Return on Investment of Public Support to SMEs and Innovation in Poland

Needs Assessment and Portfolio Mapping Technical Note

January 2020

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ACRONYMS

BERD – Business enterprise sector expenditures on R&D
BGK – National Economy Bank
BSI – Business Support Institutions
CPR – Common Provisions Regulation
EC – European Commission
EU – European Union
ESIF – European Structural and Investment Funds
FTE – Full time equivalent
GDP – Gross domestic product
GERD – Gross expenditures on R&D
GovED – Government expenditures on R&D
HEI – Higher education institutions
HERD – Higher education expenditures on R&D
IA – Implementing Authority
ICT – Information and communications technology
IPR – Intellectual property rights
LHS – Left-hand side (primary axis)
MA – Managing Authority
MoF – Ministry of Finance
MFF – Multiannual Financial Framework
MIiR – Ministry of Investments and Economic Development
MNiSW – Ministry of Science and Higher Education
MPiT – Ministry of Entrepreneurship and Technology
NCBR – National Centre for Research and Development
NCN – National Science Centre
NUTS – Nomenclature of Territorial Units for Statistics
OPI – National Information Processing Institute
OPIE – Operational Programme Innovative Economy
OPSG – Operational Programme Smart Growth
PARP – Polish Agency for Enterprise Development
PFR – Polish Development Fund
R&D – Research and development
RDI – Research and development institute
ROI – Return on Investment
ROP – Regional Operational Programme
RHS – Right-hand side (secondary axis)
S3 – Smart Specialization Strategy
SEZ – Special economic zones
SME – Small and medium-sized enterprises
SRD – Strategy for Responsible Development
STI – Science, technology and innovation
TO – Thematic Objective
TRL – Technology readiness level

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PROJECT OVERVIEW

A "Smarter Europe" is a top priority of the European Union (EU), the core of which is innovation, economic transformation, and more competitive small and medium enterprises (SMEs). These themes account for a huge part of EU spending in the past, present, and (likely) future programming periods. Despite high expenditures, impacts on the economy often appear modest or are not well understood. EU, national, and regional policymakers want to know where and how to invest to get the highest return on investment (ROI).

This project responds to a request from the European Commission to develop and pilot methodologies to measure and improve innovation and SME support instruments. Poland was selected as the pilot country, since it is the largest recipient of EU funding, and has a rich set of support measures and implementing bodies. Drawing on the World Bank's framework for *Public Expenditure Reviews in Science, Technology, and Innovation*, the project starts by examining the inputs to the innovation ecosystem, including economic priorities, government policies, and support instruments. It then analyzes the functioning of the support instruments, and ultimately the impacts on firm performance (that is, the return on investment / effectiveness). A combined understanding of these different dimensions gives public authorities a view into where and how innovation and SME support mechanisms can be improved. To our knowledge, this is the most comprehensive and robust analysis of EU support to SMEs and innovation to date.

1. Needs assessment and portfolio mapping analysis

A brief overview of Poland's innovation ecosystem was prepared to understand the country's needs and policy priorities. This "needs assessment" highlights the main weaknesses in innovation-related outcomes and challenges in Poland compared to its regional and aspirational peers. Examples of the identified challenges relate to the productivity growth of new firms, the sophistication of production and exports, and firms' capabilities (for example, management skills).

The characteristics of all the current (2014–2020) innovation and SME-related EU and nationally funded instruments were then mapped. At the national and regional levels, 182 support measures—corresponding to about €21 billion—were mapped across 14 dimensions, including: objectives, beneficiary types, support mechanisms, implementing bodies, and others. The 11 largest instruments account for half of all funding, while the remainder is split between 171 instruments. The combination of the needs assessment and the portfolio mapping permitted an analysis of the 'policy mix'. The policy mix analysis compares whether the current set of support instruments is aligned with Poland's innovation-related and strategic needs and priorities, and seeks to identify potential gaps and overlaps. Four recommendations are offered:

- Reduce fragmentation and overlap between support instruments, including through increased coordination between national and regional authorities
- Consider narrowing the focus of regional instruments to adapt to local conditions
- Improve support for management and export capabilities, and young firms
- Improve the use of evidence when choosing support mechanisms

2. Functional analysis

The functional analysis examines how the design, implementation, and governance of selected support instruments in the current EU financing perspective compare to international best practices. It aims to identify how the functionality of support instruments could be adjusted to increase the return on investment of public support. Through a series of semi-structured interviews with the managers of 21 support instruments (primarily at the regional level), detailed information on 31 dimensions of instrument design, implementation, and governance was obtained. Examples of good practices in instrument design include the identification of products and outputs, and the consideration of relevant stakeholders. Examples of good practices in instrument implementation include efficient application and selection processes, as well as project and instrument closure procedures. Additionally, the functionality of the national instruments appears somewhat better than the regional ones. Identified challenges relate to the improvement of:

- Coordination between national and regional programs
- Flexibility in the design and implementation of instruments (particularly at the regional level)
- Instrument justification, and aligning instrument design with the desired systemic change
- Operational planning, particularly with respect to better targeting instruments toward firms where the impact of public support is likely to be the highest

3. Return on investment / effectiveness analysis

An ex post impact evaluation of the 2007–2013 EU-funded innovation and SME-related support instruments was undertaken. In partnership with Statistics Poland, the direct impact of the support was estimated using firm-level data and a difference-in-differences (DID) with propensity score matching approach. Indirect/spillover effects were estimated as well. Multiple estimation models were used to make the analysis as robust as possible. The analysis provides evidence on the impact of different types of support on: firm revenues, profits, exports, value added, research and development (R&D), and productivity as well as, ultimately, on the return on investment (ROI) of public support.

The analysis found positive impacts on firm employment, sales, value added, and exports. This result is consistent across the different estimation models. In contrast, there is mixed evidence on the impact on productivity, depending on the productivity measure used. However, productivity impacts were higher for firms in the manufacturing sector. Lastly, there is minimal evidence that the programs affected investments (either physical assets or R&D) and profits. These findings are broadly similar to earlier studies, such as GUS (2015), which examined the impact for a more limited set of programs or firms. The estimated impact from the support measures translates to an estimated average cost per job gain that compares favorably to available estimates of programs in other countries. Support measures emphasizing R&D, innovation, exports, and access to markets appear significantly more cost-effective in job creation than programs with small capital grants or those focusing on access to finance.

