESIF funding, albeit separating these measures (MNiSW, 2016c). Each year, implementation of the budget are described in a detailed financial report (MNiSW, 2016i), alongside another reporting document, presenting measurable results of ministerial activities (MNiSW, 2016j).

Table 6 presents key quantitative metrics related to R&D activities funded and performed by the government sector.

**Table 6: Main R&D indicators – government**

Indicator/inputs & outputs	2010	2012	2014	2015	EU average (2014)
GBAORD in national currency (m PLN)	5,247.4	5,733.6	7,396.9	5460	NA
GBAORD as % of GDP	0.36%	0.35%	0.43%	0.31%	0.67%
R&D funded by GOV (% of GDP)	0.44%	0.45%	0.43%	0.42%	0.66%
R&D performed by GOV (% of GDP)	0.26%	0.25%	0.23%	0.25%	0.25%

Source: ESTAT (2016).

In 2016, the government streamlined some of its expenditures applying the principles of smart fiscal consolidation, while increasing spending on selected

social objectives. It resulted in a reduction of the science budget, which nevertheless didn't affect the amount of available competitive R&D funding. The science budget planned for 2016 is smaller than the executed budget from 2015 by 6.64% (calculations based on: MNiSW, 2016c; MNiSW, 2016i), but the expenditures were rationalised, with core R&D expenditures actually increased, including: funding for NCN increased by 14.17%, national funding for NCBR increased by 23.87% (although the overall funding for NCBR dropped by 28.74%, as the Centre was tasked with the distribution of substantial amount of the EU Structural Funds in the last year of the financial perspective) and spending on defence-related R&D projects going up by 86.56%. These three nationally-funded R&D streams translate into approximately 518.97m PLN (€124m) more grant financing available to beneficiaries in Poland in 2016.

GBAORD (Government Budget Appropriations or Outlays on Research and Development) data available from Eurostat do not yet include these latest changes, and demonstrate positive tendencies, as the government spending on R&D and on the public science sector has been gradually increasing during the recent years. Nevertheless, public science organisations (both PROs and HEIs) are under-funded in comparison to their counterparts from many Western European countries, with uncompetitive levels of salaries for scientists and relatively limited institutional funding. Following the large institutional reform of science and higher education in 2010-2011, the focus was reoriented towards competitive project-based funding for R&D, but the funding available from NCN can only be distributed among a limited number of research teams, and NCBR focuses on business enterprises or research consortia driven by companies. Many scientists complain about the current focus on scientific competitiveness and performance-based funding, using the pejorative Polish neologism "*grantoza*", which could be translated as "grant-based illness". More information about the shortcomings of the institutional evaluations and R&D funding distribution mechanisms are provided in section 3.3 of this report.

Public sector remains an important R&D performer, with key Higher Education Institutes (HEIs) belonging to this sector (see more information in section 2.2 below) alongside a large number of Public Research Organisations (PROs). PROs included in 2014 as many as 360 R&D performers (GUS, 2015d: I-1) that were divided into distinctive groups of R&D performers, with differentiated research interests. The institutes of the Polish Academy of Sciences concentrate on fundamental research (82.8% of R&D expenditures in 2014), with only limited activities related to applied research (10.5%) and experimental development (6.7%), while research institutes were less interested in basic research (20.4%), carrying out more applied research (41.3%) and experimental development (38.3%) (GUS, 2015d: 72). Not surprisingly, innovative enterprises, responding to the Polish edition of the Community

Innovation Survey that covered the period of 2012–2014, had more cooperation experiences with research institutes (manufacturing companies: 14.3%, service companies: 6.0%) than with the Polish Academy of Sciences (manufacturing companies: 1.9%, service companies: 1.0%) (GUS, 2015a: 104). These shares are lower than corporate cooperation with higher education institutes. Some companies also work with PROs from abroad (manufacturing companies: 0.6%, service companies: 3.7%) (GUS, 2015a: 104), and particularly the international collaboration of service companies might suggest a lack of certain skills or knowledge, needed by the industry, among PROs in Poland.

In 2014, the Polish Academy of Sciences incurred 1,320m PLN (€315.4m) of R&D expenditures and employed 7.9k R&D personnel, while research institutes invested 2,440m PLN (€583.13m) and employed 18.5k R&D personnel (GUS, 2015d: 70; 86-87). All scientific organisations in Poland are subject to regular institutional evaluations, dividing them into categories based on their R&D performance. Only 4 research institutes have the highest (“A+”) category, 41 are ranked as “A” and 67 as “B”, while 13 institutes of the Polish Academy of Sciences are “A+” designated, 43 are in the “A” category and 14 in “B” (MNiSW, 2016i: 88). The Supreme Audit Chamber carried out an extensive audit of research institutes, pointing to the problems of many institutes, maintaining very limited contacts with industrial companies, suboptimal scientific performance and excessive reliance on government funding (NIK, 2015) (see also: section 3.2 of this report). MNiSW prepares a reform of the research institutes and plans to establish the National Institute of Technology using some of their resources (see: section 4.1.5), and in 2016, the Parliament amended the relevant legislation to strengthen the ministerial oversight over some of these institutes (see: section 4.1.4).

## 2.2. Academia

The higher education sector in Poland incurred in 2014 expenditures on R&D amounting to 4,710m PLN (€1,125.6m), and these expenditures went up by 21.7% between 2010 and 2014 (GUS, 2015c: 59). The sector employed approximately 82,500 R&D personnel (headcount) in 2014 (GUS, 2015c: 80).

Only 108 public higher education institutes declared R&D activities in 2014 (GUS, 2015c: 62), even though the total count of public HEIs in that year was 132 (GUS, 2015e: 30). From 302 non-public HEIs (GUS, 2015e: 30), only few carry out larger scale R&D projects, but as many as 103 organisations declared in 2014 R&D expenditures (GUS, 2015d: I-1). The overall number of HEIs dropped from 460 in 2010 to 434 in 2014 (GUS, 2015e: 29), but remains relatively high. 10 largest public HEIs accounted for 23.2% of all students, and



2 largest HEIs (University of Warsaw and Jagiellonian University, Kraków) for 6.0% of students (GUS, 2015e: 25). Universities usually do not have engineering faculties, and only some of them have separate medical schools, while universities of technology and universities of medicine are separate organisations. R&D expenditures of an average public HEI amounted to 40.5m PLN (€9.68m), and of a non-public HEI: only 3.2m PLN (€0.76m) (GUS, 2015c: 63).

HEIs are primarily dependent on the government for funding of their R&D activities (73.1% of HERD in 2014), but also use foreign sources including the European Commission (16.6%) and own financing of the sector (7.3%). Domestic business enterprises fund 2.8% of R&D expenditures of the higher education sector, and private non-public organisations – only 0.2% (GUS, 2015c: 66). Among the foreign sources, 0.38% of HERD was funded by companies from abroad (GUS, 2015d: I-6). 16.8% of innovative enterprises from the manufacturing sector and 11.9% from the service sector cooperated with HEIs between 2012 and 2014, and in this respect, HEIs outperformed PROs, even research institutes (GUS, 2015a: 104), for which cooperation with industry should actually be a priority.

Table 7 presents the key quantitative metrics related to the HEI sector.

**Table 7: Main R&D indicators – academia**

Indicator/inputs & outputs	2010	2012	2014	2015	EU average (2014)
R&D performed by HES and funded by GOV (% of GDP)	0.2%	0.22%	0.2%	0.19%	0.37% (2013)
R&D performed by HES and funded by private BES+ PNP (% of GDP)	0.01%	0.01%	0.01%	0.01%	0.02%
International scientific co-publications per million population	173.61	199.19	235.23	251.17	NA
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	3.88	4.26	NA	NA	NA
Research excellence composite indicator (rank)	NA	24	NA	NA	NA
ERC success rate (granted over evaluated)	0.1	0.04	NA	0.04	NA

Source: ESTAT (2016); Scopus (2016).

Compared to the other types of public science organisations, public higher education institutes registered the lowest levels of R&D expenditures per one

R&D employee: only 108.1k PLN (€25.8m) in 2014, compared with 165.8k PLN (€39.6m) for research institutes and 184.6k PLN (€44.1m) for institutes of the Polish Academy of Sciences (GUS, 2015c: 87). HEIs benefited from a substantial increase in the value of their research equipment between 2010 and 2014 (83.51%), compared with 64.03% increase at PROs, but the overall value of research equipment of the HEI sector was only 66.12% of the comparable assets of research institutes and the Polish Academy of Sciences by the end of 2014 (GUS, 2015d: I-16).

HEIs focus on fundamental research (71.4% of HERD in 2014), with less important roles played by applied research (17.9%) and experimental development (10.7%) (GUS, 2015c: 60). Interestingly, HEIs outperform business enterprises and public research organisations in patenting their research outputs: 27.2% of HEIs that were performing R&D, filed patent applications in 2014, compared with 19.0% of PROs and 9.9% of companies (GUS, 2015c: 160). These volumes of academic patent applications include however also inventions that might not be commercially viable, but are patented as they are incentivized by modalities for awarding institutional funding, alongside among others scientific publications and technology transfer revenues.

Thematic focus of research and teaching activities of HEIs is presented in Table 8 highlighting substantial teaching workloads in humanities, social and economic sciences, which contrast with the most intensive R&D activities in engineering, technical and natural sciences.

**Table 8: Thematic concentration of R&D and teaching activities of Higher Education Institutes in Poland (2014)**

Field of research	Share of R&D expenditures of HEIs (2014)	Share of R&D personnel employed by HEIs (headcount, 2014)	Share of students (all study cycles, 2014)
Natural sciences	27.6%	18.3%	3.9%
Engineering and technical sciences	32.3%	21.7%	24.8%
Medical and health sciences	11.8%	16.8%	18.0%
Agriculture	6.0%	5.7%	1.7%
Social and economic sciences	11.5%	22.0%	34.1%
Humanities	10.8%	15.5%	17.5%

Sources: GUS (2015d: I-27; II-19); GUS (2015e: 60–63).

Among beneficiaries of Horizon 2020 funding in the first 200 calls, 61 HEIs participated in 182 projects with EC contribution of €43.5m, while 69 PROs participated in 147 projects, benefiting from €40.7m of EC funding (KPK, 2016: 23). This lack of balance is puzzling, as HEIs are tasked with time-consuming teaching obligations, while employees of PROs are only carrying out R&D activities, and nevertheless perform worse than their colleagues from the academia alongside many measures of scientific productivity. HEIs with the largest number of H2020 funded projects are: University of Warsaw (21 projects), Warsaw University of Technology (13 projects), AGH University of Science and Technology, Kraków (12 projects) and Jagiellonian University, Kraków (11 projects) (KPK, 2016: 23). Among PROs, only two institutes of the Polish Academy of Sciences participate in more than 10 projects in H2020: the Institute of Fundamental Technological Problems (20 projects, the Institute hosts also the National Contact Point for EU Research Programmes) and the Institute of Bioorganic Chemistry (18 projects) (KPK, 2016: 23).

Following the science and higher education reform from 2010–2011, numerous support measures were contributing to the transformation of HEIs into entrepreneurial universities, engaged in knowledge transfer and closer to the industry. The effectiveness of these measures remains limited, but they have contributed to institutional changes (including the establishment of technology transfer centres, special purpose vehicles – university holding companies and numerous academic spin-offs), increased the extent of academic patenting and generated some revenues from technology licensing. Moreover, most support measures available to HEIs do not differentiate between universities and other public and private academic institutions, so funding allocated through many competitive calls becomes dispersed between organisations of different scale and type.

**Table 9: R&D expenditures and technology transfer performance of key universities of technology and medicine in Poland (2011–2014)**

Higher Education Institute	Total R&D expenditures (2011–2014)	Patent applications (2011–2014)	Total licensing revenues (2011–2014)
Kraków University of Technology	119,940.3k PLN (€28,664k)	86	75k PLN (€18k)
AGH University of Science and Technology, Kraków	1,074,835.3k PLN (€256,873k)	388	3,738.4k PLN (€893k)
Łódź University of Technology	433,357.9k PLN (€103,568k)	289	1,302.5k PLN (€311k)

<b>Higher Education Institute</b>	<b>Total R&amp;D expenditures (2011–2014)</b>	<b>Patent applications (2011–2014)</b>	<b>Total licensing revenues (2011–2014)</b>
Warsaw University of Medicine	213,153.5k PLN (€50,941k)	23	0 PLN (€0)
Warsaw University of Technology	998,697.5k PLN (€238,677k)	201	189.5k PLN (€45k)
Wrocław University of Medicine	96,695.3k PLN (€23,109k)	46	98.4k PLN (€24k)
Wrocław University of Technology	560,019.8k PLN (€133,838k)	651	997k PLN (€238k)

Source: NIK (2016a: 45).

The Supreme Audit Chamber prepared a detailed analysis of these efforts and their suboptimal results (NIK, 2016a). In 2011–2014, the largest universities of technology and medicine had relatively low licensing revenues per each filed patent application, and these revenues amounted only to a minor fraction of the total R&D expenditures of each organisation (NIK, 2016a: 45), funded mostly by the government. Data on R&D and knowledge transfer activities of selected HEIs are presented in Among beneficiaries of Horizon 2020 funding in the first 200 calls, 61 HEIs participated in 182 projects with EC contribution of €43.5m, while 69 PROs participated in 147 projects, benefiting from €40.7m of EC funding (KPK, 2016: 23). This lack of balance is puzzling, as HEIs are tasked with time-consuming teaching obligations, while employees of PROs are only carrying out R&D activities, and nevertheless perform worse than their colleagues from the academia alongside many measures of scientific productivity. HEIs with the largest number of H2020 funded projects are: University of Warsaw (21 projects), Warsaw University of Technology (13 projects), AGH University of Science and Technology, Kraków (12 projects) and Jagiellonian University, Kraków (11 projects) (KPK, 2016: 23). Among PROs, only two institutes of the Polish Academy of Sciences participate in more than 10 projects in H2020: the Institute of Fundamental Technological Problems (20 projects, the Institute hosts also the National Contact Point for EU Research Programmes) and the Institute of Bioorganic Chemistry (18 projects) (KPK, 2016: 23).

Following the science and higher education reform from 2010–2011, numerous support measures were contributing to the transformation of HEIs into entrepreneurial universities, engaged in knowledge transfer and closer to the industry. The effectiveness of these measures remains limited, but they have contributed to institutional changes (including the establishment of technology

transfer centres, special purpose vehicles – university holding companies and numerous academic spin-offs), increased the extent of academic patenting and generated some revenues from technology licensing. Moreover, most support measures available to HEIs do not differentiate between universities and other public and private academic institutions, so funding allocated through many competitive calls becomes dispersed between organisations of different scale and type.

Moreover, most HEIs had discontinued patent protection following the patent grant (NIK, 2016a: 46), as they primarily needed the patents as indicators of applied R&D performance (used in nation-wide evaluations of scientific organisations, determining the allocations of institutional R&D funding) not for the purposes of technology transfer. Further information about the quality and research excellence of HEIs is provided in section 3.3 of this report, while the involvement of HEIs in science-industry cooperation is discussed in section 3.2.

## 2.3. Business

R&D expenditures of the business sector have substantially increased in the recent 5 years, from 2,770m PLN (€662m) in 2010 to 7,530m PLN (€1,799m) in 2014 (GUS, 2015c: 59). R&D personnel employed by business enterprises amounted to approximately 43,185 (headcount) (GUS, 2015d: II-8). In 2015, BERD increased to 8,411m PLN (€2,010m) (GUS, 2016b: 2), and R&D personnel working for companies went up to approximately 49,000 employees (GUS, 2016b: 3). Altogether, 2,814 companies declared R&D expenditures in 2014 (GUS, 2015d: I-1). Intramural R&D expenditures incurred by an average business enterprise were approximately 2.6m PLN (€0.62m) (GUS, 2015c: 61). 66.74% of all business expenditures on R&D were in 2014 incurred by large enterprises, with 250 or more employees (GUS, 2015d: I-10), but many SMEs are likely to refrain from reporting R&D expenditures, so the reliability of the BERD (Business Expenditures on Research and Development) statistics is limited (see also: section 3.1 of this report). Business R&D activities were highly concentrated in some parts of the country, with the highest ratio of BERD to the regional GDP in the South-Eastern region of Podkarpackie (0.99%) and the central region of Mazowieckie, with the country capital Warsaw (0.65%) (GUS, 2015c: 74). Relevant indicators are summarized in Table 10.

**Table 10: Main R&D indicators – business**

Indicator/inputs & outputs	2010	2012	2014	2015	EU average (2014)
BERD as % GDP	0.19%	0.33%	0.44%	0.47%	1.3%
R&D funded by BES (% of GDP)	0.18%	0.28%	0.37%	0.39%	1.13%
R&D performed by BES (% of GDP)	0.18%	0.28%	0.37%	NA	1.12% (2013)
R&D performed by BES (% of GDP) funded by GOV	0.03%	0.04%	0.05%	NA	NA
Turnover from innovation as % of total turnover	8%	6.3%	NA	NA	11.9% (2012)
SMEs introducing product or process innovations/ marketing or organisational innovations	NA	18.9%	NA	NA	25.4% (2012)
World Share of PCT applications	0.16%	0.16%	0.17%	NA	26.09%

Source: ESTAT (2016), WIPO (2016).

The primary source of financing R&D activities were own financial sources of the business enterprises (79.4% of BERD), accompanied by government funding (11.5%) and foreign sources (9.0%), including the European Commission (GUS, 2015c: 66). Only 16.6% of companies performing R&D resorted to foreign sources of funding (GUS, 2015c: 67). Business enterprises are not particularly active in applying to Horizon 2020 programme, with only 135 companies participating in 167 projects, for the overall EC funding of €34.4m based on the first 200 calls (KPK, 2016: 24), and only 21 companies involved in more than 1 project (KPK, 2016: 24). At the same time, another EC framework programme COSME has a very good uptake in Poland, which belongs to the most successful beneficiary countries in terms of COSME budget absorption, but this is owing to the activity of several financial intermediaries that secured funding for guarantees and loans to be offered to the SME sector.

Among R&D performers, particularly active were the companies controlled by foreign capital (companies fully owned by foreign investors or companies in which these investors held more than 50% of shares). These companies accounted for 19.1% of all R&D active firms, but at the same time also for a disproportionately high share of BERD (57.3%) (GUS, 2015c: 67). However, only 5.1% of these foreign-controlled firms carrying R&D filed patent applications in Poland, while the patenting activities were more important for domestically owned companies, as the overall share of patenting business enterprises was 9.9% of all companies registering R&D expenditures in Poland, 2014 (GUS, 2015c: 160–161).

In 2014, according to the R&D declarations submitted to the Central Statistical Office by companies, their R&D activities were dominated by experimental development (78.9% of expenditures) and applied research (16.1%), while fundamental research played only an insignificant role (5.0%) (GUS, 2015c: 60). Only 9.9% of R&D performing companies crowned their projects with submission of patent applications in Poland (GUS, 2015c: 160). Only 730 companies (out of 2,814 R&D performers) declared that they possessed some dedicated research equipment (GUS, 2015d: I-4). This number is expected to substantially increase in 2016 due to the introduction of R&D tax incentives that increases the propensity to report R&D expenditures (see also: sections 3.1 and 4.1.2 of this report). The largest Polish start-up association estimated the population of active start-ups at 2,423 in 2015 (Skala et al., 2015: 12). Among 423 surveyed start-up companies, over 60% of them used exclusively private financing of their founders (Skala et al., 2015: 8). In 2007–2013, over 1,000 start-up companies benefited from R&I grants based on the EU Structural Funds, including a specific measure dedicated to innovative ICT and Internet companies. Using Leontief's inter-sectoral input-output model, the consulting company Deloitte estimated that by 2023, start-ups in Poland could generate 2,244m PLN (€536.3m) added value and create 50,252 jobs (both direct and indirect) (Deloitte, 2016: 89-90).

High technology companies account only for 2.3% of all firms in Poland, 5.3% of sales revenues and 7.6% of export sales, while medium-high technology companies are 13.5% of all firms, 27.3% of sales revenues and 40.3% of exports (GUS, 2015c: 117). Polish companies have constantly been upgrading their manufacturing capabilities and infrastructures, for example number of computer-controlled production lines increased between the years of 2010 and 2014 by 22.08%, and the count of industrial robots and manipulators – by 54.01% (GUS, 2015c: 135). Nevertheless, the availability of these technologies still remains limited: as of 2014, 3,773 firms use computer-controlled production lines and only 1,342 firms – industrial robots or manipulators (GUS, 2015c: 134). This impairs Poland's ability to compete in the emerging area characterised as "Industry 4.0". In 2014, business enterprises acquired 889 technology licenses (GUS, 2015c: 137) and signed 724 licensing agreements of own technologies, including 191 with abroad recipients (GUS, 2015c: 138).

Data concerning corporate spending on innovative activities are collected by the Central Statistical Office using annual surveys, following the Community Innovation Survey Standards. This spending category is broader than R&D, encompassing the entire spectrum of R&I activities. Contrary to popular interpretations, the European Union funding was not the key source of financing innovation-related initiatives of the business sector. Manufacturing enterprises financed their innovative activities predominantly from own sources (69.18% of spending), supplemented by bank credits (10.10%), foreign sources

including the European Commission (10.10%) and state budget (1.63%) (GUS, 2015d: VI-3). The share of business enterprises with innovative activities, which benefited from the public aid, amounted to 29.4% in the manufacturing sector and 21.2% in the service sector (GUS, 2015a: 88).

Poland inherited a large number of state-owned enterprises that dominated the national economy in the socialist period. During the economic transition, the majority of these companies were privatised, and as of 2014, only 2,087 companies (approximately 1% of all business enterprises) are still state-owned (either fully owned by the state or with the state holding a controlling stake of 50% or more of the shares). Some of these companies suffer from overemployment, inefficient managerial practices and organisational cultures that do not promote high performance or innovativeness. For many years, the state control over these companies was regarded as “the necessary evil”, with strong political agendas centred on privatisation to infuse the respective sectors with private capital, increase their access to modern technologies and transform working practices. Selected data comparing the state-owned enterprises with privately-owned enterprises (as of 2014) are presented in Table 11.

**Table 11: Comparison of state-owned and privately-owned companies in Poland (2014)**

<b>Selected indicators</b>	<b>State-owned enterprises</b>	<b>Privately-owned enterprises</b>
Number of companies	2,087 (1%)	197,938 (99%)
Share of employees of industry	10.7%	89.3%
Share of R&D personnel	10.03%	89.97%
Share of investment outlays of industry	27.1%	72.9%
Share of Business Expenditures on R&D	11.93%	88.07%
Share of costs of innovative activities funded by companies' own sources	26.15%	81.70%
Technology licenses used by companies	278	2,657
Share of total industry output	10.6%	89.4%
Share of Gross Value Added of industry	13.1%	86.9%
Agreements for licensing out own technologies	6	718



**Table 11 (cont.)**

<b>Shares of expenditures on innovative activities</b>	<b>Manufacturing</b>	<b>Services</b>	<b>Manufacturing</b>	<b>Services</b>
R&D	11.00%	11.88%	19.52%	26.58%
Buildings, construction and land	45.51%	9.07%	14.14%	11.61%
Machinery and technical equipment	36.90%	66.89%	60.20%	19.80%
Marketing of new or significantly improved products	0.21%	0.67%	2.46%	24.15%

Sources: GUS (2015d: I-10; II-8, VI-1; VI-2; VI-4; VI-20); GUS (2016: 79; 91; 207; 366).

The current government reversed the previous tendencies and suspended privatisation projects, rather looking for opportunities to expand the state control over additional companies and to consolidate companies in selected sectors into bigger holding-like structures. Potential detrimental effects of such consolidations on R&D performance of publicly-owned enterprises were demonstrated by the Supreme Audit Chamber in a comprehensive audit report analysing the R&D projects of the largest Polish arms company PHO – *Polski Holding Obronny* (NIK, 2014). The government emphasizes the importance of state-owned enterprises, using the nominations to supervisory and management boards to induce positive changes in the sector. Improvements of efficiency and innovativeness of these companies are indeed highly desirable, and they seems to have a lot of potential for substantially increasing their R&D expenditures and intensify cooperation with scientific organisations, especially as these changes could be mandated by the government, which controls the companies and has exchanged the management and supervisory boards of the many of these companies in 2015-2016. The current R&I policy seems however to excessively rely on these state-owned enterprises, with some support measures launched or modified to specifically involve them in large R&D projects or support for start-ups in ways resembling corporate ventures (see more: section 4.1.2 of this report). These moves are unlikely to yield short-term positive results due to the suboptimal corporate cultures and limited absorptive capacities of most of these companies, while this shift in focus of public R&I funding might harm the privately-owned enterprises, which in 2014 accounted for 88.07% of BERD (GUS, 2015d: I-10) and 89.97% of R&D personnel employed by the business sector (GUS, 2015d: II-8). The current political discourse highlights the importance of indigenous innovations and local companies, deemphasizing the importance of foreign players, but the foreign-owned companies in Poland still build up 57.3% of BERD as of 2014 (GUS, 2015c: 67) and employ 43.81% of R&D personnel of the business sector (GUS, 2015d: I-10),

with strong embeddedness of their Polish subsidiaries in international value chains.

