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Research and Innovation Observatory Country Report 2016 Poland

The 2016 series of the RIO Country Report analyses and assesses the development and performance of the national research and innovation system of the EU-28 Member States and related policies. It aims at monitoring and evaluating the EU policy implementation as well as facilitating policy learning in the Member States.

Contents

Foreword.....	2
Acknowledgements.....	3
1. Main R&I policy developments in 2016.....	5
1.1 Focus on National and Regional Smart Specialisation Strategies.....	5
2. Economic Context	6
2.1 Structure of the economy	6
2.2 Business environment	6
2.3 Supply of human resources	7
3. Main R&I actors	7
4. R&I trends	8
4.1 Public allocation of R&D and R&D expenditure	8
4.2 Private R&D expenditure.....	9
4.3 Public sector innovation and civil society engagement	10
5. Innovation challenges.....	11
5.1 Challenge 1 Increase the intensity of private R&I	11
Description	11
Policy response	11
Policy Assessment	12
5.2 Challenge 2 Strengthen the science and industry cooperation.....	12
Description	12
Policy response	13
Policy Assessment	14
5.3 Challenge 3 Increase the quality of the public research base	14
Description	14
Policy response	14
Policy Assessment	15
5.4 Challenge 4 Priority setting in the R&I governance system	15
Description	15
Policy response	16
Policy Assessment	16
6. Focus on creating and stimulating markets.....	16
References	19
List of abbreviations and definitions.....	21
Factsheet	23
List of Figures.....	23

Foreword

This report offers an analysis of the R&I system in Poland for 2016, including relevant policies and funding, with a particular focus on topics of critical importance for EU policies. The report identifies the main challenges of the Polish research and innovation system and assesses the policy responses implemented. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports and online publications. The quantitative data are, whenever possible, comparable across all EU Member State reports. Unless specifically referenced, all data used in this report are based on Eurostat statistics available in January 2017. The analysis does not take into account the full set of CIS 2014 data that was released mid-January 2017. The factsheet in the annex include however the most recent data including one indicator from the last wave of the Community Innovation Survey.

The report contents are partly based on the RIO Country Report 2015 (Klincewicz and Szkuta, 2016).

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HIGHLIGHTS

- Real GDP continued increasing in 2015, with positive forecast for 2016-2017. The public investments remained subdued in 2016 given the cycle of the ESIF financing and lower investment activity by state-owned and state influenced enterprises.
- The Polish R&I system is centralised as regards funding allocation and governance.
- BERD continues to increase but still has relatively modest intensity.
- The public R&D outlays were not subject to fiscal consolidation processes.
- Still, the GERD target of 1.7% of GDP spent on R&D in 2020 requires an increase of both BERD and GOVERD annual growth of national budget expenditure on R&D (according to DG REGIO analysis, a steady 8-10% annual growth is required).

MAIN R&I POLICY CHALLENGES

- **Increase the intensity of private R&I.** The Polish BERD increases on a yearly basis but is still at less than half of the EU-28 average. The recent legislative measures are intended to support the positive trend as well as adjust the accounting for existing R&D efforts. The increased involvement of state-owned companies in R&D activities is a significant change to the R&I policy.
- **Strengthen the science and industry cooperation.** The Polish government recognises the importance of the challenge and has set up since 2010 a number of targeted policy measures. Yet, despite the efforts, the output indicators are still not satisfactory.
- **Increase the quality of the public research base.** The Polish science base suffers from low internationalisation and from the focus on the quantity not quality of outputs due to the incentive structure of the current performance-based funding system. The 2016 legislative efforts and Horizon2020 supported funding schemes are to be further monitored, as they are too recent to generate tangible results.
- **Priority setting in the R&I governance system.** Until 2012, Poland had no explicit R&I priorities but currently it has an R&I system with many strategic lists of thematic priorities. The Strategy for Responsible Development is expected to define focus of government R&I policy.

MAIN R&I POLICY DEVELOPMENTS IN 2016

- The [inter-ministerial Council for Innovativeness](#)
- The ["#StartInPoland"](#) framework targeting start-ups
- The [Plan for Responsible Development](#) and the more comprehensive [Strategy for Responsible Development](#) incl. an attempt to narrow down the National Smart Specialisation Strategy
- The [White Paper on Innovation](#)
- The new [Strategy for Scientific Excellence, Modern Higher Education, Partnership with Business and Responsible Research](#)
- [Ordinance on distributing state subsidies for public and non-public HEIs](#)
- First [Act on Innovativeness](#)

1. Main R&I policy developments in 2016

<p><u>Inter-ministerial Council for Innovativeness</u> (01/2016)</p>	<p>Headed by the Minister of Development, with the participation of the Ministers of: Science and Higher Education; Culture and National Heritage; Digitalisation; Treasury; Health and National Education. It gives the R&I policies a prominent position on the government's agenda, with all three Deputy Prime Ministers being members of the Council.</p>
<p><u>#StartInPoland</u> framework targeting start-ups (01/2016)</p>	<p>An umbrella programme that includes support for companies at the start up and expansion phases. The support is funded through the EU's Smart Growth 2014-2020 programme and from private funds.</p>
<p><u>Plan for Responsible Development</u> (02/2016) and the <u>Strategy for Responsible Development</u> (02/2017)</p>	<p>Outlines new directions of Poland's economic and social policies. published and opened for stakeholder consultation. Adopted in February 2017. Includes plans to review the Smart Specialisation Strategy, narrow-down the number of technological specialities and establish dedicated thematic R&I programmes.</p>
<p><u>Strategy for Scientific Excellence, Modern Higher Education, Partnership with Business and Responsible Research</u> (09/2016)</p>	<p>Summarises recently adopted regulations and announces plans for new changes (incl. the planned summoning of the National Congress for Science and the creation of the National Agency for Academic Cooperation). Complementary to SOR. It 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).</p>
<p><u>White Paper on Innovation</u> (09/2016)</p>	<p>Lists numerous barriers to the innovativeness of the Polish economy from the perspective of the main actors and proposes a list of detailed policy responses. It identifies 58 actions, including changes that would affect 15 existing legal acts and are expected to be adopted in 2017.</p>
<p><u>Ordinance on distributing public subsidies for public and non-public HEIs</u> (12/2016)</p>	<p>The new funding algorithm will be introduced by January, 2017. It relies on an indicator of student-faculty ratio, penalising HEIs that have higher numbers of students per each academic employee.</p>
<p><u>First Act on Innovativeness</u> (entry into force on 1/01/2017)</p>	<p>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</p>

1.1 Focus on National and Regional Smart Specialisation Strategies

Description and timing: The current National Smart Specialisation Strategy (adopted in 2014 and further elaborated in 2015) is a list of [20 specialisations](#) (KIS, pl. *Krajowe Inteligentne Specjalizacje*) with plans of including another specialisation related to humanities and social sciences. There are also 16 regional smart specialisations strategies (RIS). Both the national and regional strategies are used as the basis for allocating R&I-related funding from national and regional operational programmes.