A **Summary Report** brings together the findings from the different pieces of the analysis. It provides insights on where and how innovation support mechanisms could be adjusted to improve the return on investment during the upcoming EU financial perspective (2021–2027). It also offers some considerations for the application of the methodology in the future, both in Poland and other countries. Key messages concern:

- Designing and targeting instruments to maximize impact (based on clear needs assessments), including a smarter approach to supporting young firms, exports, small firms, and firm capabilities
- Reducing inefficiencies (fragmentation and overlap, for instance) and improving coordination and learning

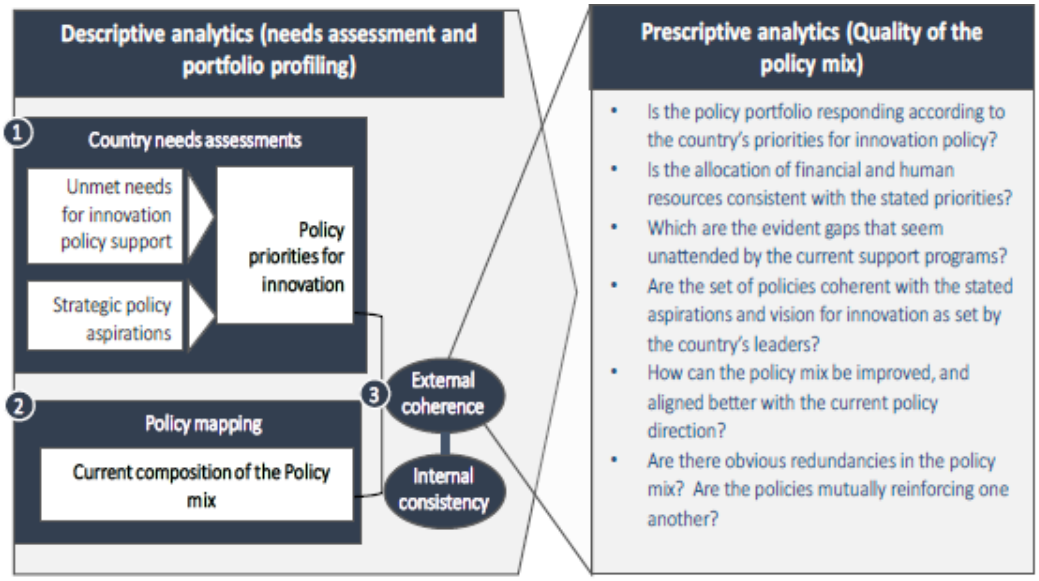
Technical Notes detailing the full methodologies and findings were prepared for each of the three dimensions. The subject of this Technical Note is the **needs assessment and portfolio mapping analysis.**

INTRODUCTION

The policy mix analysis combines an assessment of Poland's innovation-related challenges and a mapping of the portfolio of SME and science, technology, and innovation (STI) instruments available to firms. The needs assessment highlights the main challenges in the innovation environment and benchmarks Poland against a group of regional and aspirational peers. The analysis assesses outcomes and outputs (e.g. productivity and sophistication of production) against input determinants and conditions, such as firm capabilities, enabling environment, supply of knowledge and competitive pressures. The assessment aims at understanding Poland's needs for STI and business support policies and the challenges linked to achieving the desired results. It also looks at how the needs are reflected in strategic priorities and the gaps that need to be bridged to improve the policy mix.

The portfolio mapping catalogues all existing business support instruments and their characteristics relating to resource allocations (e.g. the size of support), managing and implementing authorities, objectives, types of beneficiaries, types of instruments, and so on. The analysis of the mapping identifies overlaps between instruments and gaps in STI support. An assessment of the needs of the innovation ecosystem helps identify areas where public support could be enhanced to support key economic objectives. The portfolio mapping provides a picture of whether resources in the current (2014-2020) financing perspective are going to themes and types of beneficiaries with the highest ROI during the 2007-2013 perspective. While many of the operational details changed between the previous and current perspectives (e.g. weighting of different themes, eligibility criteria), similar objectives are supported across both perspectives, e.g. R&D grants for SMEs. The combination of the above inputs provides a more evidence-based foundation for STI policy. Figure 1 presents the framework of the policy mix analysis.

Figure 1. Framework overview



Source: World Bank analysis

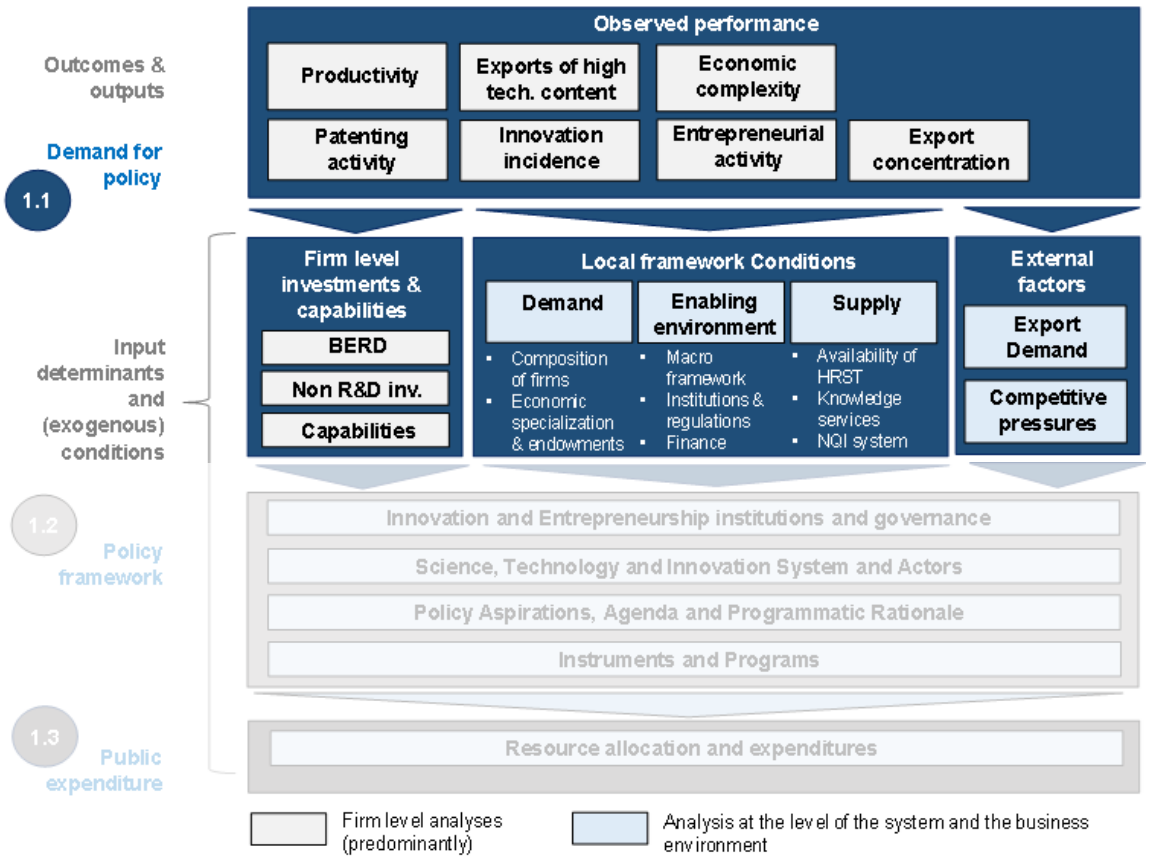
1. NEEDS ASSESSMENT

1.1 Methodology

The analytical framework that we use to assess the country's needs characterizes the underlying demand for SME policy against the existing policy framework and provision of support in the form of policies and programs. The analysis sheds light on how consistently the availability of the country's existing policies and programs responds to that demand. The observed gaps (if any) enables to identify possible action steps towards bridging them.