Foreign investors play an important role in the Polish R&I system. According to annual R&D surveys carried out by the Central Statistical Office, 57.3% of R&D expenditures in the Polish business sector in 2014 were incurred by companies controlled by foreign capital (GUS, 2015c: 67). Between 2010 and 2014, the number of foreign-owned companies that were active in R&D more than doubled, from 214 firms in 2010 to 511 firms in 2014 (GUS, 2015c: 67), and their R&D expenditures more than tripled from 1,212.5m PLN (€289.8m) in 2010 to 3,801.2m PLN (€908.4m) in 2014 (GUS, 2015c: 67).

Poland remains a moderately attractive location for R&D-focused FDIIs involving pharmaceutical research (focused on later stages of clinical research cycles), software development and ICT services. In these sectors, benefits from accessing competitively remunerated experts seem to outweigh the other limitations. It must however be noted that locations of such R&D centres could easily be shifted to other countries in the future, especially when salary pressures increase or government regulations become less attractive to individual investors. Many of these R&D establishments located in Poland are not deeply embedded into business processes of multinational corporations, focusing on precisely delineated sets of activities, not benefiting from close relations with local academic researchers or specialised R&D suppliers, and thus easily substitutable.

Transparency reports of foreign pharmaceutical companies operating in Poland revealed that their R&D expenditures in 2015 amounted to over 395m PLN (€94.4m) (INFARMA, 2016). Some of these expenditures were probably not reported through the official channels to GUS and thus not included in BERD statistics. The international pharmaceutical companies do not seem adequately embedded in the Polish R&I system, nor pursuing collaborations with local corporate or academic partners. The ClinicalTrials.gov database maintaining global data about clinical studies reveals that the multinational pharmaceutical companies do not formally declare joint projects with Polish organisations (with the rare exceptions of dedicated suppliers of contract research services), and their R&D activities have limited potential for knowledge spillovers beyond the boundaries of the individual enterprise, placing Poland in a position similar to various developing countries, hosting clinical trial projects. Moreover, some activities classified as R&D by pharmaceutical and ICT companies operating in Poland might actually involve the adaptation of existing products to the local market, instead of generating new-to-the-world solutions.

Private non-profit organisations are not important actors in funding or performing R&D in Poland. The most active non-governmental source of R&D funding is the Foundation for Polish Science (FNP, pl. *Fundacja na rzecz Nauki*

*Polskiej*), but its budget is based on a state donation and ESIF (see also: section 4.1.2). Several large companies established Public-Private Partnerships with NCBR, and co-funded R&D programmes intended to develop new technologies in selected areas, with calls open to companies or scientists and intellectual property rights resting with the creators. The companies benefit from the availability of specified technologies and local suppliers-beneficiaries of the programme, and outsource the programme management to NCBR. Examples of such joint initiatives include: KGHM (metal mining company), Synthos (chemical company), GDDKiA (managing road and motorways) and ARP (with a programme focused on shale gas technologies), and an initiative with PKP PLK (railway company) is under preparation. Several large companies maintain corporate venture programmes (investing in start-ups, with a view to capitalize on these investments, for example KGHM, media group TVN) or corporate foundations (subsidies for public science or students, perceived as charitable activities, e.g. foundations of two leading Polish pharmaceutical companies Polpharma and Adamed, as well as a sizeable financial award for the most innovative Polish chemist, offered by Synthos). Some of the largest companies in Poland, including ICT firms, invest substantial funds in sport teams or other visible activities, but their social responsibility activities do not target R&D performers, and there are hardly any private endowments at Polish HEIs (with a notable exception of funding received by the University of Warsaw from Google to pursue research projects related to digital economy).

## 2.4. Networks, cluster, platforms, linkages

Aggregate data on cooperation patterns of Polish companies resemble the situation of many European countries. 30.1% of innovative manufacturing companies and 24.6% of innovative service companies declared that they were engaged in some forms of cooperation between the years of 2012 and 2014 (GUS, 2015a: 98). The shares went up dramatically if only large enterprises (with 250 or more employees) were considered: 52.2% for manufacturing firms, 46.3% for service companies (GUS, 2015a: 98). The propensity to cooperate was different depending on the industry sector, with particularly low values for companies manufacturing clothes, furniture and food products (GUS, 2015a: 99) as well as offering transportation services (GUS, 2015a: 100). This tendency seems worrisome, as these particular sectors play important roles in the Polish economy, even though they are not R&D-intensive. Companies specialising in advanced technologies demonstrate healthy cooperative behaviours, with 48.7% of high-tech firms and 40.9% of medium-high technology firm having collaborative experiences from 2012–2014 (GUS, 2015a: 102). However,

medium- and low-technology companies still dominate in the Polish industry, with relatively low innovativeness and limited embeddedness in partnership networks. Table 12 presents main indicators related to the linkages, including public-private cooperation.

**Table 12: Main R&D indicators – linkages**

Indicator/inputs & outputs	2010	2012	2014	2015	EU average (2014)
Public R&D funded by business (% of GDP)	0.03%	0.02%	0.01%	NA	0.05% (2013)
Enterprises co-operating with universities or other higher education institutions (%)	NA	10.5%	NA	NA	13.0% (2012)
Enterprises co-operating with government, public or private research institutes	NA	8.9%	NA	NA	8.9% (2012)
Enterprises engaged in any type of co-operation	NA	31.3%	NA	NA	31.2% (2012)
Public-private co-publications per million population	4.37	3.57	3.66	NA	33.88

Sources: ESTAT (2016); Scopus (2016).

Inter-organisational cooperation of business enterprises is dominated by partnerships with suppliers – who are partners for 24.3% of manufacturing companies, 33.2% of service companies (GUS, 2015a: 104). The importance of innovation clusters and formalised corporate networks remains limited. According to a study carried out by the Polish Agency for Enterprises Development, 134 business clusters were established between the years of 2003 and 2015, with the majority created in 2011-2015, when specific funding measures were available (PARP, 2015a: 7). Altogether, 5,868 organisations were involved in these 134 clusters, with most of them being small or medium-sized enterprises (PARP, 2015a: 8). 61% of clusters seemed inactive, without ongoing projects, and 69% had no formalised development strategies (PARP, 2015a: 8). In the current financial perspective (2014-2020), ESIF financing on the national level is only available to “key national clusters” that are selected in a nationwide competition, using among others criteria related to excellence, activity and private co-funding (see more: section 4.1.2 of this report). Based on the Polish edition of the Community Innovation Survey, the shares of innovative business enterprises engaged in cluster initiatives in 2012–2014 were: 13.7% for manufacturing companies and 13.4% for service companies (GUS, 2015a: 104).

As already discussed in previous section of this chapter, business enterprises are less inclined to cooperate with scientific organisations: HEIs (manufacturing: 16.8%, services: 11.9%), research institutes (manufacturing: 14.3%, services: 6.0%), institutes of the Polish Academy of Sciences (manufacturing: 1.9%, services: 1.0%), foreign scientific organisations (manufacturing: 0.6%, services: 3.7%) (GUS, 2015a: 104). An important benchmark is however the frequency of cooperation with consulting firms: only 5.4% of innovative manufacturing companies and 3.2% of innovative service companies were cooperating with consultants in the years of 2012-2014 (GUS, 2015a: 104), while substantially more firms engaged in joint initiatives with the public science sector. Nevertheless, the extent of science-industry cooperation and knowledge transfer can still be regarded as suboptimal. This topic could be identified as a persistent challenge for the Polish R&I system and will be further discussed in section 3.2 of this report.

In 2007–2013, 22.4% of Poland’s allocations of the EU Structural Funds for core R&D activities were dedicated to “Technology transfer and university-enterprise cooperation primarily benefiting SMEs”, compared with the EU average of 30.1% (Klincewicz and Szkuta, 2016: 91–92). Substantial numbers of technology transfer intermediaries are distributed throughout the country, but many of these organisations are relatively young, and not yet yielding results (Klincewicz and Szkuta, 2016: 93). Many science or technology parks, entrepreneurship incubators, technology transfer offices and innovation brokers were financed from the EU Structural Funds between 2007 and 2013, and in the current financial perspective, ESIF financing is also used to promote numerous linkages and knowledge transfer intermediations, albeit taking into account important lessons learned from the previous years to improve the effectiveness of investments. As the Supreme Audit Chamber pointed out in an extensive evaluation, many of publicly-funded technology parks are half-empty and need to attract non-innovative tenants (NIK, 2013), while new technology-based firms use for example privately-funded co-working spaces, which were mushrooming in Poland in recent years. A more recent audit of “innovation centres” including technology parks and incubators confirmed the earlier findings and limited effectiveness of related investments (NIK, 2016e).

Detailed information about relevant measures stimulating networking and linkages is provided in section 4.1.2 of this report, and many funding schemes seem to be more performance-based, e.g. funding for maintaining research infrastructures is capped at levels linked to revenues derived by the infrastructure owner from commercial R&D activities; new investments in large research infrastructures require private co-funding and credible joint R&D agendas; technology accelerators need to form partnerships with large companies that would share managerial know-how and offer market access to supported start-

ups; incubators dealing with ICT and Internet start-ups can only orchestrate software development projects responding to specific, verified needs of target customers; sectoral R&D programmes implement research agendas, proposed by stakeholder representation of a given sector, but inviting all interested parties through open competitive calls; Public-Private Partnerships with selected, large companies create funding programmes open to other R&D performers, with the co-funding company and NCBR jointly defining research agendas to ensure the future business applicability of the developed technologies. The design of many Polish R&I support measures is promising, includes many good practices and innovative approaches. Nevertheless, many of these instruments have only recently been implemented and it is too early to evaluate their effectiveness. In the past, numerous R&D funding programmes required applicants to form science-industry consortia, with large budgets allocated to each joint project, and at least some of these initiatives resulted in rather superficial linkages between business enterprises and scientific organisations, despite the intentions of the policy makers. An additional measure that might stimulate inter-sectoral linkages is the introduction of R&D tax incentives in 2016, with tax payers able to deduct among others expenditures on R&D works contracted to scientific partners, and legislative efforts promise further increases of the available tax deductions in 2017 (see more: section 4.1.3 of this report).

# 3

## Innovation challenges

### 3.1. Innovation challenge 1. Increase the intensity of private R&D

The numbers of private sector R&D performers in Poland have been gradually increasing in recent years, alongside the overall value of BERD and its shares in GERD and GDP. In 2014, 2,814 business enterprises reported R&D expenditures (GUS, 2015d: I-1). However, these figures are still low in comparison to other EU member states, as there are over 200,000 business enterprises in Poland (GUS, 2016c: 42), and also distant from the R&D intensity targets defined by the government for the year of 2020 (BERD as 0.85% of GDP). The draft Strategy for Responsible Development (SOR) introduced the term “trap of average product” (pl. *pułapka przeciętnego produktu*) to describe low ambitions of many domestic companies, which tend to pursue imitative strategies and excessively focus on cost advantages and price competition (MR, 2016e: 15). While such a generalisation could be overly harsh for the Polish industry, domestic companies demonstrate only limited interests in pursuing product or process innovations (GUS, 2015a), and innovative activities are restricted to a relatively small group of companies. Active promotion of R&I support measures, offered by NCBR and PARP, raised the interests of the private sector, but many business enterprises only embark on formal R&D projects when they receive public co-funding. An insignificant number of companies from Poland applies for H2020 funding or other international support measures, and the domestic R&I schemes rely overwhelmingly on grants (not revolving or demand-side instruments). At the same time, many companies benefit from loans distributed by commercial banks that are co-funded from the COSME programme. In 2015, NCBR only managed to attain a 22.3% share of co-funding across its various programmes, failing to meet its annual target set by the government (MNISW, 2016j: 1). Statistical time series related to R&D expenditures demonstrate constant increases in corporate R&D spending, but the BERD dynamics is lower than the increases in availability of public co-funding, distributed in recent years by NCBR.

This phenomenon might have another explanation, as many companies carry out privately funded R&D projects and invest in the development and market

introduction of new products or services, but their activities remain unreported in national R&D statistics. The Polish accounting and tax regulations did not offer incentives to register R&D expenditures until the end of 2015, and tax payers were actually able to optimise their tax burdens by registering relevant expenditures as purchases of fixed assets and regular personnel costs, not costs associated with development works, whereas costs of research constituted non-deductible business expenses. Annual declarations of R&D expenditures were sent to the Central Statistical Office (GUS) only by a small subset of companies, and the amounts declared were different from the contents of the financial books, as the books were kept in accordance with Polish accounting standards and thus did not present R&D expenditures in the same manner as the internationally recognised methodology of OECD's "Frascati Manual" (OECD, 2015). In order to increase the response rates, GUS was also trying to follow up individual, identified organisations that were suspected to have incurred R&D expenditures. The funding agency NCBR requires applicants in various funding programmes to submit a copy of their most recent R&D declaration, thus raising awareness of these obligations among companies interested in public aid. The scale of BERD underreporting was extensively discussed in the previous RIO country report (Klincewicz, 2015a: 17) and in the country report prepared by the EC for the European Semester (EC, 2015a: 23), and first hints regarding the problem were offered by the World Bank in its evaluation of the Polish innovation system, which discussed a paradoxically low BERD that could not be coupled with the increasing international competitiveness of Polish companies and the observed, positive tendencies in total factor productivity (Kapil et al., 2012: 9). More recently, the problem was also recognised by the National Bank of Poland in its report concerning the innovativeness of the Polish economy (NBP, 2016c: 36). NCBR commissioned a report discussing accounting and tax aspects of corporate R&D in Poland that identified fundamental divergences between the existing book-keeping standards in Poland and the information requirements of R&D reporting aligned with the OECD and the EU requirements (Baklarz, 2016). This lack of reliable BERD statistics impairs the possibilities of evidence-based R&I policy design, as policy makers are not able to evaluate economic impacts of the introduction of indirect R&D support measures, estimate their expected popularity or the amount of foregone tax revenues.

The government expects the situation to change thanks to more R&D-friendly tax regulations, i.e. the adoption of the Act on Amendments of Some Acts with respect to the Support for Innovativeness in September 2015. The Act introduced the definition of R&D works and made them tax-deductible starting from 2016, thus establishing the basis for the inclusion of R&D expenditures in corporate financial books. It also eliminated previous, ill-conceived tax incentives for the acquisition of new technologies from external sources that were limiting



the private propensity to carry out in-house R&D activities. It must however be noted that the scale of tax incentives offered to R&D performers by the Act still does not outweigh the potential benefits of classifying some of the concerned investments other types of costs, so the economic impacts of the regulation introduced in 2015 remain uncertain.

### **3.2. Innovation challenge 2. Strengthen the cooperation between science and industry**

As discussed in section 2.5 of this report, quantifiable outcomes of science and industry cooperation are very limited, including low counts of joint private-public co-publications and co-patents, as well as shares of enterprises declaring cooperation with scientific organisations and shares of R&D expenditures of public science (HEIs and PROs) funded by business enterprises. A recent nation-wide survey confirmed negative attitudes of private sector representatives towards the public science sector and scientists (Maison, 2016: 14). Interestingly, while the majority of interviewed entrepreneurs and managers had no practical experiences related to cooperation with scientists, those ones who had such experiences were also significantly more positive about the benefits stemming from potential science-industry initiatives (Maison, 2016: 14–18).

The portfolio of relevant support schemes encouraging science-industry cooperation that were offered until 2015 was extensive, encompassing many forms of interventions targeting both companies and the public science sector to stimulate knowledge transfer. Regrettably, the overall effectiveness of these measures could be perceived as limited and the substantial public investments failed to induce major changes in motivations, perceptions and behaviours of researchers and entrepreneurs or organisational practices (see: relevant audits by the National Audit Chamber – NIK, 2013; NIK, 2016a; NIK, 2016e). In various R&D programmes offered by NCBR, proposals could only be submitted by consortia encompassing both companies and scientific organisations, but many collaborations established in this way did not last beyond the end of the publicly co-funded project. Until 2016, there were no tax incentives that would encourage business enterprises to fund R&D projects at HEIs or PROs, and innovation vouchers that could be used by companies to finance contracted research at HEIs have very limited financial values and are rather used for analytical services than innovative R&D. Majority of R&D co-funding schemes available for companies, particularly schemes based on ESIF, allow the beneficiaries to subcontract parts of the project but do not additionally incentivise cooperation with scientific organisations. The number of existing innovative clusters is relatively high, and most include both private and public actors, but the majority of these clusters

undertake only limited activities unless they receive dedicated public funding (PARP, 2016i). Extensive support for innovation brokers and incubators established at universities contributed only to a small number of licensing agreements (NIK, 2016a: 51). More positive were the results of measures intended to increasing the awareness of employees at HEIs and PROs. Support schemes “Top 500 Innovators” and “Transformation.doc” trained young scientists and research administrators, exposing them to the well-developed innovation ecosystems in the USA, the UK, Canada, Sweden, and the Netherlands and promoting best practices related to technology transfer and cooperation with the industry. The impacts of these efforts will be observed in years to come, thanks to the transformed mindsets of the new generation of researchers.

While the support for various forms of collaborations might have seemed abundant, there were more fundamental problems related to disjoint research interests and approaches to R&D projects in private and public sectors. Two agencies supporting academic R&D – NCN and NCBR – focus respectively on fundamental and applied research. At NCN, project evaluation criteria are strictly oriented towards fundamental research and applications indicating any practical uses or societal or economic impacts of projects are eliminated. NCN and NCBR introduced a joint programme “TANGO” to support commercialisation of successful results of NCN projects, but the funding system does not encourage proposing basic research projects that would be challenge-based, with broader societal implications, while NCBR tends to fund projects for which specific commercialisation ideas or plans can already be outlined. This further strengthens the chasm between science and industry, fuelling negative attitudes of scientists towards business cooperation and limiting their interests in practically-oriented research.

A typical academic career trajectory in Poland is based on generating publications not commercially useful solutions, with limited importance paid to societal or economic impacts of the research. Higher education curricula are usually not oriented towards industry, and HEIs were offering dedicated higher education programmes addressing identified needs of the labour market (“ordered specialities”, pl. *kierunki zamawiane*) based on the EU Structural Funds, 2007-2013, but some of them did not seem to adequately take into account specific requirements of the potential employers or ensure the highest possible educational standards. Evaluations of scientific organisations, which determine the levels of institutional R&D funding allocated for each organisation, focus on publications, granted patents and only selected forms of institutionalised cooperation with other organisations (confirmed by technology sales or licensing agreements), but do not cover many types of broader interactions with the private sector and the society that usually constitute the so-called “third mission” of universities.

Universities earn very small revenues from knowledge transfer, including technology licensing or sales (NIK, 2016a: 45). Many HEIs and PROs generate substantial counts of patents but their majority seems to have no commercial applications and is abandoned after they were being issued (i.e. owners do not pay patent renewal fees) (NIK, 2016a: 46). Counts of granted patents are featured among the criteria for evaluating scientific organisations and this could explain the artificially high patenting activity. A recent audit report of the Supreme Audit Chamber revealed also the very limited scope of knowledge transfer activities of public research institutes (NIK, 2015: 9), even though the institutes were supposed to operate in close partnerships with the industry and differentiate themselves from universities by strong focus on applied R&D and commercial projects. Aggregate revenues from knowledge transfer incurred by research institutes were lower in 2013 than in 2010 (i.e. before the legislative reform that was intended to increase the cooperation of institutes with the industry) (NIK, 2015: 9). Higher education institutes face additional barriers to effective technology transfer due to the ill-conceived regulation from 2014: the amendments to the Act on Higher Education. The legislator initially intended to assign the ownership of IPRs (Intellectual Property Rights) to university employees (i.e. introduce the so-called professor privilege), but the outcome of the legislative process merely increased the administrative burdens for universities, offering the university management an option to transfer IPRs to the employed inventors only directly after the invention was made and against a symbolic payment, not covering the actual R&D costs. Not surprisingly, the option was not exercised by universities, interested in revenues from IPR commercialisation that could at least partly cover their investments in R&D. Other forms of technology transfer at public science institutions require formal valuation of IPRs before concluding the sales transactions (as the assets of public HEIs and PROs are considered public property, the disposal of which is governed by strict regulations), and this substantially restricts the flexibility needed in effective technology transfer negotiations (NIK, 2016a: 17). Apprehensions that results of costly, applied R&D projects, co-funded by the public science institution, might be subsequently appropriated by an individual researcher are also contributing to conservative attitudes of university management towards the industry cooperation.

### **3.3. Innovation challenge 3. Increase the quality of the public research base**

Poland scores low in the European Innovation Scoreboard, including a poor ranking position for research outputs and low shares of highly cited publications in comparison with other EU member states. Merely one third of

Polish publications in 2013 were co-authored with foreign researchers (based on: Scopus database, RIO own calculations). Not more than two Polish universities – Jagiellonian University, Kraków and University of Warsaw – were included in the 2015 ARWU World University Ranking of 500 best universities (Shanghai Ranking, 2015). At the same time, the public science system encompasses a stunning number of HEIs and PROs and is fragmented into relatively small and narrowly focused institutions. Most of the “regular” universities do not have engineering or medical faculties, while universities of medicine and universities of technology usually lack departments in other scientific fields. In the smaller and lower ranked institutions throughout the country, humanities, social and economic sciences dominate their educational activities. Some HEIs do not carry out any internationally recognized research and have insignificant counts of foreign peer-reviewed publications. In a similar manner, some research institutes do not pursue globally impactful scientific research as they are expected to focus on cooperation with the private sector. The disappointing outcomes of these efforts have already been discussed in the previous section of this report, based on the findings of the Supreme Audit Chamber’s audit. The audit revealed also that large shares of employees at research institutes were aging researchers not able to attain academic ranks higher than PhD (i.e. habilitation or professor’s titles) (NIK, 2015). Research quality problems start already at the level of doctoral studies, which only see a small share of PhD students successfully completing the studies and receiving doctoral degrees (NIK, 2016b: 7). Their academic supervisors are usually not rewarded for the regular, multi-annual work with doctoral students (NIK, 2016b: 18), and only receiving a one-off payment of ~€1,200 foreseen by law if the student successfully defends the PhD thesis.

Scientists working at HEIs experience excessive bureaucratic burdens, in particular the need to prepare substantial numbers of documents related to teaching, doctoral supervision or institutional R&D funding (which is distributed on a project-basis within the HEIs, requires reporting efforts similar to much larger competitive R&D grants and can be audited by MNiSW). Many of these requirements result from the accumulation of legal regulations that followed the 2010-2011 science and higher education reform. The reform intended to increase the autonomy, international exposure and competitiveness of the Polish science, but many regulations issued in the subsequent years were overly bureaucratic and derailed the original intentions of the legislator. The outcomes of the reform could also be put into question, as many scientific institutions learned how to preserve their traditional approaches by introducing only minor adjustments or bending certain regulations contrary to the original intentions of the law makers. For example, the recruitment procedures at HEIs and PROs are formally open and merit-based, compliant with international standards, but their actual implementation by many institutions contributes to the reduced

mobility of researchers or the pre-selection of candidates even before the procedure formally starts (Fundusz Pomocy Studentom, 2016). In particular, some recruitment calls are prepared with a view to employing specific, previously identified individuals, who have graduated or attained scientific degrees at the same institution, but the procedures keep up the appearances of openness.

All employees of HEIs and PROs undergo regular performance evaluations, which officially have to include among others criteria related to scientific achievements, but these evaluations remain a mere formality at most institutions. Older employees benefit from tenure-like, permanent employment contracts signed before the 2010-2011 reform and retain their positions regardless of their performance, while younger researchers, employed after the year of 2011, work overwhelmingly based on temporary contracts that would not be extended if they do not attract R&D grants or have international publications. This situation stimulates potential conflicts between the younger, more scientifically active researchers and the representatives of the older generation, who tend to benefit from better working conditions and employment security, even though they do not need to demonstrate comparable research outputs.

There is a relatively small number of outstanding researchers in most fields of science and technology in Poland, accompanied by a substantial number of low-performing scientists. This tendency is confirmed by the distribution of national grants from NCN, FNP and Horizon 2020 (including ERC grants, dominated by the University of Warsaw), as well as publication patterns in the most prestigious international journals. Many HEIs and PROs have complex, overly bureaucratic procedures, without much administrative support offered to individual researchers preparing grant applications or implementing projects. This restricts the ability to apply for ERC or H2020 grants, even though MNiSW reimburses parts of the costs incurred in the application process. At HEIs, scientific research is also restricted by time-consuming teaching obligations – as an example, each employee of the University of Warsaw is expected to teach on average 7 hours of courses per week, not including the time needed to prepare for the classes, grade students or supervise their project work. It might therefore seem surprising that some HEIs outperform PROs in terms of acquired grants or publications in highly-cited international journals. Lack of time for research activities due to other obligations was also a key problem identified through in-depth interviews with Polish university researchers (NOU, 2016).