New developments: KIS is further being elaborated by 20 thematic taskforces. Based on their work, a new version of KIS was released in July 2016 (MR, 2016a). The teams are also tasked with monitoring and proposals for corrective actions (MG, 2015a).

The draft [Strategy for Responsible Development](#) (SOR) points to an 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) (see also challenge 4). The document divides KIS into two groups of specialisations by singling out 8 out of 20 specialisations as “fast-track programmes” (MR, 2016e: 68). KIS and RIS will be further narrowed-down to increase the effectiveness of public R&I investments by focusing on industries with the highest value added (MR, 2016e: 165) through a strategic programme “Prioritisation of KIS and RIS” that would “cluster technologies around nationally strategic industries and flagship projects” (MR, 2016e: 167).

Outstanding issues: KIS and RIS monitoring mechanisms are not yet fully established. The Ministry of Economic Development (MR) commissioned the World Bank to carry out a complex evaluation of KIS. The [Economic Observatory](#) established in 2015 to monitor effects of the KIS implementation and identify emerging specialisations (MG, 2015b) has not produced any publicly released results yet. The draft SOR includes plans to establish new consultative groups involving both regional and national level actors and a standardisation of data collection procedures and evaluation methods (MR, 2016e: 167).

2. Economic Context

Poland’s real GDP grew by 3.6% in 2015. The forecast for the rest of the year (3.1%) and 2017 is positive (3.4% in 2017). The main driver of the growth was private consumption supported by accelerating wage growth and fiscal transfers. The investments continue to fall but should accelerate in 2017 since the EU co-funded projects will be moving to the implementation phase. Poland was subject to the Excessive Deficit Procedure since July 2009 till June 2016. The government deficit is expected to narrow to 2.4% of GDP in 2016 (lowest level since 2007) but to widen again in 2017 (to 3.0%) due to the newly introduced universal child benefit expenditures and lowering of the statutory retirement age (ECFIN, 2016).

Despite the continuous slowdown in Polish TFP growth, the country’s average performance in 2006-2015 remained the best among CEE countries. Even if the economy is still constrained by a relatively low labour productivity, it registers constant growth, and the nominal labour productivity per person employed increased from 61.2% of the EU average in 2008 to 74.3% in 2015.

2.1 Structure of the economy

The Polish economy is dominated by manufacturing and agricultural sectors, but the role of the service sector is increasing. Polish manufacturing relies mostly upon low-tech and low-to-medium-tech operations, and the value added by high-tech manufacturing in 2012 only amounted to 1.3% of the total value added in the national economy, nearly half the EU average of 2.5% (Eurostat, 2015). The traditionally more R&D-intensive economic sectors (such as pharmaceuticals or electrical and optical equipment) play only a minor role in the GVA. The economy still relies on a labour cost competitiveness model and Poland has made relatively little progress towards increasing the importance of medium and high-technology products and services (Bogumił and Wielądek, 2014).

2.2 Business environment

The Polish economy is relatively highly positioned in the World Bank's ranking “Doing Business 2016”, where Poland was ranked 24th, with only 10 EU member states ranked higher (World Bank, 2017). In the ranking's sub-category concerning the easiness of getting a credit by firms, Poland had the 20th position world-wide and 1st in trading across borders. The progress towards the digitalization of the economy slowed down with Poland moving into the cluster of countries falling-behind in the 2016 Digital Economy and Society Index (ranking 22nd out of the 28 EU MS and only 25th in the Integration of Digital Technology by businesses).

2.3 Supply of human resources

Poland has a higher than EU average number of new graduates in science, maths, computing, engineering, manufacturing, construction per 1,000 population (2.79 vs 2.3 for EU-28 for 2014) and a close to the EU average share of female researchers (37.23% in Poland in 2014 vs 33.17% in EU-28, 2013). The country however lags behind the EU average in new doctoral graduates (0.44 per thousand population vs 1.16 in CZ and 2.28 in DE in 2014) and number of researchers (3.03 per thousand population in 2014 vs 5.18 in CZ and 10.54 in DK). Poland with its 3% share of ICT specialists among employed individuals ranks at the 19th place in the EU (DESI, 2016).

3. Main R&I actors

The Polish R&I system is centralised with respect to funding allocation and governance. However, in the 2014-2020 financial perspective, the ESIF-based R&I budgets are also distributed at **regional level**.

The [Council for Innovativeness](#), an inter-ministerial body aiming at boosting innovation in Poland was created at the beginning of 2016. The newly established [Ministry of Economic Development](#) (MR) defines and implements the innovation strategies, oversees the policies and regulations related to the absorption of the EU funds and co-ordinates the relevant activities of funding agencies. It supervises the work of the [Polish Agency for Enterprise Development](#) (PARP), supporting enterprises based on national funding and the European Structural and Investment Funds (ESIF), as well as through the involvement in international initiatives, including COSME and ESA.

The [Ministry of Science and Higher Education](#) (MNiSW) manages the science budget and supervises two key funding agencies: the [National Science Centre](#) (NCN), financing basic science projects, and the [National Centre for Research and Development](#) (NCBiR), financing applied research and innovative development, including R&D projects of business enterprises. The non-governmental body, partly funded from the national science budget and ESIF, the [Foundation for Polish Science](#) (FNP) awards research grants and scholarships, and complements the activities of NCN and NCBiR.

The [Polish Development Fund](#) (PFR) that replaced the Polish Investments for Development in April 2016 is a sovereign fund, planning to invest public funds into major infrastructure and innovation projects, including start-up funding. There are plans to liquidate the Ministry of Treasury and make PFR the key actor overseeing the government's equity investments. In addition, the newly created the **Witelo Fund**, a subsidiary of the largest, partly state-owned, insurance company PZU and NCBiR, will act as the fund of funds, co-ordinating the ESIF-based projects for VC funds. There are some overlaps with the Polish Development Fund, which is expected to use ESIF funding for the same purpose.