The approach for this analysis recognizes that not all the observed parameters remain under the control of the policy makers, and as such, many determinants of demand represent exogenous variables, such as external competitive pressures and other contextual macroeconomic variables, e.g. interest rates. The needs assessment is organized as follows: 1) Outcomes: Observed performance, 2) Inputs that influence the observed outcomes: Firm level investments and capabilities; 3) Local framework conditions; and 4) External factors (Figure 2).

Figure 2. Analytical framework to assess demand for innovation – Country needs assessment



Source: World Bank analysis

The results of the country needs assessment focuses on economic outcomes and identified gaps in the innovation-related outcomes of the Polish economy. The analytical approach compares Poland's performance to regional and aspirational peers. The regional peers were selected based on geography and proximity, as well as similarity in economic characteristics. Korea and Germany were selected as aspirational peers. The EU-28 average is also used as an aspirational benchmark.

Table 1. Selection of benchmarking countries

		Color Coding
Focus	Poland	
Regional peers	Czech Republic Hungary Slovak Republic Romania	
Aspirational peers	Germany Korea EU-28 average	

Source: World Bank analysis

The country's needs assessment relies on secondary sources of data collection to produce information. They are mostly comprised of databases that compare countries and ecosystems. The source of data is indicated below each graph or statement, with information from the World Bank World Development Indicators, Eurostat Structural Business Statistics, Statistics Poland, The Conference Board, and others.

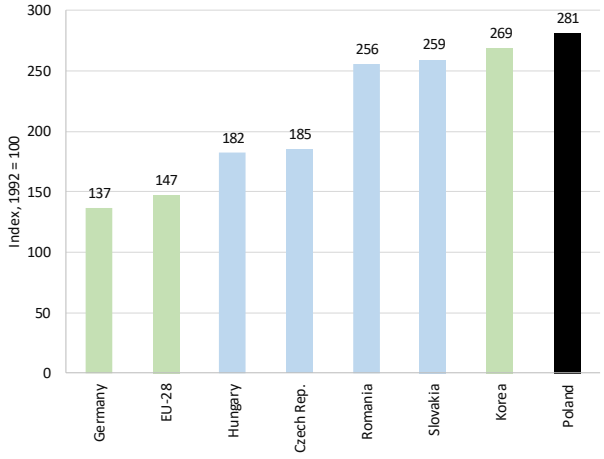
1.2 Outcomes that matter: Some stylized facts on Poland's growth and productivity dynamics

"Productivity isn't everything, but in the long run it is almost everything" Paul Krugman

1. Poland was one of the fastest growing economies during 1992-2017, with capital accumulation contributing the most to this growth

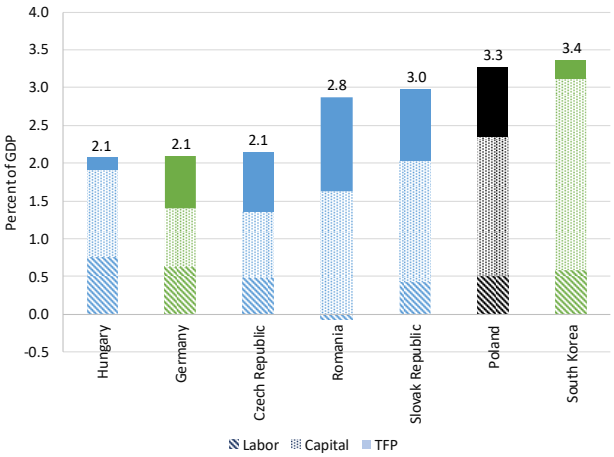
Poland experienced one of the fastest gross domestic product (GDP) per capita growth rates in the world in the last 25 years (Figure 3). Capital has been the largest contributor to GDP growth between 2010-2017, similar to Poland's regional peers (Figure 4). The contribution of labor has been positive due to decreasing unemployment, large labor cohorts entering the market, and improvements in workforce educational attainment. Total factor productivity (TFP) contributions were similar to labor. Fast catch-up helped eliminate the gap in GDP per capita with Hungary, increased the lead over Romania, and narrowed the gap with all other peers. However, Poland is still lagging behind Slovakia and the Czech Republic in GDP per capita. With an aging society, productivity improvements will be crucial for maintaining growth.

Figure 3. Change in GDP per capita, PPP (constant 2011 international US$) between 1992 and 2017, 1992= 100



Source: World Development Indicators

Figure 4. Decomposition of GDP growth, 2010-2017

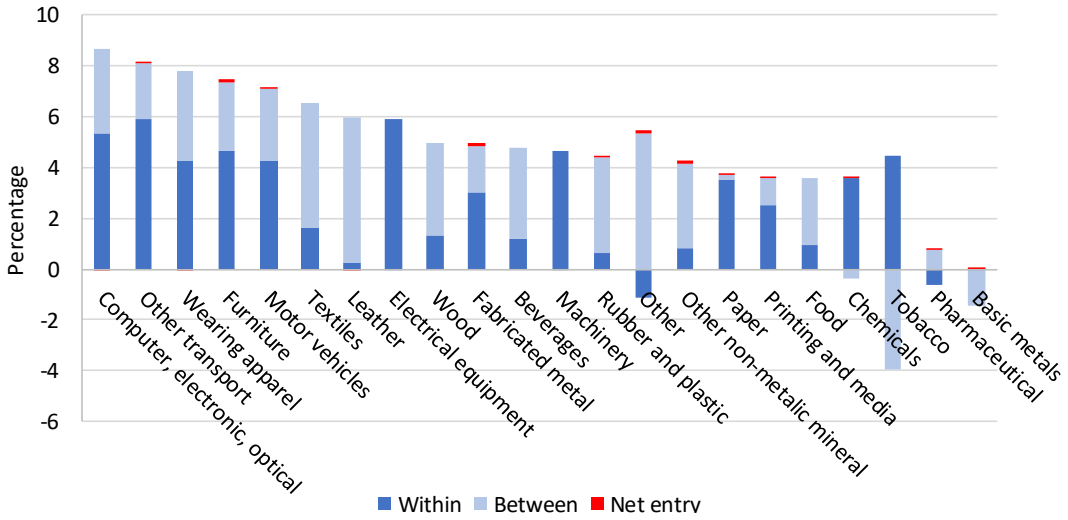


Source: The Conference Board

2. New firms make limited contributions to productivity growth relative to incumbents, while high TFP growth is not necessarily limited to the high-tech sector

New firms have a negligible contribution to productivity growth relative to incumbents. For most sectors, the main contributors to productivity growth are existing firms that increase their productivity (within), closely followed by productive firms gaining market share (between). Looking across sectors, for typically low-tech sectors productivity growth was more frequently through the "between" channel (e.g. leather, textiles, wood, food), whereas for high-tech, the "within" channel is more important (e.g. computers, el. equipment, machinery). The fastest TFP growth was observed among several low-tech industries, such as furniture, wearing apparel, textiles and leather, in addition to typically high-tech industries such as computers and vehicles. At the same time, some typically high-tech industries, such as pharmaceuticals and chemicals, had the slowest TFP growth.