There seem to be no practical ways to increase the research performance of the “silent majority” of scientists, especially those benefiting from permanent employment contracts. R&D grants are distributed among a relatively small number of beneficiaries based on the quality of applications. Low-performing researchers could only rely on small amounts of institutional R&D funding, often too limited to finance empirical research or participation in international

conferences. MNiSW earmarks parts of the institutional funding for researchers at the age of 35 or below, but a scientist surpassing this age limit will have very limited R&D financing possibilities without prior, tangible scientific achievements, and might never be able to break this vicious cycle, focusing instead on teaching or local-scale research. The needs of such scientists are served by a large number of domestic scientific journals, many of which publish low quality contributions, accepted in less restrictive peer-review practices. MNiSW maintains the list of “eligible” Polish scientific journals, which included as many as 2,212 journals, as of December 2015 (MNiSW, 2015a). Each journal was awarded a number of points (between 2 and 15) in the ministerial assessment based on pre-defined criteria. Institutions employing the authors of publications in a given journal would be able to count the specified number of points towards their scientific portfolio, used in evaluations of scientific organisations that determine the future levels of institutional R&D funding. This system seems overly complicated, with many journals probably not deserving the inclusion on the list. Almost each HEI aspires to publish its own journals and scientists have far too many publishing opportunities to be motivated to maintain the necessary theoretical and methodological rigour. Moreover, MNiSW departed from the previously used criteria related to scientific standards when updating the list of journals in 2015. The Ministry established an online system intended to register all Polish publications and decided to reward editors of journals by allocating additional points in return for importing data on previous issues of journals and references cited in published articles into the system, as well as maintaining online full-text versions of articles. In consequence, some of the journals were able to move up the ministerial ranking merely by meeting certain formal criteria, not related to their scientific quality or impacts.

In evaluations of scientific organisations (used to determine the level of allocated, institutional R&D funding) and in the development of scientific careers (procedures for attaining the habilitation and the professor’s title), excessive importance is attached to the quantity of publications, sometimes adjusted by the types of scientific journals in which the contributions were published, but not their quality, impacts or citations. Even though the 2010–2011 reform of science and higher education called for more international exposure and competitiveness of the Polish science, subsequent legal amendments have toned down these ambitions, e.g. by lowering requirements for the habilitation and the professor’s title. The use of international peers across the public science system in Poland remains limited. Reviewers of doctoral and habilitation theses could potentially be foreigners, but the theses are usually written in Polish. Most domestic journals publish in the local language and could not benefit from inputs by foreign peers, even though many of them list researchers from other countries as members of journals’ scientific boards. When distributing

R&D grants, NCN, NCBR and FNP increasingly involve international peers and applications in many calls targeting HEIs and PROs include parts submitted in English.

The above-described tendencies in Polish science might also encourage scientific misconduct or create ethical challenges. The code of scientific integrity (pl. *Kodeks Etyki Pracownika Naukowego*) was issued by the Polish Academy of Sciences in 2012, based on the European Code for Conduct for Research Integrity (PAN, 2012) but some of its specific provisions remain unclear or unenforceable. There are cases of plagiarism found in scientific works, and at times, insufficient oversight of procedures leading to the award of doctoral and habilitation degrees. First relevant good practice examples and procedures addressing research integrity were implemented by PARP – the government agency supporting innovations and entrepreneurship (PARP, 2012). R&D funding agencies followed this lead: NCBR (2015) and NCN (2016), both having now formal corruption or fraud prevention procedures in place.

The international dimension of scientific activities fuels further problems. The risk of scientific brain drain is high due to significant disparities in salaries of researchers at Polish HEIs and PROs and at their Western European counterparts (see also: comparison of researcher salaries and discussion of negative implications of these disparities for the R&I of Poland in: Klineciewicz, 2015b: 20-23). In previous years, the government took measures to improve the situation, including: distribution of additional bonuses to scientists employed at HEIs, launch of schemes to attract returning Polish scientists (offered by FNP), or Marie Skłodowska-Curie-like fellowships to foreigners planning to carry out research in Poland (NCN's "POLONEZ" scheme). The scope of these measures is nevertheless limited, and the funding levels available to individual researchers remain uncompetitive. In this context, parts of the Polish academic community reacted negatively to the scheme established by the previous government in 2015, called "Studies for the outstanding ones" (pl. *Studia dla wybitnych*), through which a selected group of students was supposed to receive a fully-paid tuition alongside the reimbursement of living costs of studies at one of the leading Western European or US universities. The costly scheme was announced as a measure intended to increase the internationalisation of the Polish economy, but it was designed in ways that would not necessarily ensure a positive balance of brain circulation.

Challenge-based research, addressing societal or economic challenges, is not actively encouraged and could not even be eligible for NCN's funding that is reserved for "pure", non-applicable fundamental research (see also: section 3.2). Scientists pursuing multi-disciplinary research might face additional barriers, as the compartmentalisation of public science in Poland is fortified by legal regulations. Only researchers representing the core discipline of any given

university department are counted towards the numbers of scientists required to offer graduate studies or confer doctoral degrees, and there are caveats regarding the use of faculty publications from outside of the core discipline in evaluations of scientific organisations for institutional R&D funding. Cross-disciplinary doctoral or habilitation theses need to be assigned by the faculty to a specific discipline and in some cases, the decision could be overruled by a ministerial committee, triggering a transfer of the procedure to another institution. Parallel problems concern the grants awarded by NCN throughout most of its funding programmes, in which applicants need to pre-select a thematic panel and risk their application being rejected if the panel considers it out of the scope of their specific scientific discipline. For these reasons, the pursuit of innovative research crossing the boundaries of traditional fields of science is not favoured by many Polish researchers.

### 3.4. Innovation challenge 4. Priority setting in the R&I system

R&I performers in Poland are guided by explicit signals regarding the thematic or functional preferences of R&I policy makers. By the end of 2015, they were faced with reciprocally inconsistent sets of priorities:

- National Research Programme (pl. *Krajowy Program Badań*, KPB, developed by MNiSW and adopted in 2011) including 7 broad thematic priorities for scientific research (RM, 2011);
- National Smart Specialisations (pl. *Krajowe Inteligentne Specjalizacje*, KIS, developed by MR's predecessor, the Ministry of Economy with the involvement of stakeholders) including 20 broad thematic concentrations related to industrial R&D (majority of ESIF funding for R&I shall be allocated only to projects compliant with KIS) (MR, 2016a);
- Regional Smart Specialisations (RIS) – different in each of the 16 Polish regions, with varying levels of technological detail;
- several sectoral programmes (pl. *programy sektorowe*) of NCBR developed in partnerships with industry stakeholders for selected industries (according to descriptions, they should match specialisations identified in KIS, but some of them were not related to KIS, e.g. INNOLOT for aviation industry, or INNOSBZ for unmanned aerial vehicles);
- themes of NCBR's strategic programmes (pl. *programy strategiczne*), funding large consortium-based R&D projects (according to the underlying legislations, they should be launched for themes identified in KPB, but some diverged from this list);

lists of prioritised sectors for export promotion, preferred FDIs and key innovation clusters.



In 2014, the Polish R&I governance was impaired by the lack of thematic R&I priorities, but at the end of 2015, the number of incommensurable thematic lists associated with specific funding schemes was overwhelming. It needs to be pointed out that some of these lists are almost all-encompassing and thus **it is difficult to describe them as prioritisations** – both KPB and KIS cover substantial numbers of detailed research directions, including health, new materials and environment. In particular, the contents of KIS were expanded in 2015 through the work of thematic groups, which represent stakeholders from science and industry. For each KIS, these groups attempted to ensure as broad as possible coverage of possible R&D topics, in order to guarantee their future eligibility for ESIF funding. Results of the first ESIF funding calls in 2015 proved also that NCBR applied very generous interpretations of KIS, agreeing to finance also projects that were inconsistent with KIS (e.g. development of enterprise software or veterinary practices).

In addition to the above-described confusion regarding thematic specialities, the underlying R&I governance frameworks were also affected by the following, detailed challenges, exposing further problems related to priority setting:

- tensions between **support for indigenous innovativeness versus brain circulation** – evidenced e.g. by the previously presented problems with funding for FDIs or scheme intended to sponsor Polish students at leading Western universities;
- lack of clarity regarding the **preferred IPR commercialisation routes at HEIs and PROs** – with legislations from 2010-2011 establishing strong institutional control over IPRs generated by employed researchers, amendments from 2014 encouraging the reassignment of IPRs to academic inventors at HEIs and Polish Academy of Sciences (but not research institutes) to encourage their cooperation with investors and companies, but support measures offered by MNiSW until 2015 focused on the traditional, institutionally-linked commercialisation pathways (e.g. support for innovation brokers, incubators and special purpose vehicles expected to license technologies and support the establishment of spin-offs partly controlled by the scientific institutions);
- **limited effectiveness of evaluation projects**, which were not always based on sound and well-conceived methodologies (see e.g. questionable benefits of carrying out in-depth interviews with a stunningly large sample of 1,000 business enterprises from three regions of Poland by the World Bank consultants, who were commissioned to evaluate the adequacy of KIS, but ended up focusing on discussions of sources of differentiation and stages of development in the interviewed companies, and instead of presenting an evidence-based KIS evaluation, recommended the establishment of dedicated, thematic focus groups to further explore the corporate dynamics; the evaluation report

was not made publicly available by the Polish authorities), and sometimes were regarded merely as a formality, not leading to institutional learning or more radical changes of evaluated programmes or support measures (there seemed to be too many evaluations, concerning multiple overlapping topics; many of evaluations related to the 2007-2013 financial perspective were carried out too late to be instrumental in designing new instruments for 2014-2020, and some ministries and agencies were overwhelmed by the amount of information coming from various evaluation reports, so some of them could not have been analysed in detail by policy makers);

- **lack of integration between R&I policies and sectoral policies** in areas such as health, environment, defence, transportation, agriculture and e-government (with many sectoral policies not explicitly described in strategic documents, yet implemented by individual ministries using dedicated instruments, including public procurement, and thus not benefiting from synergies with R&I priorities);
- **focus on distribution and absorption of R&I funding** not on the economic effects or societal impacts (with the success of agencies and programmes measured primarily by the amounts of distributed funding and private co-financing, and the R&D funding agencies NCN and NCBR not being able to convincingly present tangible outcomes of projects co-funded in previous years due to their lack of close relations with beneficiaries or deficiencies in project monitoring);
- excessive **reliance on simple, quantitative indicators** to steer R&I policies – the targets of GERD and BERD in relation to GDP (set for the year of 2020) and indicators included in the annual MNiSW plan of work (MNiSW, 2016j) related to: numbers of business enterprises benefiting from NCBR financing, shares of private co-funding throughout NCBR programmes, counts of publications with Polish affiliations indexed by Elsevier Scopus database and counts of patents granted to Polish applicants. These indicators do not capture the complexity of innovation processes, nor could they be linked to the specific policy efforts of MNiSW or other institutions in the R&I system;
- worrying **inward-looking selection of research themes**, with some funding programmes **disregarding global or European R&I tendencies** related among others to: climate change, aging societies or Industry 4.0, as well as specific topics in social sciences such e.g. gender or immigration;
- **overlaps between support measures** (e.g. researchers in humanities were able to apply with similar projects in MNiSW's National Programme for the Development of Humanities or NCN's schemes, and some industrial projects could be financed either by NCBR or PARP);
- **inconsistencies between strategies and implementation**, in particular between the contents of the high-level document outlining R&I industrial policy

(Enterprise Development Programme, pl. *Program Rozwoju Przedsiębiorstw*) and the actual policy actions or the support measures included in the ESIF-based R&I funding programme POIR;

- **counter-productive inter-governmental dynamics** substantiated in conflicts over resources and decision making power between MNiSW, MR's two predecessors (the Ministry of Economy and the Ministry of Infrastructure and Development) and the Ministry of Finance, as well as struggles between implementing agencies NCBR and PARP, equally interested in distributing R&I funding to business enterprises. This dynamics resulted in some initiatives blocked or suspended (e.g. problems with introduction of R&D tax incentives could be attributed to a long-standing conflict between the Ministries of Finance and Economy), and the funding agency NCBR turning into an almost independent R&I policy-maker, exploiting managerial deficiencies of MNiSW and lack of the necessary control over the distribution of substantial R&D budgets, including both national sources and ESIF;
- **lack of financial discipline with respect to planning public R&I expenditures**, as evidenced by instruments being launched by NCBR without ensuring the necessary financing for the entire duration and scale of projects selected for funding (MNiSW, 2016n), or large subsidies allocated to specific HEIs and PROs for infrastructure investments based on discretionary decisions of the government, with multi-annual impacts for the state R&I budget not adequately evaluated while making the decisions (e.g. a 1b PLN / €239m investment programme established by the government for the University of Warsaw and the intended support for the ELAMAT consortium, described in section 4.1.4 of this report);
- **limited involvement of stakeholders** in consultations of many programmes, instruments and priority lists – resulting from their lack of interests or understanding of the importance of such an involvement for the future design of R&I financing schemes, generally weak sectoral representations of businesses and the passivity of ministries or agencies, which were contented working with a small, not always representative group of stakeholders.

# 4

## Innovation policy

### 4.1. Recent developments in innovation policy

#### 4.1.1. Background information

Following the elections in October 2015, a new government was formed by the right-wing Law and Justice (pl. *Prawo i Sprawiedliwość*) party. The Minister of Science and Higher Education Jarosław Gowin became also the Deputy Prime Minister, and this has strengthened the importance of R&I policies. The former Ministry of Economy and Ministry of Infrastructure and Development were merged into one entity, Ministry of Economic Development, headed by another Deputy Prime Minister Mateusz Morawiecki, who put the innovativeness of business enterprises and sustainable development high on his ministerial agenda.

In January 2016, the government established an inter-ministerial Council for Innovativeness (pl. *Rada do spraw Innowacyjności*), headed by the Minister of Economic Development, with the participation of Ministers of: Science and Higher Education, Culture and National Heritage, Digitalisation, Treasury, Health and National Education. This was the first time in Poland's history that R&I policies had such a prominent position on the government's agenda, with all three Deputy Prime Ministers being members of the Council. The Council announced their agenda for 2016, including plans to launch the “#StartInPoland” programme targeting start-ups, initiative wide-ranging deregulation to eliminate legal barriers to innovativeness identified by stakeholders, and to review KIS (National Smart Specialisation), narrow-down the number of technological specialities and establish dedicated thematic R&I programmes. In February 2016, the government adopted the Plan for Responsible Development (pl. *Plan na rzecz Odpowiedzialnego Rozwoju*), outlining new directions for Poland's economic and social policies that were supposed to be elaborated in a more comprehensive Strategy for Responsible Development (pl. *Strategia na rzecz Odpowiedzialnego Rozwoju*), expected to be adopted before the end of 2016 (more details in section 4.1.4 of this report). The Committee for Development

(pl. *Komitet Rozwoju*) was formed to oversee this process, headed by the Minister of Development and involving several other ministers.

The Supreme Audit Chamber published reports of several large-scale audits, concerning: research institutes (NIK, 2015), effectiveness of knowledge transfer activities at scientific organisations (NIK, 2016a), doctoral studies (NIK, 2016b), economic promotion of Poland (including support for Polish exporters) (NIK, 2016d), innovation centres (NIK, 2016e) and adjustments of the Polish economy to the challenges of international climate policies (NIK, 2016c). Each of these reports identified deficiencies and governmental bodies were formally obliged to implement corrective actions, which often took form of new legislative proposals or programmes.

The heads of agencies NCBR, PARP and PAIiZ were changed in 2016. During the summer of 2016, several people were arrested and charged with corruption related to R&D projects funded by NCBR, including the former director of the Centre, employees of companies and universities. Government agencies in charge of R&D funding – NCBR and NCN – issued strong statements concerning the avoidance of conflicts of interests and the use of law enforcement in all financial and procedural abuses. NCN introduced the code of conduct concerning research integrity (pl. *Kodeks Narodowego Centrum Nauki dotyczący rzetelności badań naukowych i starania o fundusze na badania*) (NCN, 2016a), and a procedure for dealing with the misconducts (NCN, 2016b). NCBR followed with its own statement concerning research integrity (NCBR, 2016b) and established an e-mail account for all stakeholders willing to submit information about misconducts in the co-funded projects.

The government used informal influence channels to induce organisational changes in state-owned enterprises, which have recently taken interest in R&D and innovations, started appointing directors in the relevant areas and looking for potential scientific partners to embark on joint R&D projects or form scientific advisory boards. The government attaches particular importance to strengthening the state-owned actors, offers instruments dedicated to them in the “#StartInPoland” programme, and modifies modalities of R&I calls based on ESIF to facilitate the increased participation of the largest enterprises in the funding programmes.

The Minister of Science and Higher Education presented in September 2016 his ministry’s strategic directions, called “Gowin’s Strategy” (pl. *Strategia Gowina*), and positioned as complementary to SOR. The Strategy consists of three pillars: “Constitution for Science” (reform of HEIs), “Innovations for Economy” (support for commercialisation of R&D results) and “Science for you” (promotion of science and strengthening the social responsibility of science). The Strategy was never formalised as a document and remains a set of general directions, included in the Minister’s presentations. The Ministry

released also the White Paper on Innovations (pl. *Biała Księga Innowacji*), outlining more detailed areas for public intervention and regulatory changes, intended to promote innovativeness of the economy (see also: section 4.1.3 of this report).

#### 4.1.2. Changes to the R&I policy mix – funding schemes

The new Minister of Science and Higher Education made several decisions that caused some controversies among stakeholders and signalled departures from the policies of the previous government:

- The funding scheme “Studies for the outstanding ones” (pl. *Studia dla wybitnych*) was cancelled (MNiSW, 2015b) as the costly measure was actually contributing to the brain drain, subsidising studies and living expenses at leading Western universities, with provisions not ensuring genuine returns on the investment for the Polish economy.
- The National Programme for the Development of Humanities (pl. *Narodowy Program Rozwoju Humanistyki*) was reorganised and scaled down to eliminate overlaps with NCN’s funding and focus only on types of projects that could not be supported by existing measures available at NCN. The Ministry transferred parts of the Programme’s budget to NCN to increase the budgets of the respective funding programmes. This move rationalised funding for research projects in humanities, ensuring the compliance with high peer-review standards of NCN and ceding the funding decisions to NCN, using selection panels with a diverse representation of scientific community. MNiSW only retained two parts of the Programme, concerning projects that do not meet NCN’s standards related to the global relevance of research findings (i.e. projects related to national heritage, with a predominantly local character) and support for translations and international publishing of Polish monographs.
- MNiSW made NCBR refrain from signing agreements with 50 HEIs that were selected as beneficiaries of ESIF measure POWER 3.4 aimed at the development and implementation of anti-plagiarism software systems at universities. The rationality of the call was put into question as universities were awarded funding for developing 50 proprietary, small-scale platforms (NCBR, 2015b), while MNiSW has already been working on the development of a centralised system that would be available based on open source licenses to all academic institutions in Poland with a view to register all student theses and subject them to plagiarism verifications.
- Worrying tendencies could be observed in the area of humanities, as MNiSW reoriented financial support in programmes co-ordinated directly by the Ministry, with the Minister of Science and Higher Education making

arbitrary funding decisions that deviated from the ranking prepared by peer-reviewers (Flis and Konopczyński, 2016). Competitive R&D project funding distributed by agencies NCN and NCBR was not affected by these problems, and were divided based on open and transparent peer-review processes.

Programmes based on ESIF were rolled out throughout the year of 2016, with most calls launched by NCBR in accordance with the original plans. At the same time, an observable problem at NCBR relates to the insufficient number of Centre's employees overseeing the implementation of support measures. When planning for the 2014-2020 ESIF perspective, the Centre didn't foresee increases in headcount, despite becoming responsible for many new funding schemes. The progress in implementing some measures seems impaired by these deficiencies and by uncertainties surrounding internal restructuring of NCBR following the change of its director.

Detailed information about individual support measures available in 2016 is listed in Annex 4 of this report. The ESIF-based measures included among others the so-called "fast-track" R&D funding (POIR 1.1.1), "Pilot Lines" supporting the development and first implementation of innovative technologies (POIR 1.1.2), sectoral R&D programmes dedicated for selected, prioritised industries (POIR 1.2), as well as multiple measures targeting science-industry cooperation. Venture capital and investment funds benefited from the "BRIDGE Alfa" scheme (POIR 1.3.1), redistributing funding to start-up companies. FNP (Foundation for Polish Science) was selected by NCBR to offer a portfolio of measures for scientists, promoting research excellence and applied R&D (POIR 4.4), and NCBR launched also various calls supporting higher education and teaching initiatives, based on the Operational Programme POWER. PARP had its own set of measures, including innovation vouchers (POIR 2.3.2), support for IPR protection (2.3.4) and a large funding scheme supporting the implementation of R&D results (POIR 3.2.1). Additional instruments are available on the regional level, as each of 16 regions of Poland has its own Regional Operational Programme with R&I budgets, and four regions of Eastern Poland benefit from a dedicated Operational Programme Eastern Poland (POPW).

With a substantial delay, NCBR launched in July 2016 a support measure "*e-Pionier*", funded from the Operational Programme Digital Poland (POPC 3.3). Initially, the measure was supposed to involve pre-commercial procurement, but this construction was abandoned due to anticipated legal difficulties.

PARP carried out broad stakeholder consultations of modalities and project selection criteria for each type of support measures offered by the agency. This practice was very different from the approaches adopted by NCBR, which was merely announcing the adopted rules and criteria.

Based on POIR 2.4.1 measure, PARP launched "ScaleUp", targeting consortia of technology accelerators and large companies. Formal modalities of the call

mentioned the possibility of involving large state-owned enterprises (PARP, 2016b) but the detailed description of the “ScaleUP” concept and its objectives, published by PARP, specifically indicated that applications from consortia involving state-owned enterprises will be preferred (PARP, 2016a: 2). The consortia should operate in a manner resembling corporate ventures, supporting innovative start-ups by training, mentoring, funding and access to resources of the large enterprise. The selection of supported start-ups should respond to specific technological needs of the enterprise-consortium member. The design of “ScaleUP” is interesting and could potentially stimulate the innovativeness of the largest enterprises in Poland, promoting open innovations and helping start-ups find committed corporate partners. However, the preferences for state-owned enterprises limit the openness of the competition and raise additional concerns regarding the organisational cultures and innovative capacities of these large partners.

The state-owned bank BGK offers credits for technological innovations (POIR 3.2.2), supporting the acquisition and implementation of innovative technologies or implementation projects of technologies developed in-house. BGK’s venture capital arm KFK (National Capital Fund, pl. *Krajowy Fundusz Kapitałowy*) continues operations as a fund of funds, managing a portfolio of 17 VC funds co-funded with the EU Structural Funds from the 2007–2013 perspective, with multiple investments in innovative companies.

“BRIDGE VC” scheme (POIR 1.3.2) prepared by NCBR is dedicated for VCs investing in more mature, technology-based firms and will be implemented as an equity-based financial instrument. In addition, the largest insurance company in Poland, PZU S.A., was selected in March 2016 to act as a fund of funds, i.e. company holding a portfolio of shares in other investment funds. PZU established in June 2016 a dedicated entity called “Witelo Fund” to co-ordinate the efforts. As of November 2016, the progress in implementing the measures seems limited, especially as NCBR had initiated the preparations of “BRIDGE VC” and dialogue with the leading foreign VC funds already in 2012. There seem to be direct overlaps between BRIDGE VC and Witelo Fund, and both measures are still surrounded by uncertainty.

The government announced in June 2016 a comprehensive framework called “#StartinPoland” as an umbrella brand for various support measures targeting start-ups. Majority of these measures are expected to be based on ESIF. Many of them had already been planned before or were renamed to fit into the new framework. First instruments of “#StartinPoland” included “ScaleUP” offered by PARP and an investment programme of the Polish Development Fund. The Fund (PFR, pl. *Polski Fundusz Rozwoju*, established in April 2016 as a successor of a sovereign wealth fund PIR, “Polish Investments for Development”) plans to invest in the most promising start-ups that successfully completed the first round



of external funding through its subsidiary PFR Ventures. As of August 2016, the details of the equity investments based on ESIF remain unclear due to the overlaps in planned activities of the Witelo Fund and the Polish Development Fund, which shall both use ESIF funding for the same purpose, and their announced investment budgets do not correspond to the available ESIF allocations.

The state budget remained an important source of funding for R&I support measures, but its importance has been decreasing in recent years due to the increased availability of ESIF. MNiSW offered “Bonus on Horizon” to complement H2020 funding awarded to HEIs and PROs. The Ministry launched a new scheme “DIALOG” to support bottom-up initiatives of HEIs, PROs, companies and NGOs. NCBR established a funding scheme “PANDA 2” to support the maintenance of research infrastructures developed based on the EU Structural Funds, 2007-2013. The Centre continued also numerous other programmes targeting applied R&D performers, and NCN offered a broad portfolio of measures for fundamental research, extending its offering to fill identified funding gaps in the public science system. Additional measures were also offered by a state-owned holding company ARP S.A. and the National Fund for Environmental Protection and Water Management. Detail of these measures are presented in Annex 4.