The **R&D performers** include: Public Higher Education Institutions (PHEIs), non-public Higher Education Institutions (mostly focused on teaching in socio-economic sciences and humanities), Public Research Organisations (including research institutes, focusing on specific areas of applied research, and institutes of the Polish Academy of Sciences, engaged primarily in fundamental research), and business enterprises.

2,814 business enterprises with 43,185 R&D employees declared R&D activities in 2014 (GUS, 2016) but the data is probably underestimated (see challenge 1). The share of foreign-owned enterprises active in R&D is somewhat declining (from 23.2% in 2011 to 19.1% in 2014). The foreign-owned companies accounted for 57.3% of BERD in 2014 (GUS, 2016: 67). The Polish start-up scene is growing with 2,432 active start-ups mainly located in the cities of Warsaw, Cracow and Wroclaw (Skala et al., 2015: 12), supported by two 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) and a **network of incubators** operating in most academic centres.

Inter-organisational cooperation of business enterprises is dominated by **direct partnerships with suppliers**. The importance of innovation clusters and formalised corporate networks remains limited. Even though many science or technology parks, entrepreneurship incubators, technology transfer offices and innovation brokers were financed from the EU Structural Funds in 2007-2013, their impact on knowledge transfer has so far been small. The current ESIF financing is focused on promoting the linkages and knowledge transfer intermediaries based on lessons learned from the previous years (the Operational Programme "Smart Growth", 2014-2020, strongly incentivises the commercial exploitation of public research infrastructure).

4. R&I trends

Total GERD in Poland was €4,317m in 2015. There are three main sources of R&D funding: the business sector (€1,507m), the public sector (€1,747m), and foreign sources (€516m). The total Polish GERD has been increasing monotonically in the period 2005-2012, and stagnated in 2013 to increase again in 2014-2015. The publicly funded part of GERD declined in 2013 to increase slightly in 2014-25. The government remains the major funder of the GERD but after 2010, the government-funded share of GERD shrank considerably due to the increasing funding from the private sector (which is growing at a much faster pace) and the European Commission. In 2014, foreign sources of R&D (including the EC and international companies) accounted for 17% of GERD, domestic companies to 40% while the government spending corresponded to 44% of GERD.

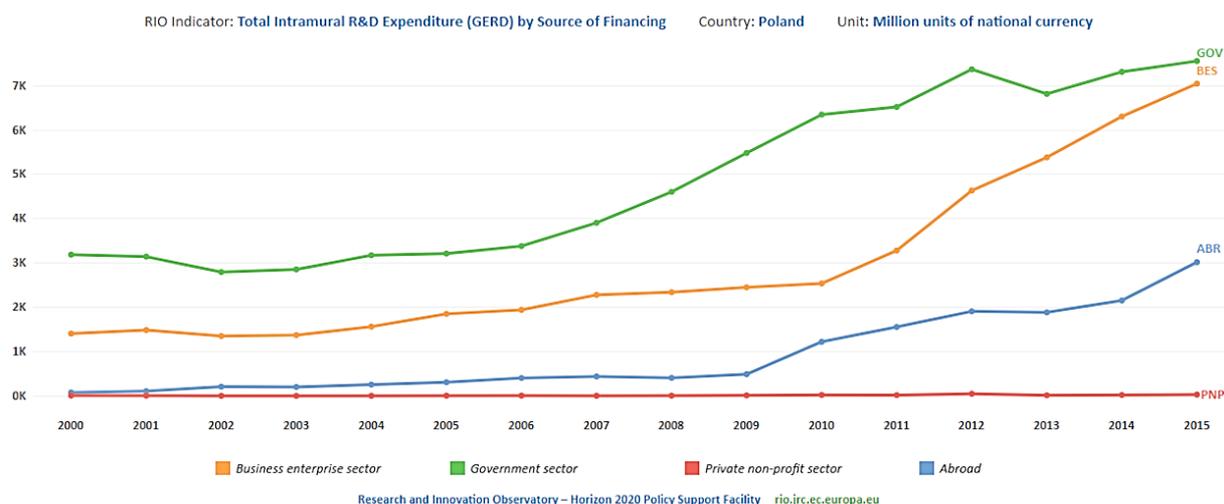


Figure 1 Development of GERD by source of funds.
Data source: Eurostat, November 2016.

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

The public sector is the main recipient of government-funded GERD and these allocations have increased significantly from 2005. Direct contribution from the government to the business R&D is limited, although has constantly been increasing from 2009.

The total government appropriations on R&D had an increasing trend in the years 2005-2015, albeit growing much slower than the Polish GDP. According to the preliminary data available on the 2015 appropriations GBARD has shrunk to €1,305m (from €1,768m in 2014) but similar to last years the final results should be higher. as the national data 2015 budget data show a 10% increase in the budget for science and further increases were announced for 2016 (by 6% compared to 2015). Yet, the plan of the budget for

2017 shows a slight decrease in the budgetary spending on R&D as compared to the 2016 appropriations¹.

Poland has replaced its ineffective tax incentives that used to promote technology acquisition rather than R&D, with a new tax relief effective from January 2016. The tax regulations were further amended in 2016, increasing the tax incentives' size, adding new eligible cost categories, expanding the deduction period and offering additional incentives for start-ups and companies that continuously increase their R&D expenditures. One of the reasons for introducing the R&D tax incentive were attempts to reduce the BERD under-reporting (see: Kapil et al., 2012; EC, 2015: 23; Klincewicz and Szkuta, 2015: 39).

The Polish government managed to exit the excessive deficit procedure while increasing R&D appropriations. Yet, part of the increase was gained through using the EU Structural Funds and the role of ESIF increases year by year (for a more extensive analysis of the trends, see: Klincewicz and Szkuta, 2015). In the longer term (after 2020) this may pose a problem for sustaining budgetary efforts on the existing levels.

4.2 Private R&D expenditure

The Polish BERD has a rather modest intensity but the strong increasing trend from 2010 onwards is worth mentioning. The increases in BERD are matched by increases in the employment of researchers and R&D personnel in business, both indicators showing a positive tendency from 2010 onwards. The current underreporting of BERD is expected to be gradually reduced through the tax incentive schemes effective from January 2016 and further changes to the R&D reporting system.