Figure 5. TFP growth across selected industries in Poland, 2006-2014

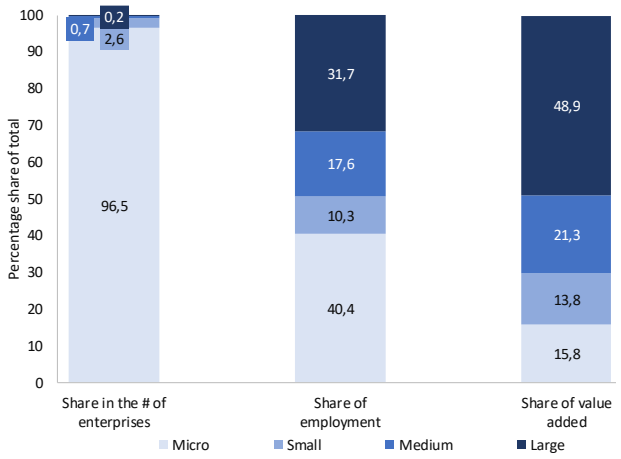


Source: Albinowski, Hagemejer, Lovo, Varela (2015)

3. *Foreign firms and large firms make disproportionally large contributions to the economy*

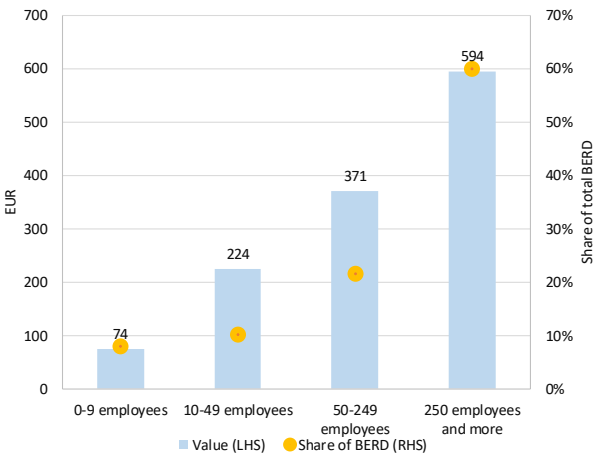
The share of micro and small enterprises in Poland is similar to most of the peers. Over 95 percent of entities are micro firms, which represent 40 percent of employment and generate 16 percent of value-added. Only 2 out of 1,000 firms are large, but they employ a third of a workforce and produce half of the value-added of the Polish economy (Figure 6). Large companies account for over 60 percent of investment and R&D expenditures. Moreover, they invest disproportionally more on R&D per employee: 5 times more than microenterprises, 3 times more than small enterprises, and 70 percent more than medium enterprises. The same pattern can be observed for business expenditures on R&D (Figure 7).

Figure 6. Contribution to the Polish economy by firm size, 2017



Source: Statistics Poland

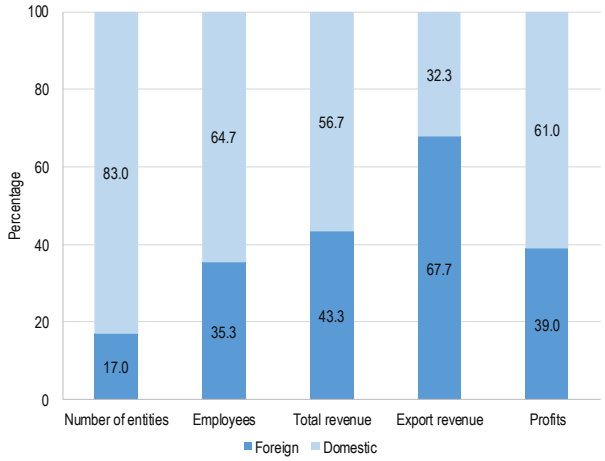
Figure 7. Business expenditures on R&D per person employed by firm size, 2017



Source: Eurostat

Overall only 0.5 percent of all companies are owned by foreigners, nonetheless, 17 percent of firms with at least 10 employees (i.e. small, medium and large) have foreign ownership. While foreign companies account for one third of employment, they generate 40-45 percent of total revenue, profits, and R&D expenditures (Figure 8 and Figure 9). Foreign firms are also the driving force behind Poland's international trade, accounting for two-thirds of exports. Additionally, foreign companies account for most of the production value in a few high-tech industries: transport equipment, computer products, and electronic equipment.

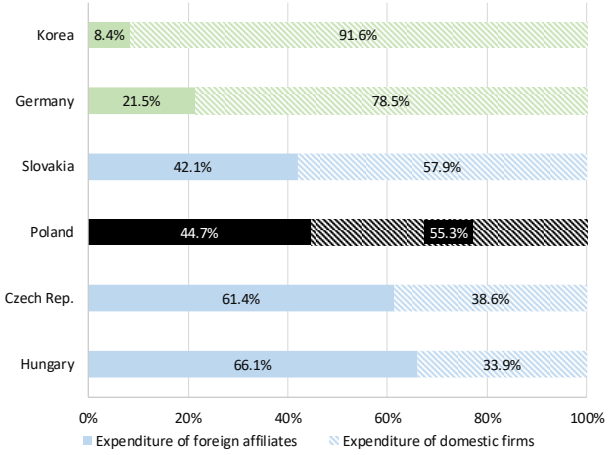
Figure 8. Economic contributions of companies with domestic and foreign capital, 2017*



Source: Statistics Poland

**data on companies with 10 or more employees*

Figure 9. Share of R&D expenditures of domestic firms and foreign affiliates, 2017