Among the suspended or discontinued measures, notable is the lack of calls in PARP’s measure “Support for securing a grant” (pl. *Wsparcie na uzyskanie grantu*) that was supposed to co-finance preparation of R&D applications by business enterprises to Horizon 2020 and other international programmes (but PARP initiated a dialogue with stakeholders concerning future plans to support the beneficiaries of H2020 “Seal of Excellence”). MNiSW did not launch in 2016 a new edition of the programme “TODDLER at the university” (pl. *MALUCH na uczelni*), supporting the establishment of nurseries or child care centres at HEIs for children of scientists and students. NCBR did not offer most of nationally-funded measures that used to be offered in previous years. Many of them would overlap with the existing offering of NCBR, co-funded from ESIF. A missing instrument is the discontinued call for PATENT PLUS, supporting international patenting at various institutions, including HEIs and PROs – as ESIF-based measure only supports patenting of business enterprises. This might further discourage active IPR protection in scientific organisations, either by refraining from patenting or by transferring the entire intellectual property to private sector entities. No dedicated measures were also available for technology transfer centres or innovation brokers at HEIs and PROs, and training programmes educating young researchers and research administrators in technology transfer and R&D commercialisation techniques were finished in 2015.

The Ministry of Development announced plans to form the Export Support Agency (pl. *Agencja Wspierania Eksportu*) to co-ordinate activities related to the

internationalisation of Polish companies. Currently, these activities are divided between PAiIZ (traditionally more focused on attracting FDIs to Poland than supporting exporters), MR (maintaining a network of economic attaches in Polish embassies) and PARP (implementing relevant support measures). The plans could address the concerns of the audit carried out by NIK (NIK, 2016d), which highlighted limited effectiveness of the existing export support system, with its operational costs much higher than funding available for actual promotional activities.

The Polish Academy of Sciences established in April 2016 the Office for Scientific Excellence (pl. *Biuro ds. Doskonałości Naukowej*), supporting Polish ERC applicants from PROs and HEIs. The Office will complement the activities of the National Contact Point for EU Research Programmes and the network of Regional Contact Points.

#### 4.1.3. Changes to the R&I policy mix – legislation

R&D tax incentives are available starting from January 2016, and one of the reasons for their introduction was the intent to reduce the BERD under-reporting by offering incentives to include the relevant costs in corporate book-keeping systems, instead of registering them as other types of costs. For corporate tax-payers, the Ministry prepared for 2016 a new tax form that will be used to declare the basis for tax deductions related to R&D (MF, 2016a). It includes data about specific scientific organisations that were commissioned by the company to carry out contract R&D. In March 2016, the Minister of Finance amended the ordinance defining tax book-keeping standards for individuals (including partnership companies), introducing the obligation to register R&D expenditures regardless of whether they are used for further tax deductions (MF, 2016c). The regulation is likely to be noticed by corporate accountants and encourage them to start registering the relevant expenditures, especially as it includes a provision stating that failure to register R&D expenditures that had actually been incurred renders the tax books invalid, and this event triggers further legal and financial consequences.

In 2016, MNiSW and MR took concerted efforts to modify some of the legal bases for the R&I system. The initiatives resulted from the work of the Council for Innovativeness, specific recommendations stemming from the NIK audits and ad hoc needs arising due to changes in certain funding programmes or modalities. Even though the government declared the drive to reduce bureaucratization of the science sector and eliminate legal barriers to innovativeness, the number of legislative amendments didn't live up to the promises of simple and non-redundant laws.

In March 2016, MNiSW shared with stakeholders a proposal for amendments to the key legal acts, affecting the innovativeness of various actors, including

HEIs, PROs and companies. As the Ministry suggested, the consultative process would involve two steps: “small” amendments adopted in 2016 (in order to eliminate as soon as possible the most controversial or irrational administrative burdens or barriers to innovativeness) and more comprehensive changes elaborated through a longer process, involving representation of stakeholders and broad consultations (with a view to define radically new legal foundations for the sector).

The “small” amendments (proposed in March 2016 and updated in July 2016) include minor tweaks to the procedures for technology transfers at HEIs and PROs (MNiSW, 2016e) by:

- Reducing the number of decisions that need to be formally issued by an organisation’s management in patenting and commercialisation procedures;
- Granting scientists-inventors the rights to a share of profits incurred by the employing HEI or institute of the Polish Academy of Sciences based on the commercialisation of IPRs generated by a given scientist (inventors employed by research institutes do not participate in their profits; starting from 2014, inventors were only able to participate in these profits during the first five years following the successful commercialisation);
- Allowing the disposal of intellectual or fixed assets above the financial threshold of €250k without the need to apply for permissions of the Minister of Treasury, merely by submitting him the information about the intended transaction and having the right to conclude it if the Minister takes no actions within 30 days;
- Empowering HEIs to create as many special purpose vehicles/holding companies (pl. *spółka celowa*) as they consider suitable (currently, only one company per university was allowed) and allowing the co-ownership of these entities by a state-owned bank BGK and a state-owned investment fund KFK, as well as companies linked to BGK and KFK (including investment funds in which BGK or KFK participate).

These changes streamline the technology transfer procedures and could strengthen the capitalisation of university-owned companies by opening them up to external investors. The Act’s key provisions concerning business enterprises included:

- Contributions of intellectual property to a joint stock company would not be taxable (so far, similar provisions were available but introduced as exceptional tax incentive applicable only in 2016 and 2017);
- Costs of patenting (including patent drafting, filing, legal proceedings and patent defence) are eligible as costs of R&D;
- R&D tax incentives are increased, from 10-20% of incurred R&D costs in 2016 to 30-50% of costs starting from 2017, with different rates depending on type of expenditures and size of company;

- R&D costs would be tax-deductible for a period of 6 years to better match the longer time horizon of R&D endeavours (as opposed to only 3 years according to regulations that were in force in 2016);
- Start-ups incurring R&D expenditures and not generating sufficient revenues to benefit from the R&D tax incentives would be eligible for cash reimbursements;
- Companies that systematically increase their R&D expenditures over a period of 3 subsequent years would benefit from an additional tax bonus in the fourth year, calculated based on a pre-defined formula (this provision incentivizes increases in corporate R&D that would directly influence the value of BERD in 2020 and support meeting the national GERD-to-GDP target).

It should be noted that this legislation introduces significant changes to the design of R&D tax credits, increasing their size, adding new eligible cost categories, expanding the deduction period and offering additional incentives for start-ups and companies that consistently increase their R&D expenditures. In the Polish tax system, these changes could be considered revolutionary and unsurprisingly, the draft Act triggered critical reactions of the Ministry of Finance, which offered an estimate of the expected foregone revenue of 4.4b PLN (€1,051.5m) in 10 years (MF, 2016b: 2), even though there is no empirical basis for calculating these impacts, and companies start including R&D costs in their financial books in 2016. At the same time, the legislator is aware of the limited attractiveness of the proposed R&D tax incentives in comparison with countries such as Czech Republic, Hungary or the UK (MNiSW, 2016b: 2) and even declares that the introduction of R&D tax incentives serves the testing purposes to be better able to estimate the scale of R&D activities in Poland (MNiSW, 2016b: 7) and thus be able to prepare evidence-based plans for future courses of action.

The “larger” legal amendments will result from the “White Paper on Innovations” (pl. *Biała Księga Innowacji*), prepared by MNiSW. The Ministry published an online form, asking all interested stakeholders to suggest specific regulations that present barriers to the innovativeness of the Polish economy (MNiSW, 2016m). 340 inputs received were comprehensive but also incommensurable, and the stakeholders were not able to present more systemic views on the desirable changes but only had the possibility of suggesting individual improvement areas, with a limit of characters for each submission. MNiSW published the White Paper in September 2016 as the basis for subsequent reform efforts (MNiSW, 2016s). The White Paper identifies 58 actions, including changes that would affect 15 existing legal acts and are expected to be adopted in 2017. These actions are described in a very general manner, without any justifications provided for the proposals. Therefore, the rationale behind some of the actions

remains unclear, they do not seem to result from a thorough diagnosis of the challenges faced by Poland's R&I system or be convincingly presented as having the potential to actually strengthen the country's innovativeness.

Many of the outlined actions could be beneficial, but the lack of detail or argumentation does not help in interpreting these plans. An example of a puzzling lack of precision is the proposed "introduction of systemic solutions to stimulate medium-sized and large firms to introduce innovative solutions and to generate demand for them" (MNiSW, 2016s: 23). The actions covered by the White Paper on Innovations include:

- Introduction of more attractive incentives for business enterprises benefiting from the status of R&D centres;
- Launch of pre-commercial procurement for innovations;
- Introduction of a patent box-like R&D tax incentives;
- Establishment of a dedicated court dealing with the issues of intellectual property;
- Changes to the legal framework to facilitate the registration of R&D expenditures by companies;
- Introduction of industrial PhDs;
- Development of templates for technology transfer agreements to be used by HEIs and PROs;
- Reform of research institutes;
- Additional incentives for scientists commercialising their R&D results, including reduction of workloads related to other academic obligations and ability to take a paid, 6-month leave to organise the commercialisation process;
- Elimination of applicant age limits in all R&D programmes (currently, in some programmes only applicants of 35 years or younger are eligible);
- Introduction of legal regulations for crowdfunding and tax incentives for companies investing in start-ups;
- Establishment of a one-stop-shop for R&D project funding;
- Better use of IT infrastructures by public administration and unrestricted access to public data.

It must be stressed that the White Paper does not go into the details of the proposed actions and is restricted to listing them in a manner similar to the list presented above. No timeframes, assumptions, action plans or success indicators were included. Some of the actions are actually under implementation and were initiated before the release of the White Paper.

Regarding the public science sector, MNiSW declared the efforts to reduce the number and stringency of regulations of HEIs and PROs, strengthen their autonomy and reduce unnecessary bureaucratic burdens. In March 2016, the Ministry introduced amendments to the Ordinance on Science Information

System (reducing the frequency of obligatory reporting by HEIs and PROs) (MNiSW, 2016h) and published another online form, collecting suggestions for specific paragraphs of legal acts that could be eliminated or modified. Based on these inputs, the Ministry proposed the “deregulation” measures in the draft Act sent to the Parliament (MNiSW, 2016f), which had the following important provisions:

- Simplified rules for establishment and accreditation of study programmes with more teaching autonomy granted to HEIs;
- Easier procedures for employing professors who do not have Polish scientific titles but substantial academic track record abroad;
- Ability to employ researchers who have recently attained higher scientific degrees or titles (PhD, habilitation, professorship) without the need to organise open competitive calls (as many selection procedures were organised merely to ensure the continuity of employment of such scientists after the recent scientific promotion, and only pretended to be genuinely open, while the procedures of awarding scientific degrees or titles already include a thorough evaluation of academic achievements of the candidate);
- Reduced frequency of performance evaluations at HEIs and PROs (once in four years, with the same frequency for all employees);
- HEIs required offer regular scholarships to at least 50% of full-time doctoral students and that the number of part-time (tuition paying) doctoral students cannot exceed the number of full-time doctoral students.

MNiSW issued an open call for submissions by teams of scientists interested in preparing proposals for a thorough reform of the higher education sector, dubbed “Legislation 2.0” (pl. *Ustawa 2.0*). The Ministry communicated its plan to select three teams that would be commissioned to work in parallel on preparing competing strategic and legislative proposals. It established a jury composed of distinguished scientists to identify the winners and accepted the jury’s decision in May 2016 (MNiSW, 2016k). The process received a lot of attention in the scientific community, symbolizing the openness of the new government to an inclusive dialogue with stakeholders.

There might however be multiple concerns surrounding the approach. First of all, the proposals are elaborated by Polish scientists – future beneficiaries of the proposed legislations, without the involvement of independent third parties such as e.g. consultants, international peers or experienced policy makers from other countries. This might lead to solutions convenient for the Polish academic community, but diverging from international trends or not adequately addressing the underlying structural challenges in the higher education system.

Secondly, all three selected teams have already presented their specific recommendations for the future architecture and mechanics of the HEI sector in their proposals and in presentations delivered in May 2016 (MNiSW, 2016k).

This does not seem methodologically correct, as the project should involve a broad, independent, prejudice-free evaluation of the system and potentially also an international benchmarking before any courses of action are recommended.

Thirdly, it is unclear how the divergences between three competing legislative proposals could be overcome. Specific deliverables will most likely be available in early 2017 (MNiSW, 2016k), and the three teams of scientists – not the Ministry itself – are expected to work towards reaching a broader stakeholder consensus over the future legislations. This shifts the responsibility for public consultations away from MNiSW and could potentially strengthen the role of the government in the process, stepping in to make final decisions if the academic community remains divided. MNiSW plans to use the services of H2020 Policy Support Facility, co-ordinated by the EC, in order to evaluate the three regulatory proposals. According to the timeline suggested by MNiSW, the new Act on Higher Education will be ready in the year of 2018, i.e. the year before the next parliamentary elections, so the consultative and implementation process will take almost the entire term of office of the present Minister. This means that for the following years, the majority of policies regarding the HEIs in Poland would remain unchanged, and the highly publicized work of the teams developing proposals for future legislations could be a smokescreen concealing some other regulatory activities.

This interpretation could be supported by the fact that in April 2016, MNiSW established a taskforce working on the analysis of the financing of higher education and science, with members nominated by the Minister (MNiSW, 2016o). The taskforce has played a far more important role than the broad, ongoing processes involving stakeholders, especially due to adjustments of public budgets for science and higher education likely resulting from the overall pressures to reduce government spending. In October 2016, MNiSW published a draft ordinance concerning the financing of teaching activities at HEIs, proposing to revolutionize the funding algorithm starting from January, 2017. The change will affect the public HEIs, which used to benefit from funding linked to the numbers of full-time students, but the new algorithm will disincentivize large sizes of student populations, and rely on an indicator of student-faculty ratio, penalizing HEIs that have higher numbers of students per each academic employee. Stakeholders reacted nervously to the proposals due to their radicalness, the planned speed of implementation (several weeks after the end of public consultations), the entry in force in the middle of academic year and detrimental financial impacts for some HEIs that would not have sufficient time to prepare for the revolutionary change. Even though the algorithm only concerns the distribution of public funding for teaching, most HEIs use this base funding to cover the salaries of academics and costs of infrastructure

maintenance, and changes are likely to affect their ability to carry out R&D activities.

In June 2016, MNiSW published draft ordinance concerning evaluation of scientific organisations that determined future institutional R&D funding (MNiSW, 2016d). The document seems overly conservative, repeating provisions prepared by the previous government. As before, organisations will accumulate points for publications, granted patents and selected forms of formalized cooperation with companies or other stakeholders. The evaluation procedures are complex, based on quantitative indicators taking also into account numbers of employees at a given faculty or institute and normalizations within a given scientific discipline, so that management of any scientific organisations could not foresee the evaluation outcomes merely by analysing the tangible R&D results. Societal or economic impacts of the research, or even their citations, are not directly considered in the evaluation, albeit selected high-impact scientific achievements could be separately declared by the evaluated organisations, accounting for a small share of points. The institutional evaluation is scheduled for 2017 and will take into account publications and other R&D results from 2013-2016. The list of eligible scientific journals with assigned numbers of points was published in December 2015, and the draft ordinance presenting evaluation criteria was only published for consultations in June 2016, with another version presented in September 2016. The final evaluation criteria were still not known by the end of November 2016, i.e. in the last month of the period covered by the institutional evaluation. The previous government was expected to define these criteria already in 2013 in order to give clear signals to HEI and PRO management by prioritising the preferred types of research activities, but for several years, scientists were not even sure whether their publications or other research results could be considered relevant in the next institutional evaluation. In addition, the draft ordinance and attachments are altogether 143 pages long, and this complexity contradicts the claims about deregulation of the science sector (even though the early version of the document was prepared by the previous government).

Other legislative initiatives of MNiSW included amendments to the Act on Principles of Science Financing, the Act on National Science Centre (NCN) and the Act on National Research and Development Centre (NCBR) (MNiSW, 2016g) to ensure that decisions concerning the award of competitive funding (NCN and NCBR grants) as well as institutional funding would not be subject to standard regulations of the administrative code (pl. *kodeks postępowania administracyjnego*), albeit with appeal procedures controlled by administrative courts. This will improve the efficiency of funding procedures, but has the potential to reduce their transparency.



Among other activities, the Ministry renegotiated the bilateral agreement with the Slovak Republic concerning the reciprocal recognition of scientific degrees (MNiSW, 2016l). This move seems important for the improvement of the quality of Polish science and elimination of misconducts, as provisions of the previous agreement allowed Polish citizens to attain a Slovak title of “*docent*”, awarded based on a combination of scientific and teaching-related criteria and use it in Poland with the same effect as the Polish habilitation, which is more stringent and oriented towards scientific achievements.

The Parliament amended the Act on Research Institute (Sejm RP, 2016), strengthening the government’s control over research institutes that enjoy the prestigious status of the “National Research Institute” (PIB, pl. *Państwowy Instytut Badawczy*). The minister supervising a given institute will have a direct possibility to appoint and recall the institute’s director and deputy director, while previously – based on the provisions of the Act from 2010 – the institutes enjoyed more autonomy, and their directors were selected by scientific councils, including a representation of an institute’s employees and persons nominated by the minister. The amendments were criticised by some stakeholders as drastically reducing the autonomy of the affected research institutes, allowing ministers to interfere in their operations and selection procedures. It must also be noted that in the draft Strategy for Responsible Development, the government outlined a proposal for the establishment of the National Institute of Technology, incorporating resources of some of the public research institutes (more information in section 4.1.4 of this report). MNiSW plans to introduce a comprehensive reform of research institutes, but as of November 2016, no details were published.

In August 2016, MNiSW published drafts of seven important ministerial ordinances, concerning teaching standards at HEIs and procedures for granting PhDs, habilitations and the titles of professor. The ordinances serve primarily the purpose of simplifying the documentary obligations and reducing administrative burdens related to specific procedures, and are needed before the beginning of the academic year. Some members of the academic community reacted negatively to the approach adopted by the MNiSW, which informed the stakeholders about draft legal documents on August the 3<sup>rd</sup>, and scheduled the end of stakeholder consultations for August the 22<sup>nd</sup>. The month of August is traditionally a vacation period at universities, and stakeholder representations would not be able to discuss their positions concerning seven new ordinances in such a short time. In October 2016, the Ministry issued another draft, outlining the proposed modalities for industrial PhDs, with doctoral students benefiting from a dual supervision by a professor and an industry expert. The students enrolled within the scheme would receive government-sponsored scholarships, and R&D costs incurred by the employing business enterprise would be tax

deductible. The draft included also a very controversial provision, allowing university rectors and directors of research institutes to award experienced researchers a status that have identical legal consequences as the habilitation, without any peer reviews or decisions of scientific councils. The provision was widely criticised as allowing HEI or PRO management to arbitrarily reward some researchers, without quality control or respect for peer review criteria. Its introduction could lead to the erosion of the habilitation degree in Poland.

The Ministry of Economic Development announced its plans to work on the “Business Constitution” – a regulation package governing the relations between the government and business enterprises, strengthening the freedom of economic activity and reducing legal barriers to entrepreneurship. The Ministry also published a proposal for a new legal corporate form, “the simple corporation” (pl. *prosta spółka akcyjna*) dedicated for small firms, including start-ups, with faster registration and more flexible governance rules (MR, 2016h). In June 2016, the Ministry presented the first outline of the proposed governance form and initiated a process of “pre-consultations” by listing a number of detailed questions that interested stakeholders could answer through online submissions that would subsequently be analysed by MR and influence the specific shape of the legislation.

Poland did not publish its ERA (European Research Area) action plan as of November 2016, but many policy initiatives are consistent with the directions defined for the ERA.

#### **4.1.4. Strategy for Responsible Development**

By the end of July 2016, the Ministry of Development published a draft of the top-level strategic document called the Strategy for Responsible Development (SOR, pl. *Strategia na rzecz Odpowiedzialnego Rozwoju*) (MR, 2016e). It is supposed to supersede the previous strategy from 2013 (the Strategy for Innovativeness and Efficiency of the Economy), which had the time horizon until 2020. According to the document, it was prepared by 12 thematic taskforces consisting of experts from various ministries, including a dedicated taskforce working on the issues of innovativeness (MR, 2016e: 3). The planning efforts started in February 2016, based on the decision of the Council of Ministers (see: section 4.1.1 of this report), and the short drafting period coincided with numerous other legislative and organisational changes, so unsurprisingly the draft document does not yet attain the optimal level of consistency between inputs seemingly coming from different thematic taskforces. Stakeholder consultations were launched on the 29<sup>th</sup> of July 2016 and will last until September 2016, and the Ministry has an ambitious plan to present the final version of the Strategy to the Council of Ministers in October 2016.

The contents of the Strategy seem particularly important for the Polish R&I system and relevant for the present report, as the document declares the intention to amend the Partnership Agreement with the European Commission and the ESIF-based operational programmes for 2014–2020, currently under implementation (MR, 2016e: 212–213). The intended changes are expected to thoroughly reengineer the set of support measures related to R&I, changing focus of public interventions, centralising some of the support activities and introducing stronger thematic focus. The Strategy presents the proposals with a rather limited level of details, referring to the planned development of numerous lower-level policy plans, programmes and flagship projects. It includes redundancies between some areas (e.g. in descriptions of measures planned with respect to innovation policy, industrial policy and export promotion), but these deficiencies are likely to be overcome before the final version of the document is prepared.

The document includes a fairly accurate diagnosis of the problems of Poland's R&I system, but it fails to deliver convincing answers to the identified challenges. It rather includes a collection of numerous planned interventions that do not yet form a comprehensive, synergistic framework. SOR declares its focus on stimulating sustainable economic growth, using both existing competitive advantages and trying to create new ones, particularly in relation to: reindustrialisation, innovativeness, international expansion and increased role of SMEs in the economy (MR, 2016e: 39–40). It accurately notes challenges for the Polish economy, resulting from increasing automation, use of robotics and ICT to decrease labour intensity in Western European manufacturing sectors (MR, 2016e: 12). In response to these observed tendencies, the Strategy aims at strengthening the private sector's awareness by establishing the Polish Platform Industry 4.0 (MR, 2016e: 60), developing the necessary technical infrastructure and competencies for Industry 4.0" (MR, 2016e: 59–60), which according to the document include: Internet of things, renewable energy generation, fossil fuels, energy storage, electric cars, ICT and sensors (MR, 2016e: 59), and developing relevant legal regulations, technical standards, interoperable ICT systems, big data analytics and cloud-based solutions (MR, 2016e: 59–60).

The Strategy refers to the limitations of environmental resources and challenges of climate change (MR, 2016e: 12), diverging from the past Polish political discourse that was largely disregarding these topics. However, the only specific measure addressing these challenges with respect to the R&I system is the promotion of ETV (Environmental Technology Verification) framework (MR, 2016e: 74), which remains a small-scale pilot initiative of the European Commission. The Strategy mentions also the intentions to use public procurement to promote innovative and sustainable products and services (MR, 2016e: 60–61), but similar declarations had regularly been repeated by governmental institutions in the past, and no details of the planned changes are provided. The government

declares to prepare the Low Emission Development Strategy (MR, 2016e: 57), which actually had been under preparation for several years (the Supreme Audit Chamber has even criticised the delays in its preparation, see: NIK, 2016c), as well as the Roadmap of Transformation towards Circular Economy (MR, 2016e: 57). The Low Emission Development Strategy is intended to “reduce emissions and energy consumption of the economy, at the same time ensuring the protection of the competitiveness of industries that are energy intensive for structural reasons” (MR, 2016e: 57), and this explanation seems to at least partly contradict the title of this planned policy document.

Among diagnosed weaknesses of the Polish economy, authors of SOR highlight the “trap of average product” (MR, 2016e: 15), resulting from the limited scope of industrial R&D and the low innovativeness of companies. They also emphasize the benefits of Foreign Direct Investments, but state that FDIs should merely support the economic development, not be the core source of financing of the growth (MR, 2016e: 17). Government intervention in the R&I system and focused industrial policies are expected to increase the development opportunities for domestic companies. The Strategy highlights the need of focus on selected industries, products and technologies (MR, 2016e: 33) and justifies the focus by the need to redirect ESIF funding to areas that are key for the economic development, thus reducing the dispersion of public aid (MR, 2016e: 165). Changes within the structure of the government and executive agencies are also needed: SOR argues that Poland has as many as 8 parallel institutional structures supporting Polish exporters and investors (MR, 2016e: 95). Restructuring is also required in the large group of public research institutes that need to be reformed to better focus on the needs of the industry (MR, 2016e: 73), with some of their resources centralised as the National Institute of Technology (pl. *Narodowy Instytut Technologiczny*) that would “support the state in the implementation of its technological policy” (MR, 2016e: 57). The Institute would have its own dedicated research programmes, alongside the R&D programmes offered by NCBR, focused on key horizontal technologies (MR, 2016e: 50). A new government agency or corporate holding structure named Polish Capital Group (pl. *Polska Grupa Kapitałowa*) will oversee a selected group of state-owned enterprises “contributing to the creation of value, flexibility in asset management and real synergies between companies in which the state holds shares” (MR, 2016e: 57). SOR proposes new thematic focus areas for R&I and industrial policies, highlighting the importance of 8 out of 20 smart specialisations that would become the basis for “fast-track programmes” (MR, 2016e: 68), but also identifying 10 “strategic sectors” that would be the basis of the “New industrial policy” (MR, 2016e: 49) and 12 industries prioritised for international promotion (MR, 2016e: 108). The Strategy discusses the need to further narrow-down the existing list of 20 smart specialisations on the national level and an

even more extensive list of specialisations selected by each of the 16 Polish regions (MR, 2016e: 134; 165). Further details regarding the proposed process of updating the specialisations are provided in section 4.2 of this report.