Manufacturing and services alone account for more than 95% of BERD expenditure and in the period 2010-2012, the BERD intensity in manufacturing and services were similar (for a more extensive analysis of BERD trends, see: Klincewicz and Szkuta, 2015).

The automotive sector (manufacture of motor vehicles), the manufacture of electrical equipment and the pharmaceutical sector are the most important contributors to the Polish BERD (both automotive sector and pharmaceutical growing in 2014 see: Figure 2). The analysis of top sectors in services indicates an important growth of the information and communication services and professional, scientific and technical activities. This can be attributed to the country's role of a supplier of advanced business services with both local investors and foreign capital creating and gradually upgrading the services to software development, clinical studies of new drugs, business research and analytics or supply chain logistics coordination centres. The total outsourcing and offshoring sector in Poland has been growing three times faster than the sector in India in recent years (McKinsey, 2015). The service activities supporting the automotive sector also follow a growing trend from 2008 onwards (see: Figure 2).

The biggest R&D spenders are: ICT companies Asseco Poland and Comarch, domestic pharmaceutical companies Adamed and Polpharma, multinational pharmaceutical companies Amgen, AstraZeneca, Janssen-Cilag and Roche, the defense group PHO (Polski Holding Obronny, formerly Bumar Group) and chemical company Synthos².

¹ <http://www.mf.gov.pl/ministerstwo-finansow/dzialalnosc-finanse-publiczne/budzet-panstwa/ustawy-budzetowe/2017>

² List based on several sources compiled by the authors.

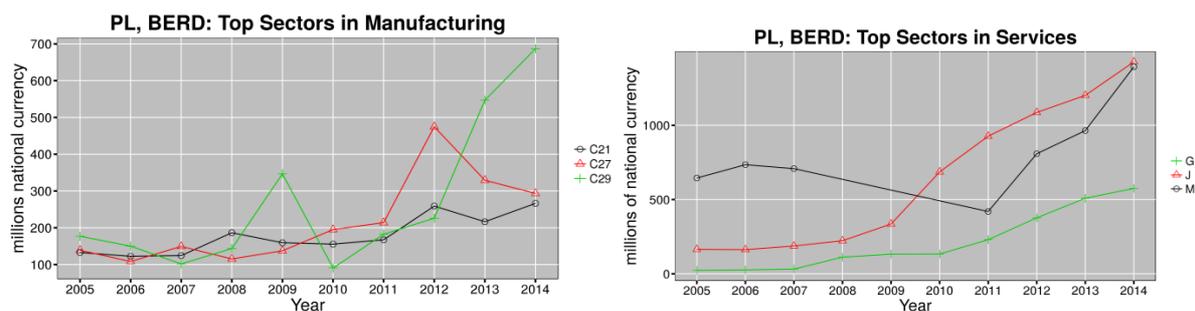


Figure 2 Top sectors: manufacturing (C21: manufacture of basic pharmaceutical products and pharmaceutical preparations; C27=manufacture of electrical equipment; C29=manufacture of motor vehicles, trailers and semi-trailers). Top sectors: service (G=wholesale and retail trade, repair of motor vehicles and motorcycles, J=information and communication, M=professional, scientific and technical activities).

The Polish government started actively attracting R&D FDIs in recent years. The government agency dealing with foreign investments, PAIiIZ, treated R&D investments as a priority and the Ministry of Economic Development offers subsidies to prioritized FDI projects through the 'Programme for the support of investments of considerable importance for Polish economy for years 2011-2020'³. At the same time, the current emphasis of R&I policies seems to be put on promoting indigenous innovations and exports, with no new instruments dedicated to R&D-intensive foreign investors (see: challenge 1). That said the public R&I support measures are available to all business enterprises.

4.3 Public sector innovation and civil society engagement

The Digital Public Services in Poland were ranked in 2016 slightly above the EU average but with decreases in the open data availability and use of pre-filled form by the administration (DESI, 2016). Even though the open government data website DanePubliczne.gov.pl was recently revamped, citizens still encounter problems with obtaining public information, as the government website only includes a limited number of datasets and other data are dispersed and available only upon request. The use of eGovernment services is still low (22% of internet users). Poland allocated significant ESIF funds for introducing public e-services and increasing the level of digital competences of the society in the OP Digital Poland for 2014-2020, with a budget of €2,255,600m. Nevertheless, its improvement is slower than the parallel improvements in the EU as a whole (EC, 2016b; MIR, ERDF, 2014). The government published also the Integrated eGov Programme, a strategic document describing the government's efforts to provide high-quality digital public services. September 2016 saw the launch of the 'one stop' government website: Obywatel.gov.pl. The past eGovernment policy actions and initiatives were perceived as not well coordinated (Mackiewicz, 2015: 256) and rarely co-developed with businesses and citizens. Interestingly, the introduction of a government child subsidiary programme called Family 500+, was prepared in cooperation with banks that opened up their existing electronic channels for the submission of applications, and this innovative approach prompted the government to reflect on projects of collaborative delivery of public services.

Citizen science initiatives are manifold but suffer from limited publicity e.g. projects implemented under the Monitoring of Birds of Poland programme and the project Open Heritage (Otwartezabytki.pl) run by Centrum Cyfrowe Projekt: Polska.

Several non-profit organisations support innovation in Poland, but without playing a major role in the R&I system. So far, their role in R&I policy is mainly advisory, they are also a source of thematic analyses (e.g. recent survey of start-up companies, Skala et

³ http://www.paiz.gov.pl/governmental_grants

al., 2015) or engage in awareness raising activities (e.g. Citizens of Science – Obywatele Nauki). MNiSW's new programme "DIALOG" supporting bottom-up projects by HEIs, PROs, companies, NGOs and consortia (20m PLN (€4.78m) per annum). The programme may stimulate inter-and intra-sectoral dialogue and innovativeness, and may better engage NGOs in the efforts to strengthen the Polish science sector.