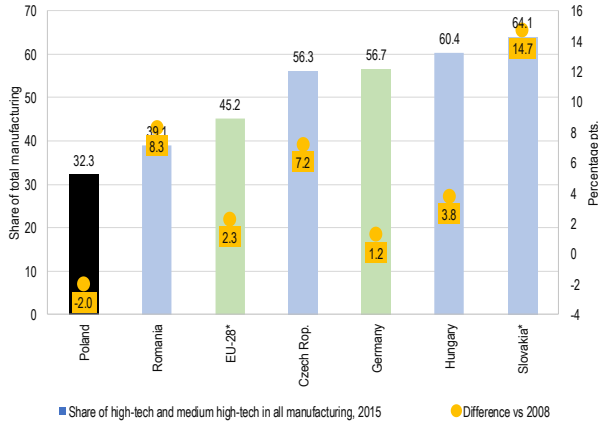


Source: OECD STI database

4. The sophistication of production and exports could be elevated

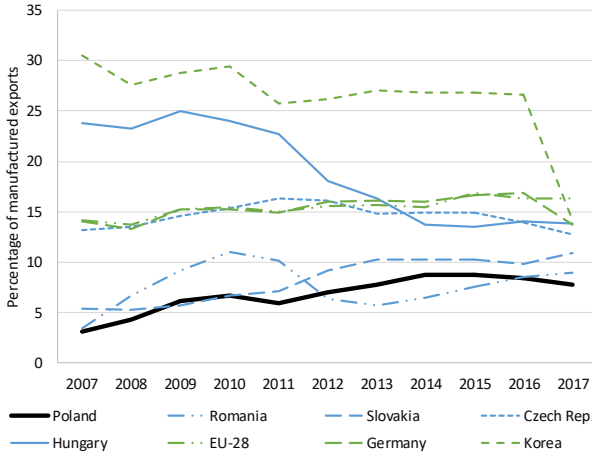
In the long run, the sophistication of production and ability to upgrade technology, regardless of the sector, can drive productivity growth. Compared to its regional peers, the share of high-tech and medium tech manufacturing in Poland is low (Figure 10). Moreover, among the comparators, Poland is the only country in the group to decrease the share of high-tech and medium high-tech manufacturing production since 2008, which indicates that technology intensity in manufacturing production is growing more slowly than the whole economy. The structure of the Polish economy is also reflected in the composition of its exports. The share of high-technology exports in Poland is similar to that in Romania, but behind other regional and aspirational peers (Figure 11).

Figure 10. Share of high-tech and medium high-tech in manufacturing, and change in the share, 2008-2015



Source: Eurostat SBS

Figure 11. High-technology exports (as a % of manufactured exports), 2007-2017



Source: World Development Indicators

1.3 Gaps in Polish innovation: Inputs that influence outcomes

1. Poland is not doing as well as its peers on innovation

The innovation ecosystem in Poland is one of the least developed in the EU. During the last few years, Poland has occupied the 4th to last place on the European Innovation Ranking, ahead of Romania, Bulgaria and Croatia. According to the European Innovation Scoreboard, Poland exhibits the most significant challenges in the areas of intensity of innovation activities (small number of innovative firms, rudimentary cooperation on R&D projects) and framework conditions (despite one of the highest shares of population that has completed tertiary education among the EU Member States).

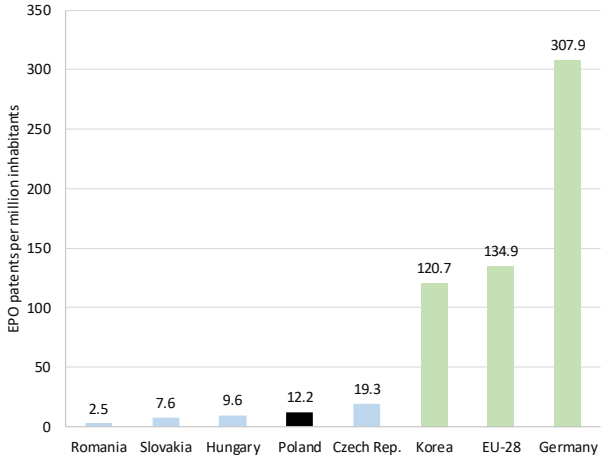
At the same time, enterprises in Poland do not report higher barriers to innovation than its peers (European Commission Community Innovation Survey, 2016). Lack of good ideas and high costs related to innovation are the main reasons prohibiting firms from engagement in R&D projects. Almost 1 in 4 enterprises in Poland considered undertaking innovative activities but chose not to due to high barriers. Similar problems are reported by other Central and Eastern European countries, except that respondents in Hungary, Romania and Slovakia point out low market demand as the most important barrier.

General conditions for entrepreneurial activity in Poland are more favorable than among regional peers, however some distance to Germany and Korea remains (2019 Ease of Doing Business Ranking). The biggest deficiencies persist in starting a business and enforcing contracts, which are particularly important for the development of innovative enterprises. In recent years, performance in these categories has improved, but the pace of change has been slow.

2. *Lower commercialization of innovation activity*

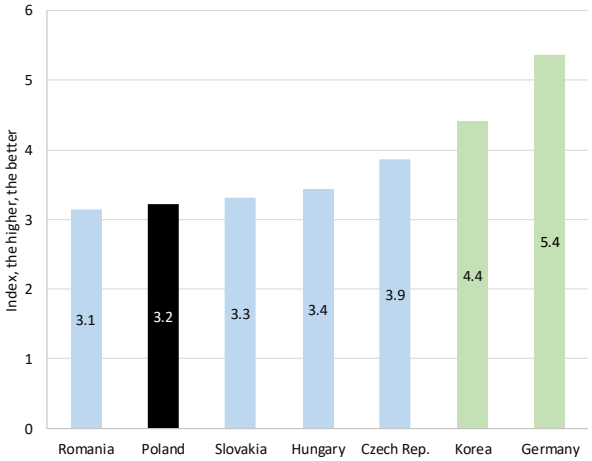
The number of patents per 1 million inhabitants in Poland is higher than among regional peers, but the applicability of patents is low. Polish scientists and companies register 12 patents per 1 million inhabitants in the European Patent Office, more than Hungary, Slovakia and Romania but less than the Czech Republic, Germany and South Korea (Figure 12). However, the implied suitability of patents for business applications is limited: the number of patents registered in the European, United States, and Japanese patent offices (so called 'triadic' patent families, which indicates high applicability of the patent) is smaller than all peers except for Romania. The distance to aspirational peers is also higher for triadic patents. One of the reasons for low patenting activity might be limited cooperation between science and industry. According to data from the Global Competitiveness Index, the intensity of university-firm collaboration in Poland is lower than among all peers except Romania (Figure 13).