The Strategy emphasizes the need for training inventors and R&D managers (MR, 2016e: 70) and the compulsory, consistent use of project management methodologies in the public sector (MR, 2016e: 216). Business enterprises will benefit from the “Business Constitution” (pl. *Konstytucja Biznesu*) (see also: section 4.1.3 of this report), increase in R&D tax incentives and reform of regional courts that would establish dedicated departments dealing with intellectual property rights (MR, 2016e: 71). Legal regulations will also undergo an “Innovation Test” to verify their impact on the innovativeness of business enterprises (MR, 2016e: 71). Some of the breakthrough technologies developed by scientists will be made available to companies based on open licenses (MR, 2016e: 73). Creative industries will benefit from additional fiscal incentives, including tax preferences for international multimedia productions (MR, 2016e: 73). Comprehensive set of actions will also address the development of e-government, resulting in the development of numerous specified platforms and public services (MR, 2016e: 198). SOR includes no declarations related to the increase of public expenditure on R&D and even prudently mentions that any increase of public spending stimulating development requires the stability of public finance and reduction of the budgetary deficit (MR, 2016e: 22). Nevertheless, it also declares increases in the national defence budget from 1.95% of GDP in 2015 to 2.2% of GDP in 2020, with a proportional increase in the related R&D budget for defence (MR, 2016e: 275). The “National arms policy” will among others include a diagnosis of technological needs of the military sector and preferable R&D directions (MR, 2016e: 278).

SOR lists on a large number of “strategic projects” and “flagship projects”, without explicitly explaining the difference between these categories. It seems that strategic projects already have pre-selected target beneficiaries, while funding for flagship projects will be distributed based on competitive calls. The selection of many detailed support directions, listed as strategic and flagship projects, remains disjoint from the analysis presented in SOR, but rather motivated by expectations of certain industrial or academic stakeholders. Public funding will be available among others for: large passenger ferries, unmanned aerial vehicles, electric buses and cars, trams, rail cars, telemedicine solutions, generic and biosimilar drugs, medical technologies, eco-friendly construction and “smart” mining (MR, 2016e: 58). Among strategic projects, funding will be earmarked for the ELAMAT initiative (MR, 2016e: 57): a large research infrastructure project related to nuclear physics facility in Southern Poland of the ELAMAT consortium, which intends to apply for €340m-€378m, with expected infrastructure maintenance costs of €55m per annum (ELAMAT, 2015). Among

all strategic and flagship projects listed in the Strategy, ELAMAT is the only initiative with a clearly indicated beneficiary.

Financial aspects of the Strategy are estimated in a concise summary table (MR, 2016e: 286), without presenting the funding needs of specific objectives, strategic projects or flagship projects, included in the plan. For 2016–2020, the funding sources for SOR will include: 529,779.4m PLN (€126,611.2m) from the state budget, 507,691.3m PLN (€121,332.4m) from regional budgets, 253,560.0m PLN (€60,597.9m) from ESIF, 12,244.2m PLN (€2,926.2m) from EU Framework Programmes, 110,000m PLN (€26,288.7m) from the European Investment Bank, 28,351.9m PLN (€6,775.8m) from the World Bank, 50,000.0m PLN (€11,949.4m) from the Polish banking sector and 111,116.1m PLN (€26,555.5m) from the Polish Development Fund. The budgetary plans includes separate positions referring to the contribution of budgets of executive agencies, listing among others NCN and NCBR, which are actually based on either state budget or ESIF, i.e. some of the funding sources might have been counted twice in the table. In a similar manner, funding of the Polish Development Fund is listed as covering also PAIiZ and PARP, whose budgets are currently reliant on the state budget. The financial plan lists figures that further increase Poland's foreign debt, and also includes funding sources that are uncertain and unlikely to be available in the planned amount (e.g. EU Framework Programmes).

The above-listed comments refer to a draft version of the Strategy, which will certainly be further improved based on the feedback from governmental and non-governmental stakeholders. The document outlines important directions for the expected changes in Poland's R&I system. This long-awaited document was published to demonstrate the scope of economic changes, envisioned by the current government. Before such an important policy document is shared with the general public, it would certainly have benefited from further analytical work, better coordination between the specific proposed policy instruments and more specificity in descriptions of these instruments. Due to the overly general descriptions of most of the planned initiatives, their assessment seems impossible at this stage. The implementation of SOR will prove difficult due to the lack of measurable objectives, milestones, indications of governmental actors supervising each initiative, and shortcomings in financial planning. Some further inconsistencies between different parts of the document, probably written by separate taskforces, will also be discussed in section 4.2 of this report.

#### **4.1.5. European Semester report and Country-Specific Recommendations**

The country report prepared by the European Commission in the course of the European Semester 2016 highlights the “fairly strong deterioration in innovation activities by SMEs” despite overall increases in BERD, and points to

the “weak performance in patents and other innovation indicators” and lack of improvements in “the quality of scientific activities in Poland” (EC, 2016e: 26). It also commented positively on the introduction of R&D tax incentives in 2016, albeit stating that their effectiveness will depend on the implementation, particularly in the case of young SMEs, especially due to lack of cash refunds or the limited ability to carry forward the unused reductions (EC, 2016e: 28).

Poland’s National Reform Programme prepared in response to the country report included an extensive chapter describing the implemented and planned changes (RM, 2016: 24-35), mostly overlapping with the presentation in previous sections of this report. Among others, it outlined plans for 2016, including: legal amendments related to R&D tax incentives and preparation of the “White Paper on Innovations” (RM, 2016: 27). It also presented a timeline leading to the elaboration of another, “large act on innovation” in the last quarter of 2016, based on the White Paper (RM, 2016: 27), but the deadline is unlikely to be met due to the delays in preparation of the Paper. When presenting the planned programme “#StartInPoland”, the document stated that it would “allow the start-ups to develop based on the needs of state-owned enterprises” (RM, 2016: 27) and result in wider opening of state-owned enterprises to innovations, including through elevating the topics to the level of the management board (RM, 2016: 27). Regrettably, nothing was written about the market dynamics, cycles of start-up development, phasing out from the corporate venture investments or global ambitions of the young technology-based companies. The focus seems to be put on the use of intellectual resources and human capital of start-ups to enrich the product or service portfolios of the largest state-owned enterprises, in response to their specific needs. The initiative seems to be a way of supporting the largest incumbent enterprises rather than innovative start-ups, and the partnership modalities could actually restrict the growth and expansion of the ambitious young companies. This approach contradicts the free-market entrepreneurial attitudes of the venture capital community, and would contribute to the expansion of state control over emerging technological areas. At the same time, the programme might reinvigorate the state-owned giants, which remain key economic actors in terms of employment, revenues and economic outputs, but still underperform in research and innovation, and often suffer from dysfunctionalities of organisational cultures, so tangible benefits could be expected in the Polish R&I system.

Country Specific Recommendations of the Council concerning the National Reform Programme of Poland from 2016 included no recommendations in the R&I policy area, although CSR-2 points among others to the need of “improving the labour market-relevance of education and training” (CEU, 2016: 9). The document stated that relevant recommendations from earlier CSR cycles had been addressed by Poland in the programming of ESIF (CEU, 2016: 4). It also

commented on the “low average standing of Polish higher education and science”, with a limited degree of internationalisation (both in terms of incoming foreign students and international research collaboration) and financing model that does not sufficiently incentivize quality (CEU, 2016: 6).

## 4.2. National and Regional Smart Specialisation Strategies

The list of national smart specialisations (KIS, pl. *Krajowe Inteligentne Specjalizacje*) was identified through a consultative process, using also inputs from two nation-wide foresights of scientific research directions (2006–2009) and industrial technologies (2011–2012), as well as quantitative data on patents and R&D activities. The processes met the requirements of the ex-ante conditionalities defined in ESIF-related regulations and their detailed description can be found in RIO country report for Poland, 2015 (Klincewicz and Szkuta, 2016: 34–36). KIS includes an overwhelming number of 20 specialisations, covering majority of possible R&D areas (with some notable exceptions: enterprise software and aviation technologies, the absence of which is difficult to understand as both are actually strong areas for Polish companies). KIS is used as the basis for project funding eligibility in multiple measures based on ESIF (particularly in POIR), but also in some nationally-funded schemes, e.g. in the programme of funding for R&I related to environmental technologies “*SOKÓŁ*”.

Each of the 16 regions defined their own regional smart specialisations (RIS) and use them as the basis for distributing R&I-related funding from Regional Operational Programmes (RPOs). The level of detail of RIS differs across regions, with some specialisations being very broad or not directly related to R&I. The regional efforts related to RIS were evaluated and supported by dedicated consulting services offered by the World Bank (Piatkowski et al., 2014). Regional governments and other stakeholders were usually very careful to avoid potential technological lock-ins as R&I projects funded from RPOs need to comply with RIS for a given region.

KIS is further being elaborated by 20 thematic taskforces, consisting of broad stakeholder representation, including both scientists and representatives of companies. The taskforces regularly update the detailed contents of technologies and research areas linked to each of the 20 specialisations, with a new version of KIS released in July 2016 (MR, 2016a). The lists became very broad and interested stakeholders seemed to have ensured the coverage of all R&I topics that could be relevant in their future activities, as KIS influences the project eligibility criteria. Ongoing efforts by scientists and NGOs could also lead to the establishment of another specialisation, related to humanities and social sciences, but so far, KIS includes only R&D directions that have



direct industrial applications. MR worked with the World Bank commissioned to evaluate the national smart specialisations, but the project didn't actually involve methodologically-sound evaluation, focusing rather on exploration of business activities of companies from selected regions, and the findings turned out to be non-conclusive with respect to the evaluation of KIS, neither were they made public by the government.

Despite the existence of KIS, there are also other lists of prioritised R&I themes: National Research Programme (KPB) (RM, 2011), sectoral programmes of NCBR, strategic programmes of NCBR, lists of sectors selected by MR for export promotion, key innovation clusters and preferred FDI areas. These lists are not entirely overlapping, and these diverging priorities might be confusing for R&I performers.

In 2016, the framework was further complicated by the introduction of RANBs – Regional Science and Research Agendas (pl. *Regionalne Agendy Naukowo-Badawcze*) (see also: description in section 4.1.2 of this report). This list of R&I specialisations was created internally by NCBR, based on submissions from 16 regions and is used in distributing funding to science-industry consortia for R&D projects based on POIR 4.1.2. Regional governments were asked by NCBR to identify the most relevant specialisations from their RIS documents that should be supported nation-wide. Subsequently, the submissions were compared with the contents of KIS and a list of 26 specialisations (called RANBs) was defined (NCBR, 2016d). Some of RANBs are not consistent with KIS and some regions might be surprised by creative re-interpretations of their submissions. Originally, POIR 4.1.2 was supposed to contribute to cross-regional R&I cooperation, ensuring that RIS-based funding complements the national, KIS-based initiatives, but the resultant scheme does not incentivize cross-regional collaboration, and complicates the policy mix by adding yet another thematic list that beneficiaries need to analyse before submitting their project application. It is unclear how RANBs translate into strengthening the competitiveness of selected industries, and relevant stakeholders were not invited by NCBR to comment on the RANBs' accuracy or relevance (while both KIS and RIS were defined and are further improved through entrepreneurial discovery processes).

The government has identified the excessive number of specialisations on both national and regional levels as a problem, reducing the economic impact of ESIF-based R&I funding, and heads of both MNiSW and MR referred to the need for focus and simplification in their public speeches and press interviews. The expected way of addressing the correctly diagnosed challenge was the Strategy for Responsible Development (SOR), but the draft document presented for stakeholder consultations in July 2016 fails to thoroughly respond to the identified problem (see also: section 4.1.4 of this report). When discussing the effectiveness of ESIF in Poland, the document points to the excessive number of

smart specialisations and their too broad definition as the core problem related to the absorption of R&I allocations (MR, 2016e: 134).

SOR divides KIS into two groups of specialisations by singling out 8 out of 20 KIS specialisations as “fast-track programmes” (pl. *programy pierwszej prędkości*) (MR, 2016e: 68). The authors of SOR argue that the selection was based on “the scale of interest of POIR stakeholders”, even though “the early implementation stage of activities in the framework of the financial perspective 2014–2020 does not allow to formulate a comprehensive diagnosis to support a more concentrated selection of priorities” (MR, 2016e: 67). The selected 8 specialisations are still relatively broad (medical engineering and biotechnologies for medicine; manufacturing of medical products, including pharmaceuticals; technologies, processes and products for agri-food, forestry and wood processing sectors; energy generation, storage and distribution technologies; smart and energy-efficient construction; environmentally-friendly transport; advanced materials and composites, including nanotechnologies; automation and robotics in technological processes) (MR, 2016e: 68). They are supposed to be addressed by dedicated, more focused R&I funding programmes in the future.

The same draft Strategy includes however a multiplicity of other, indicative thematic directions. It identifies 10 strategic sectors that “have the potential to become future engines of the Polish economy” (MR, 2016e: 49), stating that their list is not finalised yet, and “it will be regularly updated in the process of entrepreneurial discovery” (MR, 2016e: 49). The strategic sectors are: means of public transportation (including electric buses, railway carriages and ships); industrial electronics; specialised software (including for the financial sector, automation of machines and buildings, cyber-security and video games); aviation and space sectors (including unmanned aerial vehicles); medical devices, therapeutics, telemedicine and biopharmaceuticals; mining technologies; recycling of materials; eco-construction (including passive buildings and energy management); high-quality food; military systems (MR, 2016e: 49). The list seems to capture the existing strengths and focus areas of the Polish industry in ways better than the almost all-encompassing list of KIS, but relations between both lists are unclear.

Apart from the shortened version of KIS and selected strategic sectors, SOR also identifies six horizontal technologies that would be supported by dedicated programmes of NCBR and the National Institute of Technology: nanotechnologies; advanced materials; bio-economy; sensors and robotics; artificial intelligence, machine learning and big data; Internet of things (MR, 2016e: 50). Furthermore, the draft Strategy refers to numerous “flagship projects” that would use disruptive technologies to generate major economic impacts (MR, 2016e: 56). The envisaged projects include: development of passenger ferries, drones, rail vehicles, electric buses, electric cars, telemedicine, biotechnology, medical technologies, eco-

buildings and “smart” mine (MR, 2016e: 58). It identifies 12 industry sectors that are prioritised for export promotion, and the list is different from KIS and strategic sectors (MR, 2016e: 108). SOR foresees also a number of high-level policy documents to be prepared, including: the Low-Emission Development Strategy, the Roadmap towards Circular Economy (MR, 2016e: 57), the National Space Strategy (MR, 2016e: 73), the Programme of the Integrated Digitalisation of the State (MR, 2016e: 200) and the National Arms Policy (MR, 2016e: 278), all of which are expected to also influence R&I policies. It is uncertain whether these sectoral policies will be sufficiently integrated with the R&I directions and nation-wide smart specialisations. SOR also declares the intent to develop “New industrial policy” centred around the previously-described strategic sectors (MR, 2016e: 57). Moreover, the Strategy announced the plan to establish the Polish Platform “Industry 4.0” (MR, 2016e: 60) to better coordinate the R&I activities related to this emerging area. The multiplicity of incommensurable approaches to prioritisation in the draft Strategy for Responsible Development is worrisome and the draft document looks like a yet insufficiently structured compilation of inputs coming from different sectoral ministries or stakeholders. However, SOR also clearly states that KIS and RIS will be narrowed-down from the current lists to increase the effectiveness of public R&I investments by focusing on industries with the highest value added, important for the future of the national economy (MR, 2016e: 165). This will be done through a strategic programme “Prioritisation of KIS and RIS” that would “cluster technologies around nationally strategic industries and flagship projects” (MR, 2016e: 167).

KIS and RIS monitoring mechanisms are not yet fully established. MR commissioned also the World Bank to carry out a complex evaluation of KIS, as described in the earlier part of this section. The Ministry established in 2015 the Economic Observatory (pl. *Obserwatorium Gospodarcze*) involving representatives of industry to monitor effects of the KIS implementation and identify emerging specialisations (MG, 2015b), but no tangible outcomes of the work of this taskforce could be identified. In a similar manner thematic teams established for each of the 20 KIS specialisations are also tasked with monitoring and proposals for corrective actions in their respective focus areas (MG, 2015a). The draft Strategy for Responsible Development discusses the needs for better monitoring of KIS and RIS implementation, and the planned actions include the establishment of consultative groups involving both regional and national level actors and standardisation of data collection procedures and evaluation methods (MR, 2016e: 167). Already in 2014, the government received outcomes of a commissioned study, presenting practical options for monitoring and evaluation of smart specialisations on both national and regional levels (Pander et al., 2014), but it is uncertain whether and how these proposals were used by policy-makers.

### 4.3. Stakeholders' initiatives

Polish R&I stakeholders are active in putting forward reform proposals, preparing white papers and launching other initiatives, intended to influence the policy processes.

The “Coalition for Polish Innovations” (pl. *Koalicja na rzecz Polskich Innowacji*) was formed in 2015 by stakeholders representing industry (including the employer’s association “Lewiatan”), government agencies (NCBR) and non-governmental organisations (FNP). The Coalition actively engages in public consultations of legal regulations (see e.g.: Fundacja KPI, 2016) and promotes good practices in R&I.

The “Startup Poland” Foundation is the community voice of the Polish new technology-based companies (Startup Poland, 2014). It has proved very influential in raising awareness of the potential of Polish start-ups among policy makers, e.g. organised presentations of the best start-ups in the Presidential Palace in 2016. In 2015, the organisation published a report presenting results of the first national-wide survey of start-up companies (Skala et al., 2015). It also actively comments proposed legal acts or amendments to relevant regulations (see e.g.: Startup Poland, 2016).

The association “Top 500 Innovators” (pl. *Stowarzyszenie Top 500 Innovators*) assembles the alumni of a support measure “the Top 500 Innovators: Science – Management – Commercialization”, implemented by the Ministry of Science and Higher Education between 2013 and 2015 (see also: section 3.2 of this report). 500 young scientists and research administrators, who were sent to attend intensive technology transfer trainings at the leading entrepreneurial universities in the US and the UK, used the established network of contacts to form an association, which represents the young generation of scientists and academic entrepreneurs, interested in commercialisation of R&D results and industry co-operation. The association participates in legislative processes, and a good example of their impact were the legal opinions concerning the proposed amendments to the public procurement regulations, taken into account by the policy makers.

In 2015, the representatives of several academic technology transfer centres established a cooperation agreement (pl. *Porozumienie Akademickich Centrów Transferu Technologii*). The collaborative platform represents interests of academic organisations involved in knowledge transfer and industry co-operation. As of August 2016, it had 30 members, with more organisations planning to join.

Other relevant stakeholder organisations, which have been engaged in the R&I system for many years, include: the Conference of Rectors of Academic Schools in Poland (KRASP, pl. *Konferencja Rektorów Akademickich Szkół Polskich*), the Conference of Rectors of Polish Universities of Technology (KRPUT, pl.

*Konferencja Rektorów Polskich Uczelni Technicznych*), the Main Council of the Research Institutes (RGIB, pl. *Rada Główna Instytutów Badawczych*) and the Main Council of the Science and Higher Education (RGNiSW, pl. *Rada Główna Nauki i Szkolnictwa Wyższego*). These bodies include the elected representatives of HEIs and PROs, engaging in regular dialogues with the government, commenting legal proposals and offering insights into the public science budget. There are also two important grassroot movements of academic employees: the Citizens of Academia (pl. *Obywatele Nauki*) and the Crisis Committee of the Polish Humanities (pl. *Komitet Kryzysowy Polskiej Humanistyki*), often presenting views different from the rector's conferences or official management of HEIs and PROs, and more focused on the rights and working conditions of individual scientists. Representatives of public science organisations are also working in taskforces preparing proposals for the new Act on Higher Education, based on the consultative process launched by MNiSW (see more: section 4.1.3 of this report).

Business enterprises have multiple representative organisations, including employer associations (with one of them – “Lewiatan” – particularly frequently engaging in outreach activities related to R&I), clusters (see also: section 2.4 of this report) and sectoral associations. NCBR stimulated the formation of sectoral interest groups by launching dedicated R&D funding schemes (so-called sectoral programmes) based on research agendas jointly prepared by such representative bodies.

There are also several white papers published by various groups of stakeholders concerning innovation and entrepreneurship. In April 2015, the Citizens of Academia published their “Pact for Science” (pl. *Pakt dla Nauki*), outlining a comprehensive reform proposal for the scientific sector. In January 2016, a group of entrepreneurs from the initiative “Mission POLAND” (pl. *Misja POLSKA*) published the “White Paper on Entrepreneurs Postulates” (pl. *Biała Księga Postulatów Przedsiębiorców*) (Romański, 2016) with 15 specific proposals intended to improve the business environment and to boost the entrepreneurship. Another important document was “The White Paper ‘Stop the bureaucratism!’” (pl. “*Biała Księga „Stop biurokracyzmowi!”*”), developed in March 2016 as a deliverable of the 3<sup>rd</sup> Polish Economic Congress, organised by the oldest and largest industry representation, the Employers of Poland (pl. *Pracodawcy Rzeczypospolitej Polskiej*). Its recommendations concern the development of innovative sector, public procurement, changes to the tax regime and the legislative procedures (Pracodawcy RP, 2016).

The Civic Legislative Forum (pl. *Obywatelskie Forum Legislacji*) founded in 2009 by the Stefan Batory Foundation (pl. *Fundacja im. Stefana Batorego*) monitors the legislative processes in Poland, especially their transparency, and publishes detailed reports concerning selected legal acts (Fundacja Batorego,

2016). In December 2015, the Forum expressed concerns that not all legislative processes are conducted with the due participation of all interested stakeholders and made an appeal to the government and the ruling party to deliver on its relevant election promises. The Forum suggested that the politicians excessively rely on fast-track legislative procedures initiated by members of the Parliament instead of the government, which do not require legislative impact assessments and stakeholder consultations, obligatory only for legal initiatives put forward by the government (Obywatelskie Forum Legislacji, 2015). This seems to be an important problem, since the legal acts amended without public consultations included, among others, important regulations concerning the criminal law, environmental law and healthcare regulations. The amendment to the Act on Research Institutes, introduced in 2016, was also proceeded based on the fast-track procedure, but all other R&I-related legislations in 2016 were subject to extensive stakeholder consultations and accompanied by the obligatory impact assessments (see more: section 4.1.3 of this report).

#### **4.4. Monitoring and evaluation culture**

Poland has traditionally arranged regular evaluations of programmes and support measures, and this policy consulting area contributed to the development of numerous specialist SMEs. A series of evaluation reports was used to support the preparation of the 2014–2020 operational programmes, including POIR and RPO in 2014 and 2015. Details of these evaluation projects can be found in the 2015 RIO report (Kliniewicz and Szkuta, 2016: 29–30; 131–133). For the new financial perspective, detailed evaluation framework was prepared in 2015 by the Ministry of Infrastructure Development, including: standardised modalities for evaluations (MIR, 2015a) and plans for evaluating each of the operational programmes, including POIR (MR, 2016c), POWER (MR, 2016d), POPW (MIR, 2015b) and the Regional Operational Programmes. The evaluation plans indicate timeframes, preliminary evaluation questions and expected research methods for each individual support measure or groups of measures, as well as clear institutional roles in each planned evaluation project, thus ensuring better coordination and advance preparation of these efforts. This approach might eliminate some of the deficiencies of the past evaluations, namely: unclear selection of evaluation methodologies for specific projects, excessive number of evaluations concerning similar topics, and accumulation in time of many evaluations discouraging participants and preventing policy-makers from a thorough analysis of the findings.

Funding agencies PARP, NCBR and NCN regularly collect and analyse statistical data about beneficiaries and project applicant, and launch evaluation

projects related to individual support measures or programmes, in line with the above-mentioned evaluation plans. In addition, PARP carries out ongoing evaluations of “Barometer of innovativeness” and “Barometer of innovativeness of Eastern Poland” through annual surveys of panels of business enterprises, analysing broader economic and societal impacts of the public aid and other relevant topics. The Foundation for Polish Science (FNP) published results of bibliometric analysis of publications by scientists, who benefited from its grant programmes (CWTS, 2016). The National Contact Point for EU Research Programmes regularly publishes reports presenting statistical data about participation of Polish organisations in H2020 (KPK, 2016). Information about all evaluation projects carried out on national and regional level, alongside links to the published reports, are maintained in a central database (MIR, 2015a). Another good practice example is the regular publication of spreadsheets with detailed data about all projects funded from ESIF, from both the national and regional levels (MR, 2016b). The spreadsheet includes project names, summaries, names of beneficiary organisations and allocated budgets. This had greatly increased the transparency of ESIF funding, particularly as in the past, some lists of beneficiaries were not publicly available and descriptions of projects were treated as confidential information.