5. Innovation challenges

5.1 Challenge 1 Increase the intensity of private R&I

Description

Poland has been gradually increasing the business expenditures on R&D as a result of the catching-up process with its Western European counterparts (0.18% of GDP in 2010 to 0.47% in 2015, more than double in nominal terms). Yet, it continues lagging behind most EU member states, also when compared with other CEE countries (1.06% of GDP in CZ and 1.01% in HU in 2015). Even though the actual business R&D expenditure might be underestimated due to the lack of appropriate incentives for businesses to report them and/or qualify them as R&D costs (Kapil et al., 2012; EC, 2015: 23; NBP, 2016a: 36; Baklarz, 2016), innovation output indicators such as patents show little progress towards a more innovation-driven economy (European Innovation Scoreboard, 2016). Poland scores particularly low on the criteria related to SME innovation (last or second to last among 34 countries included in the ranking), with a declining trend in 2007-2012 for product or process innovation as noted by the 2016 European Semester Country Report (EC, 2016a:26). However, the provisional Community Innovation Survey 2014 results released in 2016 show increases in SME process/product innovation and SME innovativeness (European Innovation Scoreboard, 2016).

Policy response

In March 2016, the Ministry of Finance streamlined the tax bookkeeping standards introducing the obligation to register R&D expenditures regardless of whether they are used for further tax deductions (MF, 2016b).

The *Act on Amendments of Some Acts with respect to the Support for Innovativeness* adopted in September 2015 introduced the definition of R&D efforts to the Polish tax accounting system and allowed companies to classify parts of the R&D expenditures as tax deductible costs starting from 2016. The new government introduced amendments to the tax incentives regime (addressing also the European Semester Country Report's concerns about the effectiveness of these measures for young SMEs): increasing their size 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; adding new eligible cost categories (e.g. costs of patenting); expanding the deduction period (from 3 to 6 years from 2017) and offering additional incentives for start-ups (eligible for cash reimbursements) and companies that consistently increase their R&D expenditures (an additional tax bonus in the fourth year). Finally, it exempts from tax the contributions of intellectual property to a joint stock company.

The National Centre for Research and Development (NCBiR) continues to support business R&D spending with multiple grant programmes, e.g. through public-private partnerships (e.g. CuBR, SYNChem). ESIF-funded sectoral programmes target R&D agendas developed with stakeholder representatives of selected industries in a bottom-up process similar to the entrepreneurial discovery process (e.g. INNOMED or INNOLOT).

The new government puts an emphasis on the role that state-owned enterprises could play in the innovative transformation of the economy. The stronger involvement of these companies in R&I activities is encouraged by the State as the owner of the companies but also through dedicated support measures, e.g. a newly launched scheme for technology accelerators supporting start-up companies, "ScaleUP", required accelerators

to form consortia with large enterprises and explicitly mentioned state-owned enterprises as preferred partners.

Moreover, changes to the modalities of the key ESIF-based R&D funding measures POIR 1.1.1 and POIR 1.1.2, introduced in 2016, allow large enterprises to apply for several projects in one funding call with significantly increased project budgets.

Further changes are foreseen as the Ministry of Science and Higher Education currently works on proposals for legal acts based on the White Paper on Innovation (published in September 2016, MNiSW, 2016e) to be adopted as two consecutive "Acts on Innovation", which will further streamline R&D reporting, introduce the legal status of "innovative company" related to several benefits, and improve tax incentives for R&D efforts). New measures will be also announced based on the Strategy for Responsible Development (SOR) published in February 2017.

Policy Assessment

The recently introduced tax incentives and changes in the tax accounting system are likely to generate further increases of BERD in the coming years, both stimulating companies to increase their spending but also to properly account for existing R&D efforts. The Ministry of Finance offered an estimate of the expected foregone revenue of 4.4b PLN (€1,051.5m) in 10 years (MF, 2016a: 2) but the estimate was not based on strong empirical evidence or econometric modelling of anticipated impacts. The government is aware of the still limited attractiveness of the proposed R&D tax incentives in comparison with countries such as Czech Republic, Hungary or the UK (MNiSW, 2016a: 2) and regards the current legislation as a pilot measure to better estimate and analyse the scale of R&D activities in Poland (MNiSW, 2016b: 7).

The wide-ranging institutional reform of the R&D system commenced in 2010 and all policy measures aimed at leveraging business expenditure seem to have a positive effect on the Polish BERD. The BERD-enhancing measures of the NCBiR have already demonstrated visible outcomes. Although BERD dynamics is lower than the increases in availability of public co-funding. In 2015 the average private co-funding from business enterprises in all programmes financed by NCBiR amounted to only 22.3%. This calls in question the additionality effect of the measures.

The engagement of state-owned enterprises in R&I activities is expected to increase R&D expenditures. Still, it is to be monitored if this will not cut back funding available for privately-owned companies. The Polish state-owned enterprises accounted in 2014 for only 11.93% of BERD (GUS, 2015a: I-10) and 13.1% of Gross Value Added of the industry (GUS, 2016: 91), while the majority of R&I activities were carried out by privately owned companies.

5.2 Challenge 2 Strengthen the science and industry cooperation

Description

The weak linkages between the business sector and public science organisations continue to be a challenge for the Polish R&I system and were subject of Country Specific Recommendations in 2011 and 2013 and the European Semester Country Reports (2011-2016). The bulk of business expenditures in the last years concerned the acquisition and absorption of industrially available technologies (supported both by the previous system of tax incentives and by the EU Structural Funds in 2007-2013). On the supply side, commercialization of R&D results is still not a significant part of the formal performance evaluations of individual researchers or criteria for their academic promotion. Until recently, universities and research institutes were not incentivised for acquiring external sources of financing.

The number of research projects carried out by PHEIs and PROs that were contracted by 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 levels in the EU-28). 10.6% of innovative companies cooperate with higher education institutions compared to 12.2% in CZ and 20.4% in BE (CIS, 2012). The CIS 2014 data show also a decline in the shares of innovative SMEs collaborating with other partners compared to 2012. Counts of joint patent applications and co-publications are insignificant. In 2014, Poland had only 3.66 public-private co-publications per million of population compared to 13.79 in CZ and 33.88 for the EU-28⁴.

Policy response

The majority of applied R&D funding is available either for business enterprises only or to science-industry consortia, with the leading role played by the companies (NCBiR-managed "STRATEGMED", "BIOSTRATEG", a new programme "TECHMATSTRATEG").