Figure 12. High-tech applications to European Patent Office per million inhabitants, 2017



Source: Eurostat

Figure 13. University-Industry Collaboration in R&D, 2017

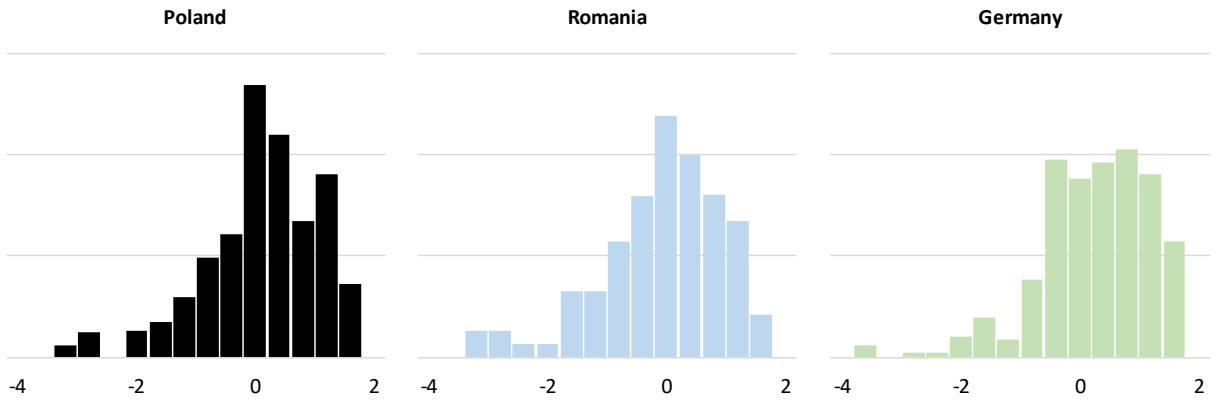


Source: World Economic Forum, Global Competitiveness Index

3. *Lower firm capabilities, low rates of technology adoption*

Polish enterprises report low adoption and readiness for new technologies. According to the Technological Readiness Index, which takes into account the level of technological adoption and information and communications technology (ICT) use, Polish companies perform below regional and aspirational peers. Moreover, Poland ranks 6th out of 12 EU Member States included in the World Management Survey assessment of managerial capabilities. On average, managerial capabilities in Poland are not far from the frontier, but the distribution of management scores across Polish firms is spread out, pointing to a large number of companies with management practices that are significantly below average (Figure 16).

Figure 14. Distribution of management scores, 2008-2010



Source: EBRD Management, Organization and Innovation Survey

1.4 Needs assessment summary and recommendations

Despite impressive growth in GDP per capita in the last 25 years, Poland is still lagging behind the Czech Republic and Slovakia as productivity growth makes limited contributions to overall growth. Moreover, production in the Polish economy remains much less sophisticated relative to regional and aspirational peers. The share of high-technology exports in manufactured exports is the lowest among the comparator countries (along with Romania). Expenditures on R&D, cooperation between science and business, and commercialization of research are all low. As a result, Poland is near the bottom of the EU-28 Innovation Scoreboard ranking, ahead of only Romania, Bulgaria and Croatia. Firm capabilities that can help enhance managerial skills and technology adoption could help improve innovation-related outcomes.

With an aging society, the importance of productivity for maintaining growth will increase. Suggestions for boosting productivity include:

i) Strengthen linkages between small or young firms and foreign or large companies;
ii) Support activities that help firms improve the sophistication of production and exports;
iii) Facilitate the participation of young firms in support programs;
iv) Improve firm capabilities, especially management and technology adoption skills.

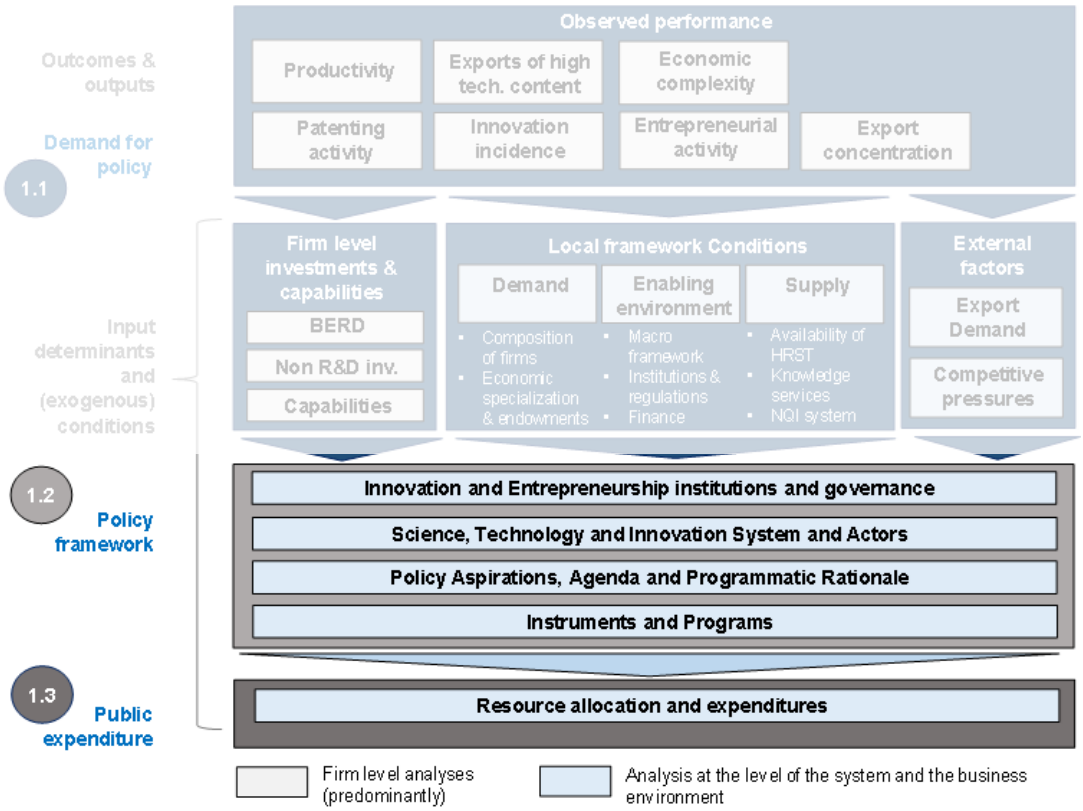
2. PORTFOLIO MAPPING

2.1 Introduction

The portfolio mapping catalogs all existing business support instruments and their characteristics relating to resource allocations (for example, the size of support), managing authorities and implementing bodies, objectives, types of beneficiaries, types of instruments, and so on. The analysis of the mapping identifies overlaps between instruments and gaps in STI support. An assessment of the needs of the innovation ecosystem helps identify areas where public support could be enhanced to support key economic objectives. The portfolio mapping provides a picture of whether resources in the current (2014–2020) financing perspective are being directed to the themes and types of beneficiaries with the highest ROI during the 2007–2013 perspective. While many operational changes occurred between the previous and current perspectives (for example, the shift from capital investment toward business R&D, the wider use of financial instruments, and the limited financing of new infrastructure), similar objectives are supported across both perspectives, (for instance, R&D grants for SMEs). The combination of the above inputs provides a more evidence-based foundation for STI policy. The portfolio mapping provides insights in five main areas:

1. Detection of overlaps in instruments (with special focus on the relationship between national and regional level interventions);
2. Coherence of the mix by objectives, departments, instruments used and types of beneficiaries;
3. Analysis of budget concentration across instruments, objectives and beneficiaries;
4. Analysis of instruments homogeneity – i.e. concentration of instruments with similar characteristics;
5. Assessment of the minimum impact scale – probability that the magnitude of budget allocation will achieve significant impact.