In the Polish R&I system, the Supreme Audit Chamber (NIK) plays also an increasingly important role through regular, specialist audits of topics relevant to the innovation and science policies. Findings from the recent audits were discussed in section 4.1.1 of this report (see also: NIK, 2015; NIK, 2016a; NIK, 2016b; NIK, 2016c; NIK, 2016d; NIK, 2016e). Regular monitoring of R&D-related variables is ensured by the Central Statistical Office (GUS), through annual surveys of R&D expenditures and R&D personnel, as well as the national implementation of the Community Innovation Survey. An online system STRATEG (<http://strateg.stat.gov.pl/>) maintained by GUS presents key data related to specific national policies, including R&I. Monitoring of the R&I policies is also strengthened by the financial reporting practices of MNiSW. The Ministry published a detailed report of the science budget from 2015, clearly differentiating the national and ESIF-based funding, accounting for each decisions amending the budget or transferring funds between budgetary categories, and linking individual funding categories to specific activities and results (MNiSW, 2016j). The quality of financial reporting at MNiSW was significantly improved compared with previous years, and the increased transparency and level of detail of the report help monitor the directions and implementation status of R&I policies. MNiSW maintains also extensive ICT systems, used for monitoring tendencies in higher education and science sector, including data about: students at each HEI, scientists employed at HEIs and PROs, peer-reviewed publications

with Polish affiliations, citations of Polish publications, research infrastructures at HEIs and PROs as well as awarded scientific titles and degrees.

A notable deficiency of the Polish R&I monitoring system is very limited use of modelling to support policy-making processes. No econometric models are used on a regular basis by government-related organisations to analyse the broader impacts of R&I policy mix. Impact analysis documents (pl. *ocena skutków regulacji*), which should accompany any legislative proposal submitted by the government, have weak quantitative foundations, for example the recent analysis justifying the need to increase the scale of R&D tax incentives only included rough estimates of budgetary implications unsupported by any methodologically sound analyses (MNiSW, 2016b), and the critical response coming from the Ministry of Finance wasn't either based on strong empirical evidence or econometric modelling of anticipated impacts (MF, 2016b).



# 5

## Creating and stimulating markets

### 5.1. Demand driven innovation

The Polish public procurement market in 2015 was worth 116.3b PLN (€27.8b), which was 16.9b PLN (€4.04b) less than in 2014 (UZP, 2016: 7). The value of the public procurement market accounted for approximately 6.5% of Poland's GDP in 2015 (UZP, 2016: 27). The amendments to the Act on Public Procurement introduced in 2014 encouraged a broader use of qualitative criteria in tenders, and the price was no longer used as the only criterion for awarding public procurement contracts. In 2014, in around 80% of tenders, price was the only criterion, whereas in 2015 only in around 12% (UZP, 2016: 7). Unfortunately, this does not necessarily mean that there were substantial improvements in the quality of selection procedures.

In 2016, there were additional amendments to the Act on Public Procurement. One of their main purposes was to implement the EU Directives: 2014/24/UE and 2014/25/UE. The deadline for the implementation was set for April 2016, which means that the Polish legislator adopted the amendments three months late. The introduced changes include: the concept of in-house procurement, the use of Internet as a recognised communication channel in public procurement, the introduction of the European Single Procurement Document, changes in the negotiated procurement procedures, changes in the contract award criteria, changes aiming at improving access of SMEs to public procurement and the introduction of innovation partnerships. The vast majority of new provisions came into force within 14 days of their publication but the full tenders' digitalisation will be binding from October 2018.

As of 2016, apart from the Act on Public Procurement, there are several policy documents affecting public procurement and innovation. Poland has a formal action plan related to Sustainable Public Procurement, which includes the Green Public Procurement. The planned activities focus mainly on sharing information and promotion, and do not include any specific procurement targets. The Plan for Responsible Development (pl. *Plan na rzecz Odpowiedzialnego Rozwoju*) released in February 2016 includes priorities for smart public procurement

(pl. *inteligentne zamówienia publiczne*) (aimed at creating demand for innovative products and services), introduces the concept of the state being the lead user (MR, 2016i: 56) and promotes the idea of procurement policies supporting the economic growth (MR, 2016i: 66). Moreover, the draft Strategy for Responsible Development (MR, 2016e) contains, among others, information about smart public procurement and possible attempts to use public procurement for the promotion of innovative and sustainable products and services (MR, 2016e: 49, 54, 60–61). Stimulating demand for innovation by the public sector is mentioned as one of the aims of public interventions (e.g. the Electromobility programme, pl. *Ekomobilność*, aimed at stimulating the design and manufacture of Polish electric vehicles). Planned corresponding actions include public procurement for innovation (PPI) and pre-commercial procurement (PCP) (MR, 2016e: 74).

There are also initiatives regarding pre-commercial procurement launched at the regional level. For example, the Regional Innovation Strategy of the Lubelskie Voivodeship 2020 (pl. *Regionalna Strategia Innowacji Województwa Lubelskiego do 2020 roku*) published in 2014 (Urząd Marszałkowski Województwa Lubelskiego, 2014: 54–55) and the Regional Innovation Strategy of the Kujawsko-Pomorskie Voivodeship 2014–2020 (pl. *Regionalna Strategia Innowacji Województwa Kujawsko-Pomorskiego na lata 2014–2020*), published in 2015 (Zarząd Województwa Kujawsko-Pomorskiego, 2015: 62–63), both assume the implementation of pre-commercial procurement.

Several information and promotion actions on the topic of demand driven innovations have been carried out by the Polish Agency for Enterprise Development, the Ministry of Economy, the Public Procurement Office (UZP, pl. *Urząd Zamówień Publicznych*) and the Marshal offices in regions. For example, on April 15<sup>th</sup>, 2016 the Marshal Office of Kujawsko-Pomorskie region organised a meeting with the representatives of NCBR, PARP and UZP concerning PCP (KPAI, 2016). On June 30<sup>th</sup>, 2016 a conference on the topic of amendments to the Act on Public Procurement took place at the Ministry of Economic Development (PARP, 2016i). The Polish Agency for Enterprise Development offers nation-wide series of training and consulting initiatives in the field of public procurement under the operational programme POWER, measure 2.2, co-financed by the EU, intended to improve the quality of public procurement procedures (PARP, 2016g).

Nevertheless, the use of PCP and PPI is still limited in Poland. There are only few examples of such activities and are usually associated with the implementation of projects funded by the European Commission, in which the Polish entities were partners. Public procurement for innovation carried out by the hospital in Rawicz (2012) under the project LCB-Healthcare and the hospital in Sucha Beskidzka (2014) under the project EcoQUIP seem to be pioneering in the country. The first case concerned the development of innovative hospital

uniforms. Implementation of the project included, among others, the following steps: collecting information from the users, developing specifications, setting the tender evaluation criteria and testing phase (LCB-Healthcare, 2012). The aim of the second one was to develop cost-effective and low-carbon solutions to maintain thermal comfort of patients. The project included market research, technical dialogue and a procurement procedure, which was concluded in February 2015 (EcoQUIP, 2015; Zespół Opieki Zdrowotnej w Suchej Beskidzkiej, 2015: 4).

In July 2013, NCBR launched a pilot PCP project, with a budget of about €12m (50m PLN), opening a call for proposals addressing potential social needs and challenges that could be achieved by carrying out the process of pre-commercial procurement (NCBR, 2013). NCBR received only few proposals and it never run the PCP competition based on the reported needs (Kardas, 2017). In July 2016, NCBR launched a call for proposals under measure 3.3 of the Operational Programme “Digital Poland” named “e-Pionier”, which was meant to be based on the PCP formula. The objective of the programme is to support the creation of new ICT solutions based on needs identified by selected public organisations (see more information in section 1.2.3). The 1<sup>st</sup> “e-Pionier” competition budget amounted to 50m PLN (€11.95m) and the total planned budget is approximately 100m PLN (€23.9m) till 2020 (NCBR, 2016e). Unfortunately, NCBR decided to implement the measure as grants nor PCP due to anticipated legal difficulties.

Other important examples of innovative procurement can be observed in the defence and health care sectors. NCBR coordinates a large pre-competitive procurement-type military R&D programme. Calls for proposals address specific needs, defined by the military organisations, and concentrate on related research areas. The objectives of this programme include the development of domestic R&I performers in terms of their know-how related to technologies critical for national defence and security. A specific form of public procurement is present also in healthcare. The Polish health care system allows to subsidise selected drugs and medical equipment. The main purpose of such actions is to lower their costs to patients and health care institutions. However, it also supports local enterprises by stimulating the demand for products made in Poland. As a result, many companies developed ‘blockbuster drugs’ counterparts, synthesized in alternative ways, which were later patented and exported (e.g. Polpharma, Adamed). Moreover, the launch of governmental initiative “National Cancer Prevention Programme” stimulated the development of local radiopharmaceutical companies and laboratories (Klincewicz, 2015a: 54–56).

Even though the support for PCP and PPI has been repeatedly reaffirmed in governmental documents, these few examples suggest that by 2016, public procurement has rarely been used in Poland to support innovation.

## 5.2. Regulations and standards

Until 2016, Poland did not take any systematic actions aimed at assessing the impact of regulation on innovation. Legal acts that may influence innovation undergo the same formally required impact analysis as all other legal acts. In May 2015, the Council of Ministers adopted the “Guidelines for impact assessment and public consultation on the government’s legislative process” (pl. *Wytyczne do przeprowadzania oceny wpływu i konsultacji publicznych w ramach rządowego procesu legislacyjnego*), which replaced the impact analysis standards from 2006 (MG, 2006) and two documents on public consultation from 2009 and 2012 (MG, 2009; MAC, 2012). The new document presents the regulatory impact assessment, discusses the cases when it is compulsory, recommends and instructs how to perform it alongside the public consultation process (MG, KPRM, 2015: 7–8). Unfortunately, it doesn’t include any specific information about assessing the impact of regulation on innovation, even though this aspect used to be mentioned as a part of impact assessment on competitiveness and entrepreneurship before (MG, 2006: 31–32). Moreover, in 2006 PARP was authorised by the Ministry of Economy to analyse new regulations’ impact on entrepreneurship and innovativeness (MG, 2006: 25–26), but there is no evidence that such analyses were carried out. The document adopted in 2015 does not include these provisions. It states that there are three types of documents that should be developed while performing the formally required impact analyses (MG, KPRM, 2015: 12–13):

- regulatory test (TR, pl. *Test Regulacyjny*), at the stage of preparing assumptions for the draft of a legal act;
- regulatory impact assessment (OSR, pl. *Ocena Skutków Regulacji*), carried out while a draft of legal act is being prepared;
- legislative health check (OSR *ex post*, pl. *Ocena Funkcjonowania Ustawy*), for legal acts in force.

The release of the document was intended to improve the quality and transparency of the legislative process and to give it a more ordered structure (MG, 2015c: 74–75).

A governmental programme “Better Regulations 2015” (pl. *Lepsze Regulacje 2015*) includes a pilot project carried out by the Polish Agency for Enterprise Development, commissioned by the Ministry of Economy, concerning the implementation of mechanisms for the verification of proposed amendments in legal acts in terms of their impact on small and medium-sized enterprises, so called “SME test” (pl. *test MŚP*) (measure: 6.I.B.4), that should be included in regulatory impact assessment (OSR) (MG, 2013: 25). In 2014, such analysis was conducted three times, with respect to the following draft legal acts: the Act Amending the Act on Special Economic Zones, the Act Amending the Act on

Public-Private Partnership, and the Act on Public Finance and amendments to the Labour Code (MG, 2015c: 75). In 2015, PARP performed other SME tests, with respect to the Act on Electronic Signature (PARP, 2015c) and legal acts concerning income taxes (PARP, 2015b).

In 2015, an online platform [www.konsultacje.gov.pl](http://www.konsultacje.gov.pl) was launched. It is a pilot online consultation system that facilitates the participation of stakeholders in the legislative process. It is intended to help interested stakeholders provide their insights on the impact of drafted regulations on innovation. In June 2016, the Ministry of Economic Development also launched “pre-consultation” of a proposal of new legal corporate form, “the simple corporation” (pl. *prosta spółka akcyjna*). Using an online submission with detailed questions provided by the Ministry, interested stakeholders were able to provide their insights concerning the proposal. Broad stakeholder consultations were also carried out by PARP, which decided to get opinions from stakeholders concerning project selection criteria for each type of support measures under introduction, including ESIF-based measures. This approach was different from the one adopted earlier by NCBR.

The actions undertaken by the Polish government in order to provide better and more comprehensive guidelines to assess the impact of legal regulations do not directly concern innovation and cannot be seen as systematic policy actions related to the assessment of the regulatory impact on innovation. Nevertheless, the Ministry of Economic Development declares that the amendments to the key legal acts affecting innovativeness will include changes regarding regulatory impact assessment (OSR) concerning the addition of the new section, and thus would enable to assess the impact of regulation on the innovativeness of the economy (more information in section 4.1.3) (MR, 2016j). Moreover, the draft Strategy for Responsible Development (SOR) includes measures intended to strengthen the legal and institutional environment for innovative enterprises. Among planned strategic projects, there is an “Innovation Test”, testing the usefulness and effectiveness of analytical tools used to prepare regulatory impact assessment and implementing relevant standards to verify the impact of existing and future regulations on the innovativeness of enterprises (MR, 2016e: 70–71).

Regulations and standards can be seen as an important determinant of innovation. In Poland, it is possible to point out several sectors where new regulations or standardisation influenced innovation in various ways. There are many examples in power engineering (BMP, 2016; EY, 2016), environmental protection (Lewandowska, 2015; Mazur-Wierzbicka, 2014) and chemical industry (Szczęśniak, 2015), where new regulations led companies to innovate. In 2015, Grupa Azoty Zakłady Azotowe Kędzierzyn S.A. has expanded its product mix with the introduction of Oxoviflex™, the first Polish non-phthalic

plasticizer (Grupa Azoty, 2015). According to the former President of the Management Board, Adam Leszkiewicz, the innovation was the response to the European regulation REACH, which negatively affected the market development opportunities of one of the company's key products – a plasticizer manufactured by its plant in Kędzierzyn-Koźle. Under the pressure of REACH regulation, the company has developed a new, safe plasticizer (Executive Club, 2016). When it comes to opening new markets driven by regulation and standardisation, digitalization seems to be a good example in Poland. A number of key changes in European legislation in this area positively influenced the development of digital resources of the country (including available equipment, systems and networks), e-business (including new communication standards), e-commerce and e-governance (Chaber, 2016; Arak, Bobiński, 2016). The digitalization is, at the same time, a good example of regulation leading to public sector innovation (e.g. in 2015 the launch of a pilot online consultation system, [www.konsultacje.gov.pl](http://www.konsultacje.gov.pl), that facilitates the participation of stakeholders in the legislative process).

### 5.3. Increasing the internationalisation of companies

In 2014, Poland reported an increase in the share of high-technology product exports in total value of exports, compared to 2013 (from 6.7% to 7.9%). The same trend applied to imports of high-technology products in the given period (growing from 10.8 % to 11.3%). The most important field of high-technology export and import is electronics and telecommunication, holding a share of more than 40% of high-tech trade (GUS, 2015c). The share of exports of high technology products in total exports for the entire EU-28 was 15.6% in 2014, i.e. nearly two times higher than in Poland. It shows that there is still room for improvements with regards to Poland's policy supporting foreign trade as a basic form of internationalisation of companies, in particular SMEs.

The promotion of Poland in foreign markets is co-ordinated by several institutions and governmental agencies supervised by the Ministry of Economic Development, i.e. Trade and Investment Promotion Departments of the Embassies and Consulates of the Republic of Poland (WPHI, pl. *Wydziały Promocji Handlu i Inwestycji Ambasad i Konsulatów RP*), the Polish Information and Foreign Investment Agency (PAIiIZ, pl. *Polska Agencja Informacji i Inwestycji Zagranicznych*), the Polish Agency for Enterprise Development and the Investors and Exporters' Service Centres (COIE, pl. *Centra Obsługi Inwestorów i Eksporterów*).

In 2016, the Ministry of Economic Development was working on a new model of Polish export support, which is planned to be ready by the end of

2016. The Export Support Agency (pl. *Agencja Wspierania Eksportu*) will be a key element of this system. The Export Promotion Agency will become a part of the Polish Development Fund launched in April 2016, and will supplant on the potential of Polish Agency for Information and Foreign Investment, which deals mainly with attracting foreign investments into Poland. The new agency will co-ordinate the relevant support measures, trade missions and fairs in order to support internationalisation of Polish companies, in particular to promote Polish exports and Polish investments abroad. It also will be responsible for attracting FDIs to Poland.

The Ministry of Economic Development has four instruments of export promotion, implemented as *de minimis* aid. In the period of 2012–2014 it provided support for 766 enterprises with 5.5m PLN (€1.3m) being the total amount of support (MG, 2015c: 64–65). MR also developed and implemented a catalogue of standard services provided free of charge to Polish entrepreneurs by the Trade and Investment Promotion Departments of the Embassies and Consulates (pl. *Katalog standardowych usług świadczonych nieodpłatnie na rzecz polskich przedsiębiorców przez WPHI*), which includes also contact details to 49 WPHIs located in 44 countries as well as to 15 COIEs located around the country (MG, 2014). The catalogue provides detailed information about the scope of support granted to Polish entrepreneurs in the process of their internationalisation. Moreover, COIE located in Toruń published in 2015 “Exporter’s guide” (pl. *Informator eksportera*), which is available online on Export Promotion Portal run by the Ministry of Economic Development (Wiśniewska, 2015).

The main Polish government agency that provides support for entrepreneurs including internationalisation of firms using state budget and ESIF is the Polish Agency for Enterprise Development (PARP). In the 2014–2020 perspective, PARP is responsible for the implementation of relevant measures under three operational programmes: Smart Growth (POIR, pl. *Program Operacyjny Inteligentny Rozwój*) (budget: €1.94b), Eastern Poland (POPW, pl. *Program Operacyjny Polska Wschodnia*) (budget: €1.64b) and Knowledge Education Development (POWER, pl. *Program Operacyjny Wiedza Edukacja Rozwój*) (budget: €90b) (Wojtaszek, 2016: 3). The measures of these programmes that support the internationalisation of companies include, among others, internationalisation of Key National Clusters, Polish tech-bridges and support for SMEs in the promotion of Polish product brands (MR, 2016f; PARP, 2016d). Various Regional Operational Programmes (RPOs, pl. *Regionalne Programy Operacyjne*) also include various measures supporting the internationalization of companies.

PARP also coordinates operations of 30 Polish centres that are members of the Enterprise Europe Network (EEN), the world’s largest network supporting

the internationalisation of SMEs. The network is funded in the 2014–2020 perspective under the EU programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME) (PARP, 2016e, 2016f). In 2014, nearly 16k enterprises benefited from services provided by the EEN centres in Poland and there were over 1,4 million recipients of promotional activities (MG, 2015c: 50).

GO\_GLOBAL.PL is another support measure that aims to support the internationalisation of innovative Polish SMEs. The pilot project was launched by NCBR in 2012 (NCBR, 2016f). In 2016, there was a second call for proposals, wherein 32 innovative enterprises received support for the commercialisation of their solutions on foreign markets through NCBR's strategic partners – technology accelerators in key international locations.

Apart from foreign trade, internationalisation of the Polish economy can be increased through Foreign Direct Investments (FDIs). In the period of 2010–2014, there have been significant swings in both FDI inflows and outflows in Poland. According to the National Bank of Poland (NBP, pl. *Narodowy Bank Polski*) data, in the 2015 FDI inflow amounted to €12,138m (compared to €14,256.1m in 2011). The outflow of Polish capital abroad stood at €2,897,7m in 2015 and was lower than in 2011 (€5,866.5m) (NBP, 2016a; NBP, 2016b).

Poland attracts foreign investors thanks to the quality of human capital, wide availability of skilled engineers and competitive labour costs. For a small number of foreign investors, the government also offers dedicated public aid through bilateral agreements that list obligations related among others to the volumes of invested funds and numbers of established workplaces (awarded under the “Programme for the support of investments of considerable importance for Polish economy for years 2011–2020”). The process of negotiating such agreements raises the transaction costs of investors, tends to be time-consuming and available only to a limited number of large projects. By the end of 2015, 64 agreements with investors were in place (RM, 2016: 26).

Looking at the macroeconomic data, both the flows and the stocks of foreign direct investments in Poland appear substantial, also in comparison with other countries in the region (UNCTAD, 2016), but the structure of FDIs might be less beneficial for the Polish economy. Majority of FDI projects are related to manufacturing and service operations, not R&D activities. They create jobs – including knowledge-intensive jobs in the shared service centres of multinational corporations or Business Process Outsourcing providers – but do not increase the country's technological capabilities or contribute to the development of sustainable competitive advantages. Owing to the limited attractiveness of R&D tax incentives, investors looking for new R&D centre locations are more likely to consider other Central and Eastern European countries, which attract them by R&D-friendly taxation schemes. The majority of projects



overseen in 2015 by the government agency in charge of FDIs, PAIIZ, were related to R&D, but their investment volumes were substantially lower than for manufacturing-related projects from the same period (PAIIZ, 2015; Chojnowska-Haponik, 2015: 5).

Some of the large beneficiaries of the R&D funding offered by NCBR based on POIR 1.1.1 (“fast track” – R&D funding) and POIR 1.2.1 (technology demonstrations) were multinational enterprises, often applying for projects with substantially higher budgets than their domestic counterparts. For example, General Electric Company benefited from the largest grant R&D awarded so far from POIR 1.1.1 (31.4m PLN, €7.5m) (NCBR, 2015a). In addition, funding modalities in POIR calls motivate the beneficiaries to conclude projects by implementing R&D results, but were indifferent to various possible forms of implementation so that one could envisage a scenario, in which the local economy would not derive any benefits from the R&D project, as R&D results could be internally transferred to foreign subsidiaries of the same corporation to confirm their “implementation”. In a similar manner, local beneficiaries of POIR funding could also successfully “commercialise” technologies developed in publicly co-funded R&D projects by transferring their ownership to foreign firms. POIR funding modalities did not explicitly exclude cases when such a transfer constitutes a case of disguised contract research, with a large foreign company detailing specific R&D requirements to its Polish partner, who subsequently submits a project application funded from POIR and benefits from higher intensity of public aid, “returning” the results of the successfully completed project to the foreign contractor. Interestingly, the local company engaged in such activities was allowed to subcontract up works corresponding to up to 50% of the project budget to third parties (NCBR, 2015c: 7), thus being able to formalise the cooperation with their foreign patron and share with him parts of the funding. Regrettably, the R&D funding system based on POIR introduced in 2015 did not foresee provisions that would prevent such types of project-related fraud, and fast-track evaluations of project proposals did not offer opportunities for extensive ethical checks.

As far as attracting FDIs to Poland is concerned, the Polish government is focused on incentivising R&D-oriented FDIs through grants, tax incentives and outreach activities provided by the dedicated agency PAIIZ, which priority focuses on greenfield projects. Public policies do not directly regulate brownfield investments and acquisitions by foreign firms, which remain regulated by market forces. Foreign investors with projects of high potential that could make substantial contribution towards the development of the national economy and increase its competitive edge can benefit from government grants under the “Programme for supporting investments of major importance to the Polish economy for years 2011-2020”. They can also establish operations in various

Special Economic Zones and benefit from state aid in the form of income tax exemptions.

The Polish Information and Foreign Investment Agency (PAIiIZ) helps investors to enter the Polish market. As of August 2016, PAIiIZ successfully completed 36 foreign investment projects in 2016 with a total value of over €396k and concerning over 7,500 new workplaces. Apart from attracting FDIs to Poland, PAIiIZ also co-ordinates some initiatives that facilitate promotion of Polish products and services as well as Polish investments abroad. As of 2016, it is engaged in 180 projects worth over €4b and it co-ordinates, among others, the following programmes (PAIiIZ, 2016b):

- “GoChina” – the initiative was launched in 2012. Measures implemented under the project include dissemination of information about the investment and cooperation possibilities with China among Polish entrepreneurs, as well as the presentation of the opportunities to invest in Poland for Chinese entrepreneurs (GoChina, 2016).
- “GoAfrica” – the initiative was launched in 2013. The objective of the project is to increase trade exchange with African countries and to boost Polish investments in Africa. It also aims at building a positive image of Poland across the continent. The project focuses on the largest markets in Africa, such as Angola, Algeria, Nigeria and South Africa, but also supports entrepreneurs interested in business opportunities in other countries of the continent.
- “GoArctic” – the initiative was launched in December 2015. Its objective is to encourage entrepreneurs to invest in countries such as Denmark, Finland, Iceland, Canada, Norway and Sweden. It also aims at helping Polish exporters to benefit from economic opportunities developed by the countries that belong to the Arctic Council (PAIiIZ, 2016a).