The amendments to the Higher Education Act from 2014 foresaw new rules for commercialisation of research in universities with a mix of university ownership and the inventor ownership model but the changes increased the administrative burdens for universities without a noticeable growth of technology transfer outcomes. In 2016, the so-called Small Act on Innovativeness streamlined the procedures to reduce excessive bureaucratic burden so that the inventor ownership model is only considered when explicitly requested by the academic inventor. According to the same Act, public science organisations are also required to spend at least 0.5% of the institutional R&D funding allocated by the government on the commercialisation of research results. The 2015 *Act on Amendments of Some Acts with respect to the Support for Innovativeness* facilitated the transfer of intangible assets to newly created companies and lifted related taxes in 2016-2017 (this lift was extended indefinitely in 2016). In 2016, the Ministry of Finance changed the tax forms, which now have a dedicated annex to list the data on contract R&D commissioned to scientific organisations (tax form "PIT/BR").

The year of 2016 saw also a legislative change streamlining the technology transfer procedures and potentially strengthening the capitalisation of university-owned companies by opening them up to external investors. It was introduced by the Small Act on Innovativeness.

In 2016 a number of measures were launched with the ESIF support, including the PARP-managed programmes "Research for market" and "ScaleUp" targeting consortia of technology accelerators and large companies but with a preference for those involving state-owned enterprises (PARP, 2016a: 2). NCBiR introduced a continuation of the "BRIDGE VC" scheme (POIR 1.3.2) dedicated to VCs investing in more mature, technology-based firms and implemented as an equity-based financial instrument⁵. The agency continues also the strategic R&D programmes for science-industry consortia. The fundamental science funding agency (NCN) and NCBiR jointly run the programme "TANGO 2" (similar to the ERC Proof of Concept grants), the only programme bridging fundamental and applied research funding. NCBiR-coordinated POWER programme supports higher education and teaching initiatives, incl. e.g. "New Teaching Programmes" (for study programmes oriented towards labour market), and "Competence Development Programme" (POWER 3.1, for skills improvement of HEI employees).

The White Paper on Innovation (MNiSW, 2016e) published in September 2016 announces several measures addressing this challenge, including incentives for commercialisation for researchers, support for patenting, the reform of public research

⁴ RIO elaboration based on Scopus data.

⁵ The measure will be supported by the largest insurance company in Poland, PZU S.A., selected in March 2016 to act as a fund of funds, i.e. company holding a portfolio of shares in other investment funds through a dedicated entity 'Witelo Fund'.

institutes or introduction of the industrial doctorates that will be co-financed from the Regional Operational Programmes.

In October 2016, MNiSW published draft amendments to the Act on Scientific Degrees and Scientific Title and Degrees and Titles in Arts, introducing a.o. industrial doctorates.

Policy Assessment

The performance on output indicators remains unsatisfactory, thus questioning the effectiveness of the policy responses from 2010-2015. The existing policy mix supports mainly business enterprises in their collaboration with academia and not vice versa. The low innovativeness of the Polish business sector and especially the SMEs (see challenge 1) and limited interest in new to the market innovations result in a low uptake of knowledge transfer. As a result, it may further enforce the fundamental and applied science division and continuously weaken Poland's score in PCT patent applications (in societal challenges).

The impact of the 2015 regulations on science-industry collaborations remained marginal but the recent amendments to the law from 2016 may increase its efficiency.

Investments in the intersectoral mobility of highly skilled employees in science and technology were so far limited until the recently announced industrial doctorates measure.

5.3 Challenge 3 Increase the quality of the public research base

Description

Poland ranks low among research performers in the EU, as evidenced by the score in the Research Excellence Output Indicator (EIS 2016). The share of the top 10% highly cited publications was at 4.26% in 2012 (compared to 6.28% for the Czech Republic and 14.22% for the top-performing UK). The Polish research output is also less internationally oriented with about one third of publications co-published internationally (the lowest value among all EU-28 Member States) (Scopus data 2013, RIO own calculations), as the current evaluation system with its metric system incentivises quantity rather than quality. Poland benefited in total from only 1.1% of all FP7 funding allocated to beneficiaries from EU-28 and has even lower results in the first calls of Horizon 2020 (based on eCorda database). However, the wide availability of alternative sources of funding for R&D, including state-funded programmes and the EU Structural Funds in the 2007-2013 period, was an important inhibitor for participation in more competitive European research programmes. The 2016 European Semester Country Report (EC, 2016a) pinpoints the lack of improvements in "the quality of scientific activities in Poland" (EC, 2016a: 26).

Policy response

Poland introduced performance-based funding models already in the 1990s. The assessment in 2017 will be carried out according to an updated methodology. In June 2016, MNiSW published a draft ordinance concerning the evaluation of scientific organisations that determines future institutional R&D funding (MNiSW, 2016c). The institutional evaluation will take into account publications and other R&D results from 2013-2016. The methodology relies on quantifiable data such as counts of publications, R&D grants and knowledge transfer revenues, but does not include indicators of broader scientific impacts or even citation-based indicators to incentivise an increase in the quality of publications. In 2016, the Ministry further improved the Information System on Science (POL-on) that aggregates data about researchers, research infrastructures, publications and R&D projects of PHEIs and PROs in order to better monitor the performance of the system.

The European Structural and Investment Funds are used to support the launch and delivery of innovative doctoral studies, with preference for interdisciplinary programmes,

involving international researchers and science-industry collaboration (New Teaching Programmes, International Study Programmes). MNI SW signed a voluntary agreement with interested PHEIs and PROs ("Pact for Horizon 2020"), ensuring additional support for research teams that apply for funding and implement Horizon 2020 projects. A good example of support for research excellence are the highly-selective R&D funding programs offered by the Foundation for Polish Science (FNP), oriented towards internationally competitive projects and international mobility schemes.

The Polish Academy of Sciences established in April 2016 the Office for Scientific Excellence supporting Polish ERC applicants from PROs and HEIs and complementing the activities of the National Contact Point for EU Research Programmes and the network of Regional Contact Points.

In 2016, the MNI SW 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*) (MNI SW, 2016d). The three winning teams will propose competing strategic and legislative proposals (first one was published in November 2016). In parallel Poland ask for a H2020 Policy Support Facility Peer Review of its R&I system (2017). In addition, a call for proposals of various initiatives aimed at improving the quality of science was launched (programme "DIALOG).

In September 2016, the Ministry announced the new Strategy for for Scientific Excellence, Modern Higher Education, Partnership with Business and Responsible Research announced in September 2016 summarising both recently adopted regulations and announcing plans for new changes (incl. the plans to summon the National Congress for Science and create the National Agency for Academic Cooperation).