Figure 15. Approach to assess policy priorities for innovation - Portfolio mapping



Source: World Bank analysis

Each of the topics is analyzed in detail below. The results of the portfolio mapping include information on entities in charge of managing support for innovation, distribution and budget allocations per objectives and R&D stages, form of support, and final recipients.

2.2 Methodology

The portfolio mapping catalogs support instruments and budget allocations and identifies responsible institutions (points 1.2 and 1.3 in Figure 15. **Approach to assess policy priorities for innovation - Portfolio mapping**). It provides the basis for analyzing the alignment between the demand for innovation (the country's needs) and the portfolio of support instruments and helps identify potential overlaps and gaps.

The analysis includes information about all public instruments that support firm development financed from national and European sources (Thematic Objectives 1 and 3).[1] The unit of analysis is an individual

[1] Interventions implemented under Thematic Objective 1 – Research and Innovation and Thematic Objective 3 – Competitiveness of small and medium-sized firms, constitute together STI support instruments analyzed in this document.

support instrument, which is defined as a measure (pol. działanie) or, if available, a sub-measure (pol. poddziałanie).[2]

National: All EU co-financed support instruments aimed to support firm development in the 2014-2020 financial perspective managed by the Ministry of Investments and Economic Development (MIiR):

- Implemented under Thematic Objective 1 – Strengthening research, technological development and innovation;
- Implemented under Thematic Objective 3 – Enhancing the competitiveness of SMEs;
    - Excluding instruments for the small-scale piloting of new interventions and monitoring of national smart specializations.

Domestic: All instruments targeted to support firm development financed from national resources implemented in 2014-2018 managed by the Ministry of Science and Higher Education (MNiSW).

Regional: All EU co-financed support instruments targeted to firms in 2014-2020 financial perspective managed by the 16 Marshals' Offices:

- Implemented under Thematic Objective 1;
- Implemented under Thematic Objective 3;
    - Excluding instruments for the development of investment areas.

The policy mix assessment required creation of a matrix containing detailed information about each STI support instrument included in the scope of the analysis. The structure of the matrix was adapted to the Polish context and consists of 14 dimensions *(number of variables in each category in brackets)*:

- General (15)
- Form of support (8)
- Alignment with Strategy for Responsible Development (SRD)[3] (8)
- Intervention objective (8)
- Supported R&D phases (7)
- Firm development (4)
- Sectoral orientation (3)
- Geographic coverage (2)
- Beneficiaries type (7)
- Target group (7)
- Enterprise size (4)
- Support parameters (3)
- Budget source and split (7)
- Concluding remarks (1)

Detailed information on variables in individual categories is provided in Annex 2. Data on the 14 dimensions were collected for each of the 182 identified instruments, resulting in over 15,200 data points. Descriptive multivariate statistics tools were employed (including cross-tabulations, conditional distributions and graphical representations) to describe the relationship between variables. Calculations were performed on two types of data: number of instruments and, when possible, value of instruments.

[2] Not all measures are further broken down to sub-measures. The decision to divide interventions into measures and sub-measures depends on the managing authority. This breakdown affects the count of the total number of instruments but has limited impact when characteristics of instruments are analyzed.

[3] Strategy for Responsible Development – a key document of the Polish State in the field of the medium- and long-term economic policy adopted by the resolution of the Council of Ministers on February 14, 2017.

Data was sourced from program documentation, which was supplemented by a review of EU and national regulations. Sources of data used for the analysis include program documentation (Partnership Agreement between Government of Poland and the EC, Detailed Descriptions of Priority Axes for Smart Growth Operational Programme and 16 regional operational programs (ROPs)) and strategic documentation (Strategy for Responsible Development, regional and local development strategies). To better interpret the results, a review of EU and national regulations was performed.

For selected categories, no direct information was available in the data sources. In such cases, assignment to particular variables was done by the World Bank team (e.g. in Alignment with SRD or Intervention objective categories). To ensure high quality of data gathered in the portfolio mapping matrix, data about instruments was validated with the respective managing authorities to ensure the accuracy. This was particularly important for the categories where the intended rather than *de jure* characteristic of an instrument was needed (e.g. stage at which the company is supported). Consequently, an accurate representation of all STI support instruments implemented in Poland was obtained. The timeline of instrument profiling is presented in Figure 16.

Figure 16. Timeline of creation of portfolio mapping matrix

Source: World Bank elaboration

2.3 Results

2.3.1 Institutions responsible for support to SMEs and innovation

In the years 2014-2020, the value of public support instruments for enterprises in Poland is almost €21 billion. Two-thirds of this budget is invested through country-wide 'national' (that is, EU-cofinanced) and 'domestic' (that is, Polish government-financed) programs, with the remainder managed at the regional level (Figure 17). The national programs, with budgets of over €13 billion, are implemented by seven agencies under the EU co-financed Smart Growth and Eastern Poland operational programs. Entirely state-budget financed domestic instruments worth €0.7 billion euros are managed by the Ministry of Science and Higher Education. Additionally, the 16 top-level administrative regions called voivodeships (NUTS2 level)[4] invest jointly €7 billion euro (34 percent of the total for Poland, on average €443 million per voivodship in STI policy and support for entrepreneurship) through regional operational programs.

Support is fragmented, as there are 182 SME and innovation instruments, including 10 domestic, 36 national, and 136 regional instruments. The number of regional instruments is a consequence of Poland's administrative division into 16 regions and the decision to channel financing closer to the final recipient. Budget allocations across institutions and fragmentation of support create substantial differences between the size of instruments at the national and regional levels. An average national instrument has a

[4] NUTS is the EU standard for referencing the subdivisions of countries for statistical purposes. NUTS2 is the second level in the hierarchy, corresponding to the administrative division of Poland into 16 regions called voivodeships.

budget of €364 million, whereas the average for domestic and regional instruments is €69 million and €52 million respectively (Figure 18). The average budget of instruments implemented by National Centre for Research and Development (NCBR) is higher than the STI budgets of each voivodship except for Śląskie. The single biggest Polish Agency for Enterprise Development (PARP) instrument is the same size as the total support provided by the 6 smallest regional STI budgets together. The above number increases to 9 regions for the top NCBR instrument. The budget of the 11 largest instruments (six percent of all instruments) represents over half of the budget of all STI interventions in Poland. The other half is dispersed across 171 instruments (Figure 19).