In March 2016, the Ministry of Economic Development, PAIiIZ, Business Link Poland and the Foundation Startup Hub Poland signed an agreement allowing start-ups to promote their solutions abroad. PAIiIZ in the promotion programmes in foreign markets plans to target start-ups as a separate group, alongside large companies (MR, 2016h). Moreover, PAIiIZ is getting ready to introduce three new projects to support Polish businesses abroad: “GoIndia”, “GoASEAN” and “GoIran”. Even though many measures implemented or planned concentrate on supporting Polish exporters, there are also some successful ones that were discontinued (e.g. GreenEvo – Green Technology Accelerator supporting environmental technology exporters).

Even though the Polish government has recognised the need to attract R&D-focused FDIs already in 2014, its responses were limited to soft measures (mostly: promotional activities) and the willingness to negotiate dedicated public aid packages for selected, large investors. There were no specific measures

stimulating linkages between foreign enterprises and local companies or scientific organisations, or promoting a better embeddedness of FDIs in the Polish R&I system. The lack of local R&D partnerships across various segments of value chains restricts the innovative potential of FDIs and is also likely to fuel the growing criticism of foreign investors, whose contributions to the development of Polish economy might not be fully recognised or adequately addressed in the political discourse.

# 6

## Conclusions

The Polish R&I system went through major changes in 2016, and the assessment of many important initiatives seems premature. The present chapter will focus on discussing how the multiplicity of policy actions from 2016 addressed the four structural challenges, identified in sections 3.1–3.4 of this report. Three of these innovation challenges were adequately diagnosed by the policy makers, but the responses offered by R&I policy mix remain sub-optimal, with further changes planned for the following year.

**Innovation challenge 1. Increase the intensity of private R&D.** Poland's R&I policies are oriented towards supporting R&D activities of business enterprises. The majority of ESIF-based support measures from POIR are available either for companies or for consortia with the leading role of corporate partners. Starting from 2016, companies can also benefit from R&D tax incentives, which will be increased in 2017 (with higher tax deductions and cash reimbursements for start-ups). Many new sectoral programmes were launched, implementing dedicated research agendas important for specific industry sectors. A promising instrument is also *SOKÓŁ*, offered by the National Fund of Environmental Protection and Water Management, using the Fund's own sources to support a broad range of eco-innovations, both at the stages of R&D and implementation. MNiSW prepares the White Paper on Innovations, setting ground for further legal reforms addressing the private sector innovativeness. The actions taken in 2016 can be expected to trigger proportional increases in BERD, but the growth will be primarily induced by the public co-funding and not necessarily sustainable. At the same time, the R&I policy mix related to business enterprises seems strongly focused on absorption of funding instead of economic or innovative impacts. NCBR's funding schemes induced in 2015 only 22.3% of private co-funding, and many companies consider large R&D projects when government grants are available. Some ESIF support measures that were originally designed as financial instruments or demand-side measures but were offered in 2016 as grants, further disincentivizing the mobilisation of private capital. Despite the introduction of R&D tax incentives, R&D reporting by companies remains problematic, and

the existing tax and accounting regulations might still discourage companies from classifying certain expenditures as costs of R&D, but the problems seem to have been acknowledged by the policy makers (in particular, planning to address it through one of actions outlined in the White Paper on Innovations). Another worrying tendency is the excessive focus on state-owned enterprises, which at present perform particularly poorly in R&I. They have substantial growth potential, but are unlikely to induce major innovative changes in the Polish economy, which is dominated by privately owned firms. One of challenges for the business enterprise sector is the increase in the expansion of the R&I base, encouraging more companies to engage in innovative projects. However, the recent changes to support modalities in key R&D funding instruments (POIR 1.1.1 and POIR 1.1.2) are likely to contribute to the concentration of R&D funding among a smaller number of large enterprises, thus failing to stimulate changes across the Polish industry. Some of important support measures targeting companies experienced introduction delays, with a major VC-oriented scheme BRIDGE VC still not operational, and the state-owned insurance company PZU becoming the implementing agent through its newly established subsidiary Witelo Fund. BRIDGE VC has been under preparation for several years, and has benefited from substantial know-how coming from the leading VC partners from Western countries and Israel. It remains uncertain whether the recent developments would not bring major discontinuities in the scheme, which has substantial ESIF allocations reserved, and was expected to bring about major changes to the way innovative companies are supported, with private capital matching the public funding and experienced VC funds contributing their knowledge of markets and business models.

**Innovation challenge 2. Strengthen the co-operation between science and industry.** Audits by the Supreme Audit Chamber from 2013, 2015 and 2016 suggest very limited effectiveness of the attempts to stimulate the commercialisation of R&D results or formal knowledge transfer activities at HEIs and PROs. It is unclear whether the support measures from 2010–2015 were inadequate, or whether it is too early to evaluate their impacts. At the same time, past actions of the government had detrimental effects for the co-operation through the indecisiveness: during several years, radically different knowledge transfer pathways were promoted and supported by laws and financial measures, either strengthening the HEIs/PROs ownership of IPRs and empowering technology transfer centres, university-owned companies and innovation brokers, or encouraging the institutions to cede the IPRs to scientists, who could directly liaise with corporate partners. The legal and procedural frameworks were confusing, but the implemented support measures certainly had one important, positive outcome: many scientists, particularly from the younger generation,

consider applied R&D and industry co-operation as viable options for their academic careers. Nevertheless, the public science system still disincentivizes such activities, with strong focus on “pure”, non-applied science as understood by many Polish scientists. NCN eliminates all project applications that could offer practical benefits for the industry, and thus fundamental R&D in Poland is not trying to address important societal or economic challenges but merely generate research findings that would be publishable in major international journals. The division between NCN and NCBR, fundamental and applied research, remains a serious chasm in the Polish R&I system, and it is not surprising that NCBR has shifted its focus towards companies in recent years, offering only a small number of measures dedicated for scientists. The current approach of the policy makers involves enforcing science-industry linkages, as many ESIF-based measures offer funding for HEIs/PROs only in collaboration with industrial partners. This could yield positive results by promoting more inter-sectoral dialogue, but many important applied R&D initiatives might be abandoned if no corporate partners are interested in the earlier project stages, and the Polish business enterprises still have relatively limited interest in R&D initiatives. Multiple measures incentivize and enforce the co-operation, including R&D funding schemes (POIR 4.1.4, *SYNChem*, *STRATEGMED*, *BIOSTRATEG*, *TECHMATSTRATEG*), innovation vouchers (POIR 2.3.2), support for research infrastructures only in connection with their commercial uses (*PANDA 2* and POIR 4.2) and measures empowering researchers to work with industry (NCBR’s *LIDER*, FNP’s *TEAM TECH*). Approaches to defence R&D funding have also been improved, with dedicated measures attracting young researchers and Polish scientists working abroad. MNiSW amended the Act on Higher Education, simplifying the knowledge transfer pathways at universities and eliminating major bottlenecks. The Ministry plans a comprehensive reform of research institutes, and further adjustments of legal acts identified in the White Paper on Innovations. The understanding of the importance of effective science-industry co-operation is visible among the R&I policy makers, particularly in MNiSW. At the same time, certain policy actions remain contradictory to these directions, e.g. amendments to the Act on Research Institutes adopted by the Parliament in 2016, forging closer links between some of these institutes and sectoral ministries (while the reforms should rather strengthen their co-operation with industry), or proposals included in the draft Strategy for Responsible Development to enforce the use of open licenses for some of the technologies developed by HEIs and PROs.

**Innovation challenge 3. Increase the quality of the public research base.** The policy makers demonstrated genuine interests in improving the public scientific organisations, albeit with mixed results. Legislative actions led to reductions in administrative burdens for HEIs, and new Act on Higher Education is being

prepared with the involvement of academic stakeholders. NCN introduces new funding schemes, filling certain gaps identified in the R&I system, including funding for more smaller R&D projects by young researchers (*MINIATURA* and *SONATINA*) and networking between Polish scientists and foreign ERC grantees (*UWERTURA*). The establishment of the Office for Scientific Excellence, tasked with the support of ERC candidates, is also a commendable action. The Foundation for Polish Science launched a portfolio of well-designed support measures for top researchers at different career stages (support measures based on POIR 4.4), and NCN plans to imitate ERC's project selection modalities, thus bringing the Polish science closer to the international standards. MNiSW offers generous bonuses for HEIs and PROs benefiting from H2020 funding, supports various bottom-up initiatives aimed at improving the public science (*DIALOG*) and numerous support measures from the operational programme POWER stimulate continuous improvements at universities. At the same time, short-term "fixes" in the public science system cause new problems and do not seem to support the quality improvements. The rules for evaluation of scientific organisations and practices related to the lists of "eligible" Polish scientific journals are flawed, not promoting high-quality research and cementing the existing, sub-optimal institutional frameworks. In 2016, problems with scientific integrity and misconduct related to publicly funded R&D projects were noticed by NCN and NCBR, but the relevant corrective actions came very late, only after the former director of NCBR was arrested for corruption, while another government agency, dealing primarily with business enterprises (PARP) had the necessary anti-corruption procedures in place for several years. The results of NCN's *POLONEZ* call were also meaningful in the context of this innovation challenge. *POLONEZ* was intended to support leading foreign scientists, planning to relocate to Poland to carry out R&D projects, but the portfolio of supported projects does not seem to include first-tier initiatives, and Poland does not seem an attractive destination for foreign researchers.

**Innovation challenge 4. Priority setting in the R&I system.** Polish R&I system includes multiple, incommensurable lists of prioritised R&D areas, research fields, technological specialities or export specialities. In 2016, the complexity was not reduced but further expanded: in an effort to narrow down the list of 20 national specialities defined by KIS and combine them with specialities of 16 regions, NCBR generated an even longer list of 26 RANBs (Regional Science-Research Agendas). In another attempt at prioritisation, the draft Strategy for Responsible Development listed 8 out of 20 areas previously identified as national smart specialisations and declared them as more important than others, deserving dedicated, "fast-track programmes". The willingness to reduce the almost all-encompassing list of specialities is commendable, but it

should involve stakeholders and be evidence-based, preferably in accordance with the entrepreneurial discovery processes, not as top-down decisions of the government to avoid policy capture by individual, influential stakeholders or sub-optimal allocation of financial resources resulting from lack of insights into the actual R&I activities in relevant areas. Moreover, the draft SOR included several other, confusing sets of priorities, identifying strategic sectors, horizontal technologies, sectors for international promotion, as well as strategic and flagship projects in some technological areas, while also declaring that the plans to continue “prioritisation of KIS and RIS”. On top of this, there are no visible KIS or RIS monitoring efforts, and the Economic Observatory established in 2015 to continuously analyse Poland’s smart specialisations seems inactive.

Table 13 summarizes the R&I challenges and evaluates the effects of the policy responses, described in this chapter.

**Table 13: R&I challenges – summary**

Challenge	Policy response	Assessment
<b>1. Increase the intensity of private R&amp;D</b>	<ul style="list-style-type: none"> <li>Substantial increases in the availability of public R&amp;D funding for business enterprises</li> <li>Introduction of R&amp;D tax incentives in 2016 and their further improvements in 2017</li> <li>Support targeting state-owned enterprises</li> <li>Launch of sectoral programmes, and multiple new measures targeting selected industrial areas, including eco-innovations</li> <li>Preparations for the launch of large VC programmes BRIDGE VC and Witelo Fund</li> <li>Planned activities related to the streamlining of R&amp;D reporting by business enterprises</li> </ul>	<ul style="list-style-type: none"> <li>Public grants do not induce substantial increases in private R&amp;D funding</li> <li>Most of the newly introduced schemes are offered as grants, not financial instruments or demand-side measures</li> <li>Companies have no motivation to report R&amp;D expenditures and used other accounting categories to classify these costs in order to optimise their tax burdens</li> <li>Limited concern of policy makers about genuine impacts of R&amp;D funding – strong focus on fast absorption of ESIF</li> <li>Long-term changes might be more positive thanks to the ongoing process of preparing the White Paper on Innovations and drafting further legal reforms to improve framework conditions for private R&amp;I</li> </ul>



Table 13 (cont.)

Challenge	Policy response	Assessment
<b>2. Strengthen the co-operation between science and industry</b>	<ul style="list-style-type: none"> <li>• R&amp;D funding schemes strongly promoting science-industry co-operation (in many cases, scientists can benefit from applied R&amp;D funding only in consortia projects)</li> <li>• Amendments to the Act on Higher Education streamlining the academic knowledge transfer pathways</li> <li>• R&amp;D tax incentives available for R&amp;D contracted to HEIs or PROs</li> <li>• Strict division between fundamental and applied research (NCN-NCBR), with “TANGO” scheme trying to bridge the separate approaches</li> <li>• The Strategy for Responsible Development and the White Paper on Innovations recognizing the importance of science-industry co-operation for the Polish economy</li> <li>• Plans to support industrial PhDs and incentivize commercial involvement of scientists</li> </ul>	<ul style="list-style-type: none"> <li>• Very limited effectiveness of policy responses from 2010–2015 and stereotypical views held by both scientists and corporate managers</li> <li>• Policy makers focus on supporting business enterprises that could liaise with scientists, but Polish industrial companies might not possess the necessary capabilities to appreciate many applied R&amp;D directions</li> <li>• Scientists encouraged to pursue fundamental research projects instead of addressing societal or economic challenges</li> </ul>
<b>3. Increase the quality of the public research base</b>	<ul style="list-style-type: none"> <li>• Reduction of administrative burdens at HEIs, and plans for further reforms prepared with the involvement of stakeholders</li> <li>• New support measures offered by MNiSW, NCN and FNP, further promoting scientific excellence and positive changes at HEIs and PROs</li> <li>• Stronger public support for participation of Polish scientists in H2020 and ERC competitions</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term plans for sectoral reforms of HEIs and PROs seem promising, prepared through inclusive stakeholder consultations, but legal changes introduced in 2016 seem to contradict these idealistic approaches</li> <li>• Deregulation of HEIs will reduce administrative burdens of scientists and university management, but is not directly linked to the quality of scientific base</li> </ul>

Challenge	Policy response	Assessment
	<ul style="list-style-type: none"> <li>• Introduction of rules strengthening scientific integrity and preventing misconducts at NCN and NCBR</li> <li>• Planned future reform of research institutes</li> <li>• New rules for evaluation of scientific organisations, which will determine institutional R&amp;D funding (highly bureaucratised, focused on quantitative bibliometric and financial indicators not real scientific impact)</li> <li>• Amendments of the Act on Research Institutes making some of the institutes directly influenced by sectoral ministries</li> </ul>	<ul style="list-style-type: none"> <li>• Positive initiatives related to the introduction of new R&amp;D funding schemes, including support for smaller R&amp;D projects, international networking, and schemes adopting standards known from ERC competitions</li> <li>• Scientific integrity and anti-corruption measures adopted by NCN and NCBR in reaction to major legal challenges</li> <li>• Chasm between fundamental and applied R&amp;D (NCN-NCBR), with NCN rejecting projects addressing societal or economic challenges, and NCBR focusing on support of business enterprises</li> </ul>
<b>4. Priority setting in the R&amp;I system</b>	<ul style="list-style-type: none"> <li>• Introduction of RANBs (Regional Science-Research Agendas), intended to synthesize KIS and RIS</li> <li>• Attempts to narrow-down the comprehensive list of smart specialisations in the Strategy for Responsible Development</li> <li>• Plans to initiate the process of “prioritisation of KIS and RIS”</li> </ul>	<ul style="list-style-type: none"> <li>• Further increases in the number of priority/specialisation lists (26 RANBs compared with 20 KIS, several incommensurable sets of priorities in SOR)</li> <li>• Risks that future prioritisation might be defined in a top-down mode, disregarding stakeholders and entrepreneurial discovery processes, redirecting R&amp;I funding to sectors or beneficiaries identified by the government</li> </ul>

Source: Authors' compilation.

## Annex 1

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## Annex 2

### Abbreviations

ARP	Industrial Development Agency ( <i>Agencja Rozwoju Przemysłu</i> )
ARR	Agricultural Market Agency ( <i>Agencja Rynku Rolnego</i> )
BERD	Business Expenditures on Research and Development
BES	Business Enterprise Sector
BGK	<i>Bank Gospodarstwa Krajowego</i>
CEE	Central and Eastern Europe
CEIDG	Central Registration and Information on Economic Activity ( <i>Centralna Ewidencja i Informacja o Działalności Gospodarczej</i> )
CIS	Community Innovation Survey
COIE	Investors and Exporters' Service Centres ( <i>Centra Obsługi Inwestorów i Eksporterów</i> )
COSME	Programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises
CSR	Country Specific Recommendations
DESI	Digital Economy and Society Index
EC	European Commission
ECSA	European Citizen Science Association
EEN	Enterprise Europe Network
EGDI	E-Government Development Index
ERA	European Research Area
ERC	European Research Council
ESIF	European Structural and Investment Funds
ETV	Environmental Technology Verification
EU	European Union

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EU-15	the 15 Member States of the European Union from 1995 until 30.4.2004 (BE, DK, DE, EL, ES, FR, IE, IT, LU, NL, AT, PT, FI, SE, UK)
EU-28	European Union including 28 Member States
FDI	Foreign Direct Investment
FNP	Foundation for Polish Science ( <i>Fundacja na rzecz Nauki Polskiej</i> )
FTE	Full-time Equivalent
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditures on R&D
GOV	Government
GUS	Central Statistical Office ( <i>Główny Urząd Statystyczny</i> )
GVA	Gross Value Added
GVC	Global Value Chain
HEI	Higher Education Institute
HERD	Higher Education Expenditure on R&D
H2020	Horizon 2020
ICT	Information & Communication Technologies
IPRs	Intellectual Property Rights
IT	Information Technology
KFK	National Capital Fund ( <i>Krajowy Fundusz Kapitałowy</i> )
KIS	National Smart Specialisations ( <i>Krajowe Inteligentne Specjalizacje</i> )
KPB	National Research Programme ( <i>Krajowy Program Badań</i> )
KPK	National Contact Point for Research Programmes of the European Union ( <i>Krajowy Punkt Kontaktowy Programów Badawczych UE</i> )
KPRM	The Chancellery of the Prime Minister ( <i>Kancelaria Prezesa Rady Ministrów</i> )
KRASP	Conference of Rectors of Academic Schools in Poland ( <i>Konferencja Rektorów Akademickich Szkół Polskich</i> )
KRPUT	Conference of Rectors of Polish Universities of Technology ( <i>Konferencja Rektorów Polskich Uczelni Technicznych</i> )
MF	Ministry of Finance ( <i>Ministerstwo Finansów</i> )

MG	Ministry of Economy ( <i>Ministerstwo Gospodarki</i> )
MNiSW	Ministry of Science and Higher Education ( <i>Ministerstwo Nauki i Szkolnictwa Wyższego</i> )
MR	Ministry of Economic Development ( <i>Ministerstwo Rozwoju</i> )
MSP	Ministry of Treasury ( <i>Ministerstwo Skarbu Państwa</i> )
NBP	National Bank of Poland ( <i>Narodowy Bank Polski</i> )
NCBR	National Research and Development Centre ( <i>Narodowe Centrum Badań i Rozwoju</i> )
NCN	National Science Centre ( <i>Narodowe Centrum Nauki</i> )
NFOŚiGW	National Fund for Environmental Protection and Water Management ( <i>Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej</i> )
NGO	Non-governmental Organization
NIK	Supreme Audit Office ( <i>Najwyższa Izba Kontroli</i> )
OECD	Organisation for Economic Co-operation and Development
OSR	Regulatory Impact Assessment ( <i>Ocena Skutków Regulacji</i> )
OSR ex post	Legislative Health Check ( <i>Ocena Funkcjonowania Ustawy</i> )
PAN	Polish Academy of Sciences ( <i>Polska Akademia Nauk</i> )
PAIiIZ	Polish Information and Foreign Investment Agency ( <i>Polska Agencja Informacji i Inwestycji Zagranicznych</i> )
PARP	Polish Agency for Enterprise Development ( <i>Polska Agencja Rozwoju Przedsiębiorczości</i> )
PCP	Pre-commercial Procurement
PCT	Patent Co-operation Treaty
PE	Private Equity
PFR	Polish Development Fund ( <i>Polski Fundusz Rozwoju</i> )
PIB	National Research Institute ( <i>Państwowy Instytut Badawczy</i> )
PLN	Polish zloty
PNP	Private non-profit sector
POIR	Operational Programme Smart Growth ( <i>Program Operacyjny Inteligentny Rozwój</i> )
POPW	Operational Programme Eastern Poland ( <i>Program Operacyjny Polski Wschodniej</i> )

POT	Polish National Tourist Office ( <i>Polska Organizacja Turystyczna</i> )
POWER	Operational Programme Knowledge, Education and Development ( <i>Program Operacyjny Wiedza, Edukacja i Rozwój</i> )
PPI	Public Procurement for Innovation
PRO	Public Research Organisation
RANBs	Regional Science and Research Agendas ( <i>Regionalne Agendy Naukowo-Badawcze</i> )
R&D	Research and development
RGIB	Main Council of the Research Institutes ( <i>Rada Główna Instytutów Badawczych</i> )
RGNiSW	Main Council of the Science and Higher Education ( <i>Rada Główna Nauki i Szkolnictwa Wyższego</i> )
R&I	Research and innovation
RIS	Regional Smart Specialisations ( <i>Regionalne Inteligentne Specjalizacje</i> )
RPO	Regional Operational Programme ( <i>Regionalny Program Operacyjny</i> )
SOOIPP	Polish Business and Innovation Centres Association ( <i>Stowarzyszenie Organizatorów Ośrodków Innowacji i Przedsiębiorczości w Polsce</i> )
SOR	Strategy for Responsible Development ( <i>Strategia na rzecz Odpowiedzialnego Rozwoju</i> )
SME	Small and Medium-sized Enterprise
STEM	Science, Technology, Engineering and Mathematics
TFP	Total Factor Productivity
TR	Regulatory Test ( <i>Test Regulacyjny</i> )
UZP	Public Procurement Office ( <i>Urząd Zamówień Publicznych</i> )
VC	Venture Capital
WPHI	Trade and Investment Promotion Departments of the Embassies and Consulates of the Republic of Poland ( <i>Wydziały Promocji Handlu i Inwestycji Ambasad i Konsulatów RP</i> )
YOY	Year Over Year

## Annex 3

### Top R&D performers

**Table 14: List of top R&D performers from public and private sectors**

Public sector	Private sector
Institutes of the Polish Academy of Sciences	Asseco Poland S.A.
University of Warsaw	Adamed Sp. z o.o.
Jagiellonian University, Kraków	Zakłady Farmaceutyczne Polpharma S.A.
AGH University of Technology, Kraków	Polski Holding Obronny Sp. z o.o.
Warsaw University of Technology	Comarch S.A.
Wrocław University of Technology	Synthos S.A.
Silesian University of Technology, Gliwice	Amgen Biotechnologia Sp. z o.o.
Adam Mickiewicz University, Poznań	AstraZeneca Pharma Polska Sp. z o.o.
Medical University of Warsaw	Janssen-Cilag Polska Sp. z o.o.
University of Wrocław	Roche Polska Sp. z o.o.

Top public sector R&D performers identified based on the analysis of publication data for 2014–2020, indexed in the Elsevier Scopus database. No single institute of the Polish Academy of Sciences was included among the top 10 performers – the Academy is a conglomerate of diverse research institutions in different parts of Poland.

Private sector R&D performers identified based on multiple data sources, indicating their R&D expenditures in 2013, 2014 or 2015, including: Baklarz (2016), NIK (2014), “Computerworld Top 200” rankings, publicly available corporate annual reports and transparency reports of pharmaceutical companies – members of the Employers’ Association of Innovative Pharmaceutical Companies INFARMA. The list includes data on R&D expenditures from different years, and should not be interpreted as a ranking (i.e. the position on the list does not indicate the relative size of expenditures of each company).

## Annex 4

### Overview of R&I support measures

The annex describes in detail R&I funding schemes available in Poland in 2016, and complements the section 4.1.2 of the report.

The ESIF measures offered by NCBR in 2016 include:

- POIR 1.1.1 – so-called “fast track” (pl. *szybka ścieżka*), main R&D funding instrument ensuring funding decisions within 60 days, with separate calls for SMEs and large enterprises. Originally, large enterprises were not allowed to submit more than one project application in each funding call. In July 2016, NCBR lifted this restriction and there are risks that a small number of large companies will accumulate substantial funding from the overall budget of this support measure.
- POIR 1.1.2 – previously called “DEMONSTRATOR” was renamed to “Pilot Lines” (pl. *Linie Pilotażowe*), still supporting the development and first implementation of innovative technologies. The measure has significantly changed its eligibility criteria: the support measure is only available to large enterprises (two calls in 2015 had also separate allocations for SMEs), and minimum project budget is 30m PLN (€7.17m) (previously the funding was available for budgets starting at 5m PLN, €1.19m). Beneficiaries will be required to implement project results either in own operations or by licensing or selling the IPRs to another company, and NCBR plans to use business intelligence services to verify the applicants before distributing the funding (NCBR, 2016c: 17).
- POIR 1.2 – the portfolio of sectoral programmes (pl. *programy sektorowe*) was expanded to cover other sectors, with competitive calls for project proposals launched based on research agendas that were submitted by sectoral representations of stakeholders in 2014-2015 and refined in the process of negotiations with NCBR. As of 2016, the following programmes are available: INNOLOT (aviation), INNOMED (medicine), INNOCHEM (chemical engineering), INNOTEXTILE (textiles), INNOSTAL (steel industry), GAMEINN (video games), INNOSBZ (Unmanned Aviation Vehicles), INNOTABOR (railway infrastructure), INNOMOTO (automotive technologies), PBSE (energy), IUSER (ICT for energy sector).