Policy Assessment

The current institutional evaluation system is excessively focused on simple quantitative indicators, resulting i.a. in the establishment of a large number of academic journals in Poland, allowing scientists to "score points" used in the evaluation. As of December 2015, as many as 2,212 Polish scientific journals were recognised by the Ministry of Science and Higher Education, reducing the incentives for publishing in internationally recognised outlets or pursue ambitious, globally-oriented research projects.

Recent efforts to increase the funding for international co-operation and incentives aimed at raising the Horizon 2020 success rates by increasing the share of public funding for best performers should be closely monitored. Given the low share of international tertiary students and researchers (European Innovation Scoreboard, 2016), important efforts are still needed to attract excellent researchers from abroad to further open and internationalise the Polish research system.

The open collaborative process of preparing the new Act on Higher Education received a lot of attention in the scientific community. Nevertheless, according to the timeline suggested by MNI SW (MNI SW, 2016a), the new act is expected to be ready in 2018, so the current system will be in place for at least next two years.

5.4 Challenge 4 Priority setting in the R&I governance system

Description

The European Commission in its 2012 Country Specific Recommendations pointed out the need for higher concentration of investments in priority areas. Contrary to the previous lack of R&I priorities, the current situation brings several sometimes contradictory directions guiding R&I policy. By the end of 2015, Poland has a large set of priorities, including the National Research Programme from 2011, the National and Regional Smart Specialisation Strategies, sectoral programmes that sometimes do not match the National Smart Specialisation, the NCBiR's strategic programmes as well as

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

The R&I policy is also impaired by the limited effectiveness of evaluation projects, which were not always based on sound and well-designed methodologies. Some of the evaluations related to the 2007-2013 financial perspective were carried out too late to be instrumental in designing new instruments for 2014-2020. Also given the amount of information coming from various evaluation reports, it reduced their usefulness for policy. Finally, the focus on distribution and absorption of funding and monitoring built on simple quantitative and high-level indicators results in a lack of evidence of the economic effects or societal impacts of R&I projects.

Policy response

In 2016, NCBiR made an effort to integrate the extensive lists of National and Regional Smart Specialisations and prepared yet another document called [Regional Science and Research Agendas](#) (RANBs, pl. *Regionalne Agendy Naukowo-Badawcze*). The document is however even broader than the list included in the National Smart Specialisation Strategy.

The draft [Strategy for Responsible Development](#) from July 2016 selects 8 out of 20 National Smart Specialisations as the key directions for R&I support (in a top-down mode, without applying the entrepreneurial discovery process), but also lists strategic industry sectors, key horizontal technologies and sectors selected for internationalisation policies. It further 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 largely modify the set of support measures related to R&I, including changing the focus of public interventions (see: challenge 1), centralising some of the support activities and introducing stronger thematic focus.

Policy Assessment

The extensive sets of priorities in Poland's R&I system may be confusing for R&I stakeholders. Moreover, government agencies were not consistently implementing the selected funding objectives, e.g. two sectoral programmes funded by NCBiR are not consistent with the National Smart Specialisation Strategy (e.g. INNOLOT for aviation industry, or INNOSBZ for unmanned aerial vehicles). In 2016, the complexity of the system further increased owing to new priority lists such as RANBs and the declarations included in the [Strategy for Responsible Development](#). In addition, it is uncertain whether future efforts focused on narrowing-down the list of priorities would involve stakeholders in a manner similar to the entrepreneurial discovery process. The draft Strategy for Responsible Development already includes a list of 8 specialisations pre-selected by the government, and indicates a number of strategic or flagship project areas, for which public funding will be allocated. The narrowing down process is not explained in the Strategy nor referenced with evidence-based analyses of economic and technological strengths, neither is it a result of stakeholders' consultation. At the same time, the document is being open for stakeholders' consultation as of September 2016.

6. Focus on creating and stimulating markets

This section aims at describing and assessing national level efforts to introduce demand-side innovation policies to stimulate the uptake of innovation or act on their diffusion, including public procurement and regulations supporting innovation. It also analyses policy measures aimed at internationalisation of companies with the aim of increasing the innovativeness of the economy.

The Polish strategic documents have been repeatedly mentioning the role of public procurement for innovation. Poland has a formal action plan on Sustainable Public Procurement including Green Public Procurement but the planned activities refer mainly

to sharing information and promotion and do not include any specific procurement targets. The use of PCP and PPI is still limited in Poland. There are only few examples of their implementation, which stem mainly from projects funded by the European Commission, in which the Polish entities have been partners (LCB-Healthcare, EcoQUIP, defence sector).

In 2014, Poland reported an increase in the share of high-technology products export in total export, compared to 2013 (from 6.7% to 7.9%, still far from the EU-28 average being 15.6% in 2014) and in the import of high-technology products (from 10.8 % to 11.3%). 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 (GUS, 2015b). The internationalisation of the Polish economy can also be increased through Foreign Direct Investments (FDI). In the period of 2010-2014, there have been significant swings in both FDI inflows and outflows in Poland. According to NBP data, in 2015 FDI inflow amounted to €12,138m (compared to €14,256.1m in 2011). Outflow of Polish capital abroad stood at €2,897.7m in 2015 and was lower than in 2011 (€5,866.5m) (NBP, 2016b, 2016c). So far, the FDI policies in Poland but also in other Central and Eastern European countries were focused on FDI inflows with the main aim of generating employment in less economically developed regions. Yet, this focus on cost competitiveness attracted mostly low to mid-low technology and required a relatively low-skilled labour force (Radosevic and Stancova, 2015).

The Plan for Responsible Development released in 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, 2016b: 56) and promotes the idea of procurement policy supporting economic growth (MR, 2016b: 66). Moreover, the draft Strategy for Responsible Development (MR, 2016a) mentions the role of public procurement for the promotion of innovative and sustainable products and services (MR, 2016a: 49, 54, 60-61). An example is the planned Electromobility programme, introduced by the Strategy and aimed at stimulating the design and manufacture of Polish electric vehicles, including public transportation vehicles. Corresponding, planned actions include public procurement for innovation (PPI) and pre-commercial procurement (PCP) (MR, 2016a: 74). The White Paper on Innovation (MNiSW, 2016e) also announces measures aimed at popularising PCP and PPI in the Polish administration.