- POIR 1.3.1 – “BRIDGE Alfa” for venture capital and investment funds, acquiring equity in R&D-intensive, innovative start-up companies, had its modalities modified: the support provided by NCBR to the investors will be classified as grants not financial instruments, as it had originally been planned, and investors only need to cover 20% of the project budget.
- POIR 4.1.1 – allocated for “strategic research programmes for the economy”, including programmes based on Public-Private Partnerships with large business enterprises. First such programme – “SYNChem” – was launched in 2016, with 50% of the budget covered by a chemical company Synthos S.A., and funding distributed through an open competition among consortia of HEIs and PROs with the possibility of involving also SMEs.
- POIR 4.1.2 – RANBs, “Regional Science and Research Agendas” (pl. *Regionalne agendy naukowo-badawcze*) for projects by science-industry consortia, matching a broad list of R&D themes. The list was prepared based on submissions from 16 regional government that were asked to indicate which of their regional smart specialisations should be supported on the national level. The regional proposals were subsequently compared with the contents of KIS (National Smart Specialisations) and a list of 26 specific topics was selected (NCBR, 2016d) (with some specific topics going beyond the original scope of KIS, e.g. related to ICT or fossil fuels). The existence of dissimilar lists outlining thematic specialisations for R&I funding (KIS, 16 RIS and RAND) might be confusing for some applicants. Even though the name suggest a regionally-oriented instrument, the applicants could come from any part of Poland, and the measure doesn’t actually target any specific regions, neither it involves regional governments in the evaluation of project proposals.
- POIR 4.1.3 – “Innovative methods of research management” (pl. *Innowacyjne metody zarządzania badaniami*) – a measure intended to support precompetitive R&D, modelled after the US’ DARPA.
- POIR 4.1.4 – “Applied research projects” (pl. *Projekty aplikacyjne*) target science-industry consortia, with 15 projects funded in February 2016. The budget of his measure was expanded by adding allocations originally planned for the cancelled instrument POIR 4.1.3 (“Virtual research institutes”, pl. *Wirtualne instytuty badawcze*) that was intended to support networking of scientists.
- POIR 4.2 (funding for large research infrastructures, co-ordinated by the research institute OPI, the Information Processing Institute, on behalf of NBCiR) and POIR 4.3 (funding for International Research Agendas, complementing H2020 Teaming for Excellence projects) were continued.
- POIR 4.4 – implemented by FNP (Foundation for Polish Science) based on an agreement with NCBR. POIR 4.4 covers dedicated measures available for

scientists: “HOMING” (breakthrough research by postdocs), “*POWROTY*” (postdocs returning to work after a break in their careers, including maternity leaves), “First TEAM” (projects for young PhDs), “TEAM TECH” (technology development by scientists with the involvement of industry), “TEAM” (ERC-type projects with the involvement of a foreign partner). The offering is based on successful measures that were offered by FNP in the 2007-2013 perspective, with one important addition of “TEAM TECH” that fills the gap in ambitious, applied R&D projects initiated by HEIs or PROs, as most measures offered by NCBR target business enterprises, while NCN does not fund applied R&D.

- NCBR coordinates also support calls based on another operational programme – POWER – supporting higher education and teaching initiatives. The measures offered included: “New Teaching Programmes” (for study programmes oriented towards labour market), “Competence Development Programme” (POWER 3.1, for skills improvement of HEI employees), “International Study Programmes” (POWER 3.3, for internationalisation of HEI offerings) and “Managing higher education institutes” (POWER 3.4, for managerial training of HEI employees). In addition, MNiSW supports international accreditation of HEIs (POWER 3.3), and MR distributes funding for social innovations (POWER 4.1).

MNiSW uses POIR funding to continue its scheme “Incubator of Innovativeness” (pl. *Inkubator Innowacyjności+*), supporting technology transfer offices and university incubators (POIR 4.4).

With a substantial delay, NCBR launched in July 2016 a support measure “*e-Pionier*”, funded from the Operational Programme Digital Poland (POPC 3.3). Initially, the measure was supposed to involve pre-commercial procurement, but this construction was abandoned due to anticipated legal difficulties. The call targets technology accelerators experienced in ICT sector. Each of the beneficiaries will identify specific business opportunities for the incubation of new ICT start-ups by diagnosing needs of selected public sector organisations (including among others governmental bodies, justice system and health care) that offer potential for repeat sales to other organisations, and match these needs with a team of talented programmers, helping them establish a start-up company to address the identified opportunity.

PARP launched a number of ESIF-based measures supporting innovations in business enterprises, including:

- POIR 2.3.1 – Pro-innovation consulting services for SMEs, delivered by specialised service providers;
- POIR 2.3.2 – Innovation vouchers stimulating science-industry cooperation;



- POIR 2.3.3 – Internationalisation of key innovative clusters, selected in a nation-wide competition;
- POIR 2.3.4 – Protection of industrial property – co-funding patenting in Poland and abroad;
- POIR 3.1.5 – “4Stock” – supporting SMEs in accessing capital markets, including stock exchange listing;
- POIR 3.2.1 – “Research for market” – one of key support measures in the Polish R&I system, supporting the implementation of R&D results. It complements POIR 1.1.1 (focused on earlier Technology Readiness Levels) and POIR 1.1.2 (targeting technology demonstrators and pilot installations), and could also be used to launch new products or services based on externally acquired or licensed IPRs;
- POIR 3.3.3 – “Go to” brand – a portfolio of projects promoting Polish exporters in selected international markets, including match-making support;
- PARP is also a beneficiary of POIR 2.4.1 measure, supporting the analysis and piloting new support instruments. The first instruments was launched in this framework in June 2016 and called “ScaleUp”, targeting consortia of technology accelerators and large companies, with preference for state-owned enterprises (PARP, 2016b) (see: description in section 4.1.2).

16 regions of Poland have their own Regional Operational Programmes with R&I allocations used among others for research infrastructure of business enterprises, joint science-industry projects and implementation of innovations. Each region has a different portfolio of measures and eligibility criteria, alongside an own list of regional smart specialisations (RIS) with which all or majority of eligible applications need to comply. In addition, PARP coordinates also R&I support measures in the Operational Programme Eastern Poland (POPW), established for the four regions belonging to the group of the least developed parts of Poland. The measures are likely to encourage innovative SMEs from other Polish regions to relocate to the eastern part of the country, and also target some of the regional specialities (e.g. strength in furniture design and manufacturing):

- POPW 1.1.1. – “Start-up platforms” (pl. *Platformy startowe*) with 3 technology parks in Eastern Poland contracted to offer support for innovative start-ups founded by young entrepreneurs, including incubation services, training and networking with the investment community. Parks located in different regions compete with one another in attracting start-ups, some even offer “soft landing” services, including help in finding apartments, schools for children, doctors, or offering discounts for public transportation;
- POPW 1.1.2 – financial support for start-ups in Eastern Poland;
- POPW 1.2 – support for internationalisation of SMEs from Eastern Poland;

- POPW 1.3.1 – support for the implementation of R&D results by SMEs from Eastern Poland;
- POPW 1.3.2 – support for the development of innovative products by consortia of companies from Eastern Poland;
- POPW 1.4 – support for the commercialisation of industrial designs by companies from Eastern Poland.

Support measures based on national funding that were available in 2016 include the following schemes:

- MNiSW introduced in November 2015 “Bonus on Horizon” (pl. *Premia na Horyzoncie*) to complement H2020 funding attracted by HEIs and PROs by 20–25% bonuses (MNiSW, 2015c). In parallel, FNP discontinued its dedicated instrument “Ideas for Poland” (pl. *Idee dla Polski*) that was co-funding beneficiaries of ERC grants.
- MNiSW launched a new programme “DIALOG” to support various initiatives proposed by HEIs, PROs, companies, NGOs and consortia, aiming to strengthen scientific excellence, knowledge transfer or innovations in the field of humanities. The call’s formula is very broad, with relatively simple application forms encouraging bottom-up proposals of projects with a wide range of budgets (100k PLN to 2m PLN, €23.9k–€477.9k), and the total funding allocated is 20m PLN (€4.78m) per annum. The programme could stimulate inter- and intra-sectoral dialogue and innovativeness, and could better engage NGOs in the efforts to strengthen the Polish science sector.
- MNiSW reorganised the National Programme for the Development of Humanities, transferring its part to NCN (see description above), and launched a dedicated call for “Monuments of the Polish philosophical, theological and social thought in the 20<sup>th</sup> and 21<sup>st</sup> century” (pl. *Pomniki polskiej myśli filozoficznej, teologicznej i społecznej XX i XXI wieku*). The call’s results were controversial as MNiSW disregarded the ranking prepared by peer-reviewers and arbitrarily selected beneficiaries of the programme.
- NCBR launched “PANDA 2” programme to support the maintenance of research infrastructures that were funded from the EU Structural Funds, 2007-2013. The financial support is available for infrastructures worth at least 50m PLN (€11.9m) and used for R&D projects delivered to external clients, including companies. Altogether 16 institutions were selected in the call as beneficiaries. Funding allocated in the programme is not fixed as the amount distributed to each beneficiary will be linked to revenues from R&D commercialisation, generated by the infrastructure owner during the previous year. The programme responds to important concerns of the scientific community, offering the support for maintenance of research infrastructures but only if they are used in projects that have broader economic impacts.

- NCBR continued strategic R&D programmes for science-industry consortia: “STRATEGMED” (141m PLN, €33.7m, medical sciences) and “BIOSTRATEG” (150m PLN, €35.8m, environment, agriculture and forestry) and launched a new programme “TECHMATSTRATEG” (150m PLN, €35.8m, advanced materials). The Centre launched public consultations of a new strategic programme “GOSPOSTRATEG” (500m PLN, €119.5m, social and economic sciences).
- NCBR continued its “LIDER” programme financing applied R&D projects of young researchers and launched a call in “CuBR” programme, concerning applied R&D related to non-ferrous metals (based on a Public-Private Partnerships with the metal mining company KGHM, co-funding the programme’s budget distributed in competitive calls).
- NCBR expanded the scope of its “Go\_Global.pl” support measure for innovative high-tech firms, participating in acceleration programmes in leading high-tech centres. The partnering technology accelerators are located in the USA, Germany, Spain and Israel.
- NCBR launched a new call for “Future-oriented technologies for defence – call for young researchers” (pl. *Przyszłościowe technologie dla obronności – konkurs dla młodych naukowców*) (NCBR, 2016a) to attract the interests of young researchers, particularly in technical sciences, who usually did not consider potential military applications of their R&D results
- Another programme – “KOŚCIUSZKO” – was offered by the Ministry of Defence for military R&D projects carried out by researchers returning to Poland from foreign scientific institutions. Poland’s expenditure on defence in relation to GDP belongs to the highest among NATO members, and an increasing share of the defence budget is allocated on R&D, including funding distributed through NCBR. The launch of new, more targeted calls, helps diversify the groups of beneficiaries, ensuring better access to emerging technologies and talent scientists.
- NCBR and NCN jointly launched “TANGO 2” competition, supporting proof-of-concept development of the results of fundamental research projects, originally funded by NCN.
- NCN awarded funding in “POLONEZ” programme to 48 experienced foreign researchers planning to carry-out R&D projects in Poland, and initiated another call in the programme.
- NCN reorganized the structure of its funding programmes, addressing gaps and rationalising its portfolio. “MINIATURA” for small R&D projects managed by young researchers and “SONATINA” that will replace the previously available “IUVENTUS PLUS” that used to be offered by MNiSW. Two other programmes, “SONATA” and “SONATA PLUS”, also targeting young postdocs

with a growing size and complexity of supported projects, had its proposal evaluation procedures modified to imitate the standards adopted by ERC, i.e. written project applications are supplemented by interviews with candidates.

- NCN prepared the launch of a new programme “UWERTURA”, intended to support Polish researchers in their participation in ERC-funded projects abroad, as team members who could gain the necessary skills to submit their own ERC grant applications (following the ERC’s framework of “Fellowship to visit ERC grantee”).
- NCN continued its portfolio of fundamental R&D programmes, including “ETIUDA” (doctoral scholarships), “PRELUDIUM” (doctoral R&D grants), “FUGA” (research internships for young PhDs), “OPUS” (R&D grants distributed in a bottom-up mode among researchers representing various disciplines and careers stages), “HARMONIA” (grant for international collaborative R&D) and “MAESTRO” (pioneer R&D projects by the most experienced scientists).
- ARP S.A., a state-owned holding company that used to focus on restructuring of large state-owned enterprises, entered into the R&I area already in 2014, and was engaged in various innovation-oriented activities, including: launch of technology accelerator for video games in Silesian region, a series of innovation co-creation workshops with the largest Polish gas company PGNiG S.A. to form community of innovators helping generate emission reducing innovations, and equity investments in innovative companies done by its subsidiary ARP Venture.
- MR offers tax incentives to companies meeting the criteria for a formally registered R&D centre. As of July 2016, 44 companies were benefiting from the official status of R&D centre (MR, 2016g), and supports large investors based on “Programme for the support of investments of considerable importance for Polish economy for years 2011–2020”.
- National Fund for Environmental Protection and Water Management launched a new financing programme “SOKÓŁ” (Falcon) to support the development or implementation of innovative environmental technologies. The programme has a substantial budget of up to 1,000m PLN (€238.9m) for investments in years 2016-2023, divided between grants and financial instruments, including loans and equity investments (NFOŚiGW, 2016). It targets technological areas identified as national smart specialisations in KIS. The financing comes from the National Fund, which collects fees for using the environment from various entities operating in Poland. In the past, the Fund collaborated with NCBR, testing R&D support on a much smaller scale, but the introduction of “SOKÓŁ” turns the Fund into an important, new actor in the field of R&I support.

The following list of measures that support the internationalisation of companies in Poland in 2016, complements the section 5.3 of the report.

The ESIF measures offered on the national level in 2016 include:

- POIR 2.3.3 – Internationalisation of Key National Clusters, selected in competition (budget: €33,250,000).
- POIR 3.3.1 – Polish tech-bridges supporting the development of Polish technology companies on selected, foreign markets. The project will be carried out jointly by PARR and the Ministry of Development. PARR is going to coordinate the internationalisation on four foreign markets – USA, Great Britain, Ireland and Israel, whereas MR will focus on USA, Germany, the United Arab Emirates, China, Singapore and the ASEAN countries (budget: €42.287m) (PARR, 2016h).
- POIR 3.3.2 – Promotion of the economy on the basis of Polish product brands – Brand of the Polish Economy aiming at presenting Polish IT/ICT products and services among foreign partners and promoting Poland as a country which develops advanced technologies and services and has potential for growth in foreign markets (budget: 149.642m PLN, €35.762m). The project will be carried out by the Ministry of Development in partnership with PARR, Agricultural Market Agency (ARR, pl. *Agencja Rynku Rolnego*), Adam Mickiewicz Institute (pl. *Instytut Adama Mickiewicza*) and Polish National Tourist Office (POT, pl. *Polska Organizacja Turystyczna*).
- POIR 3.3.3 – Support for SMEs in the promotion of Polish product brands – Go to Brand. The objective of this portfolio of projects is to promote Polish companies with representing sectors with the highest export potential (budget: €90m) (PARR, 2016c).
- POPW 1.2 – Internationalisation of SMEs, aimed at supporting internationalisation of SMEs from Eastern Poland, in particular companies entering new foreign markets (budget: €115.05m).

Measures supporting the internationalization of companies offered under Regional Operational Programmes (RPOs, pl. *Regionalne Programy Operacyjne*) include:

- RPO of Małopolskie Region – RPO WM 3.3.2 International activity of SMEs from Malopolska;
- RPO Wielkopolski – WRPO 2014+ 1.4.1 Comprehensive support the development of business activities on foreign markets for enterprises with export development plan;
- RPO of Łódzkie Region – RPO WŁ II.2.1 Business models for SMEs;
- RPO of Dolnośląskie Region – RPO WD 1.4 Internationalisation of enterprises;
- RPO of Lubelskie Region – RPO WL 3.6 Business marketing;

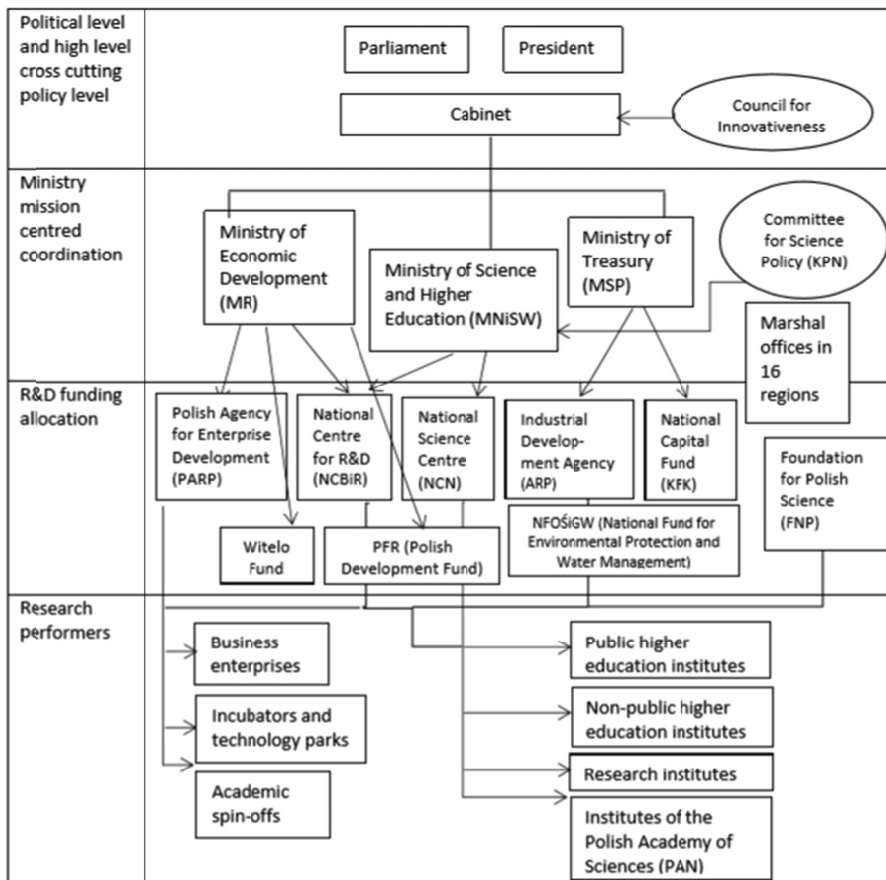
- RPO of Opolskie Region – RPO WO 2.4 Economic cooperation and promotion;
- RPO of Mazowieckie Region – RPO WM 3.2.2 Internationalisation of enterprises;
- RPO of Kujawsko-Pomorskie Region – RPO WK-P 1.5.2 Support for the process of enterprises internationalization, 1.5.3 Support for the academic enterprises internationalisation process;
- RPO of Warmińsko-Mazurskie Region – RPO WiM 1.3.5 SMEs support services, 1.4.4 SMEs internationalisation.

## Annex 5

### Governance of the R&I system

Poland's R&I system is predominantly centralised, with the national government defining policy directions and allocating funding through its agencies. Figure 1 presents the most important R&I policy makers, funders and performers in Poland.

**Figure 1: Structure of the Polish R&I system**



The Parliament is the legislative body, and the Council of Ministers (the Cabinet) has the executive power to set the relevant national policies, as well as the ability to start legislative initiatives or amendments of legal acts. The President can also submit proposals for new legal acts and accept the legislations adopted by the Parliament. R&I policies are co-ordinated by the Council for Innovativeness, established in January 2016 and including three deputy prime ministers and ministers from the key relevant institutions. This governance setting is unique in Poland's history, as signals the importance of R&I policies in the current government agendas.

The Ministry of Economic Development (MR) defines policies related to innovations, particularly with respect to the private sector, and coordinates Poland's activities related to ESIF, while the Ministry of Science and Higher Education (MNiSW) focuses on public science. The Ministry of Treasury (MSP) manages state-owned assets, oversees sovereign funds and state-owned enterprises. MNiSW is supposed to rely on the advice of the Committee for Science Policy (KPN), which represents the key stakeholders from HEIs and PROs.

R&I funding is distributed by numerous agencies and the government declared plans to rationalize the funding landscape, but as of August 2016, the list of R&I funders includes:

- National Science Centre (NCN) – supporting fundamental R&D;
- National Centre for Research and Development (NCBR) – financing applied R&D in business enterprises and science-industry consortia, and coordinating some of the funding schemes targeting HEIs and PROs;
- Polish Agency for Enterprise Development (PARP) – supporting innovations and entrepreneurship, including funding for start-ups and industrial development;
- National Capital Fund (KFK) – managing venture capital funds based on co-funding from the EU Structural Funds, 2007–2013;
- Polish Development Fund (PFR) – newly established sovereign fund that is expected to play a key role in the future R&I funding;
- Industrial Development Agency (ARP) – coordinating management of selected state-owned enterprises and making venture capital and other equity investments in innovative companies;
- Foundation for Polish Science (FNP) – a non-governmental institution, distributing ESIF funding targeting public science;
- Witelo Fund – newly created fund of funds that will hold shares in VC funds, established based on ESIF to offer equity investments in innovative high-tech companies.
- National Fund for Environmental Protection and Water Management (NFOŚiGW) – financed from environmental fees and ESIF, and offering dedicated, substantial R&I funding for eco-innovations.



In the 2014–2020 financial perspective, additional ESIF-based R&I budgets are also distributed on regional levels, and the relevant activities of 16 regions of Poland are overseen by the Ministry of Economic Development. Altogether, the ESIF allocations for R&I amount to €8.6b on the national level and €5.8b on the regional levels.

The R&I governance structures are likely to evolve, as the government plans to liquidate MSP, strengthen the role of PFR, and integrate the resources of PARP, ARP and some other agencies. As of August 2016, the plans are still uncertain, and the funding landscape remains fragmented, even though recent policy initiatives are aimed at strengthening the position of MR and further centralising the R&I governance.

New support measures tend to be designed in co-ordination between various governmental actors, and these processes have become more inclusive and consultative in recent years. For ESIF-based measures, MR plays an important gate-keeping role, defining general implementation guidelines, but the Ministry empowers funding agencies and sectoral ministries to elaborate specific instruments. All ESIF support measures are approved by monitoring committees, involving governmental and non-governmental stakeholders. R&D funding agencies NCN and NCBR rely on the decisions of their councils – representations of R&D performers and government departments, which make recommendations on new support measures and approve proposals prepared by the management. MNiSW has strong influence upon the support measures offered by NCBR, and MR directly influenced the definition of most instruments offered by PARP. The process of launching new instruments usually involves broad stakeholder consultations, and relevant examples from 2016 were described in section 4.1.2 of the report.

Key groups of R&I performers presented in Figure 1 are described in chapter 2, including Higher Education Institutes (both public and non-public), Public Research Organisations (with research institutes and institutes of the Polish Academy of Sciences) and business enterprises. Universities maintain special purpose vehicles – holding companies (pl. *spółka celowa*) that control shares of academic spin-offs. Incubators and technology parks operate in most academic cities, usually relying on public co-funding.

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The book presents an overall analysis of the Polish system of innovations. It elaborates on key actors in the R&I system, identifies main challenges that Polish system of innovations faces nowadays and assesses the policy response. The wide range of topics covered by the book include: structure of the economy, business environment, market creation and stimulation, public sector innovations, civil society innovations and recent developments in the Polish innovation policy.

**Krzysztof Klincewicz** manages the regional office of EIT Food, part of European Institute of Innovation and Technology, established to stimulate the innovativeness of agri-food sector. Professor at Faculty of Management, University of Warsaw. Prior work experiences from the high-tech industry in Poland, Finland and the UK, international negotiations within the United Nations system, implementing government support for innovative entrepreneurship in Poland and the European Union, as well as IP management and technology transfer in the academic sectors in Poland and Japan. Certified chartered marketer of the Chartered Institute of Marketing. Professional and academic career focused on strategies of technology companies and project management.

**Magdalena Marczevska**, Assistant Professor at the Faculty of Management, University of Warsaw. Specializes in innovation and technology management, as well as project management, with the focus on environmental technologies. Participant of research projects commissioned by the Polish Ministry of Environment, European Commission, the World Intellectual Property Organization (WIPO), the Polish Patent Office and the National Science Centre (NCN, Poland). Beneficiary of numerous international exchange programs, among others, at the University of Kentucky, London School of Economics and Political Science, University of Padova, University of Ferrara and Lund University.