The Ministry of Economic Development offers instruments of export promotion, implemented as *de minimis* aid. In the period of 2012-2014, its predecessor (Ministry of Economy) provided support for 766 enterprises with 5.5m PLN (€1.3m) aid granted (MG, 2015: 64-65). PARP is responsible for the implementation of ESIF-based measures that support the internationalisation of companies. It also coordinates operations of 30 Polish centres that are members of Enterprise Europe Network (EEN), the world's largest network of supporting internationalisation of SMEs.

The Polish government attracts the R&D-oriented FDIs through grants, tax incentives and outreach activities, and has a dedicated agency (The Polish Agency for Information and Foreign Investment, PAIIZ) targeting greenfield projects. Public policies do not foresee additional provisions for brownfield investments or corporate acquisitions by foreign firms that remain regulated by market forces.

The Ministry of Economic Development is currently working on a new model of Polish export support to be finalised by the end of 2016. The Export Support Agency (pl. *Agencja Wspierania Eksportu*) will be the key element of this system. The agency will become a part of Polish Development Fund launched in April 2016 and drawing on experience of PAIZ.

Even though the support for PCP and PPI has been repeatedly declared in governmental documents, as of 2016 public procurement has been rarely used to support innovation. Nevertheless, many innovative solutions and practices were developed and implemented as results of projects commissioned based on public procurement procedures.

There are no systematic activities aimed at assessing the impact of regulation on innovation even though the government agency PARP was tasked already in 2006 to engage in conducting the analysis of the regulations' impact on entrepreneurship and innovation (MG, 2006:25-26). The support system for internationalisation of Polish companies will undergo major changes in 2017.

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List of abbreviations

BERD	Business Expenditures on Research and Development
CEE	Central and Eastern Europe
CIS	Community Innovation Survey
CSR	Country Specific Recommendations
DESI	Digital Economy and Society Index
EC	European Commission
ERA	European Research Area
ERC	European Research Council
ESIF	European Structural and Investment Funds
EU	European Union
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>)
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
KFK	National Capital Fund (<i>Krajowy Fundusz Kapitałowy</i>)
KIS	National Smart Specialisation Strategy (<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>)
MF	Ministry of Finance (<i>Ministerstwo Finansów</i>)
MNiSW	Ministry of Science and Higher Education (<i>Ministerstwo Nauki i Szkolnictwa Wyższego</i>)
MR	Ministry of Economic Development (<i>Ministerstwo Rozwoju</i>)

NBP	National Bank of Poland (<i>Narodowy Bank Polski</i>)
NCBiR	National Research and Development Centre (<i>Narodowe Centrum Badań i Rozwoju</i>)
NCN	National Science Centre (<i>Narodowe Centrum Nauki</i>)
NGO	Non-governmental Organization
NIK	Supreme Audit Office (<i>Najwyższa Izba Kontroli</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
PFR	Polish Development Fund (<i>Polski Fundusz Rozwoju</i>)
PLN	Polish zloty
PNP	Private non-profit sector
POIR	Operational Programme Smart Growth (<i>Program Operacyjny Inteligentny Rozwój</i>)
POWER	Operational Programme Knowledge Education Development (<i>Program Operacyjny Wiedza Edukacja Rozwój</i>)
POPW	Operational Programme Eastern Europe (<i>Program Operacyjny Polska Wschodnia</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
R&I	Research and innovation
RIS	Regional Smart Specialisation Strategy (<i>Regionalne Inteligentne Specjalizacje</i>)
SOR	Strategy for Responsible Development (<i>Strategia na rzecz Odpowiedzialnego Rozwoju</i>)
SME	Small and Medium-sized Enterprise
TFP	Total Factor Productivity
Y-O-Y	Year Over Year

Factsheet

	2009	2010	2011	2012	2013	2014	2015	2016
GDP per capita (euro per capita)	8300	9400	9900	10100	10200	10700	11100	
Value added of services as share of the total value added (% of total)	63.68	63.92	62.83	63.42	64.52	63.85	63.25	
Value added of manufacturing as share of the total value added (%)	18.5	17.68	18.1	18.44	17.91	18.92	19.69	
Employment in manufacturing as share of total employment (%)	19.28	18.58	18.71	18.6	19.02	19.1	19.37	
Employment in services as share of total employment (%)	55.77	56.88	56.65	57.27	57.75	58.3	58.21	
Share of Foreign controlled enterprises in the total nb of enterprises (%)	0.42	0.42	0.43	0.44	0.46			
Labour productivity (Index, 2010=100)	93.7	100	104.7	106.5	108.3	109.6	111.8	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34				0.41	0.48	0.44		
Summary Innovation Index (rank)	28	28	29	29	30	30	29	
Innovative enterprises as a share of total number of enterprises (CIS data) (%)				23		21		
Innovation output indicator (Rank, Intra-EU Comparison)			19	20	19	20		
Turnover from innovation as % of total turnover (Eurostat)		8		6.3				
Country position in Doing Business (Ease of doing business index WB)(1=most business-friendly regulations)						28	25	24
Ease of getting credit (WB GII) (Rank)						16	18	
Venture capital investment as % of GDP (seed, start-up and later stage)	0.001	0.002	0.007	0.002	0.006	0.006	0.007	
EC Digital Economy & Society Index (DESI) (Rank)						22	22	22
E-Government Development Index Rank		45				42		36
Online availability of public services – Percentage of individuals having interactions with public authorities via Internet (last 12 months)	25	28	28	32	23	27	27	30
GERD (as % of GDP)	0.66	0.72	0.75	0.88	0.87	0.94	1	
GBAORD (as % of GDP)	0.33	0.36	0.31	0.35	0.36	0.43	0.31	
R&D funded by GOV (% of GDP)	0.4	0.44	0.42	0.45	0.41	0.43	0.42	
BERD (% of GDP)	0.19	0.19	0.22	0.33	0.38	0.44	0.47	
Research excellence composite indicator (Rank)				24				
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country		4.13	4.04	4.24	5.01			
Public-private co-publications per million population	2.88	4.37	4.68	3.57	3.57	3.66		
World Share of PCT applications	0.14	0.16	0.16	0.16	0.19	0.17		

List of Figures

Figure 1 Development of government funding of the total GERD. 8

Figure 2 Top sectors in manufacturing (C21: manufacture of basic pharmaceutical products and pharmaceutical preparations; C27=manufacture of electrical equipment; C29=manufacture of motor vehicles, trailers and semi-trailers). Top service sectors (G=wholesale and retail trade, repair of motor vehicles and motorcycles, J=information and communication, M=professional, scientific and technical activities). 10

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