Figure 17. Distribution of STI budgets among levels of governance

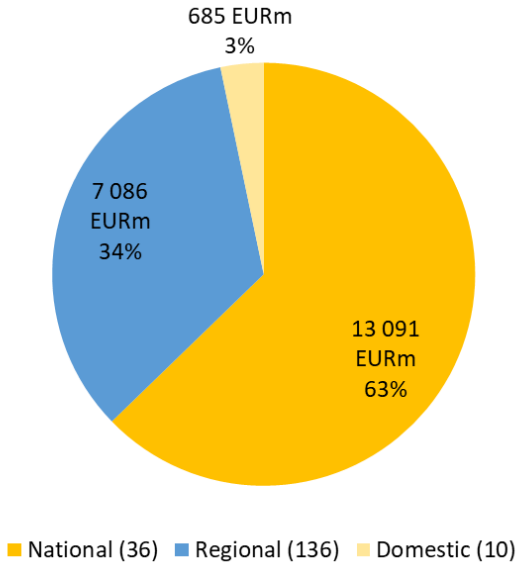
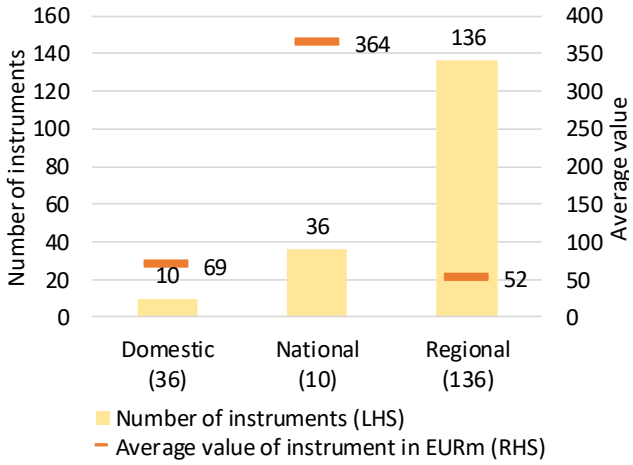


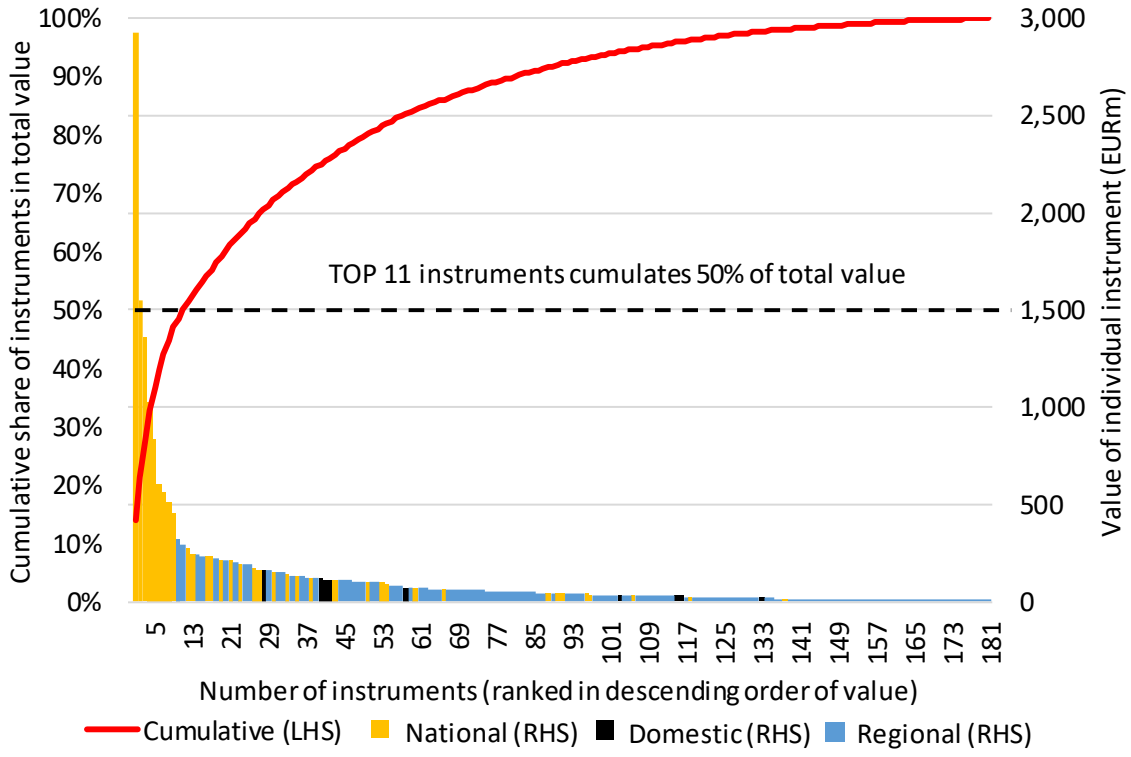
Figure 18. Total and average value of instruments [EURm]



Source: World Bank analysis

Note: The total number of instruments managed at each level and by each institution is given in the brackets.

Figure 19. Instruments' value and budget concentration



Source: World Bank analysis

National and domestic instruments

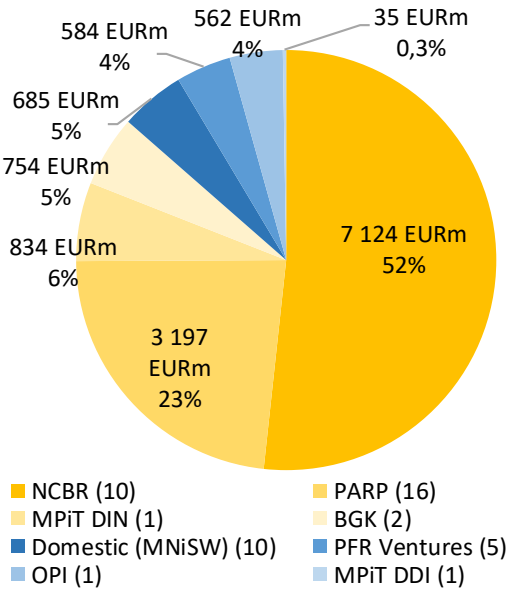
Over half of the budget for country-wide interventions is implemented by the National Centre for Research and Development through 10 national instruments (Figure 20). Another 25 percent of the budget of the country-wide interventions is invested by PARP, with the remaining implementing bodies each responsible for 4-6 percent of the budget. An exception is one ministerial department implementing a single instrument focused on internationalization of Polish firms with 0.3 percent of the country-wide budget (POIR 3.3.2 – Promotion of Polish brands).[5] Additionally, 10 domestic instruments managed by the MNiSW constitute a total of 5 percent of the budget of country-wide support.

[5] Such specialization is justified in case of POIR 3.3.2, because of long-term expertise of the department in establishing international trade connections.

The number of country-wide instruments varies significantly between agencies. PARP and NCBR alone are responsible for 72 percent instruments. The remaining 10 interventions are divided between 5 entities, each specialized in a particular area of the innovation ecosystem:

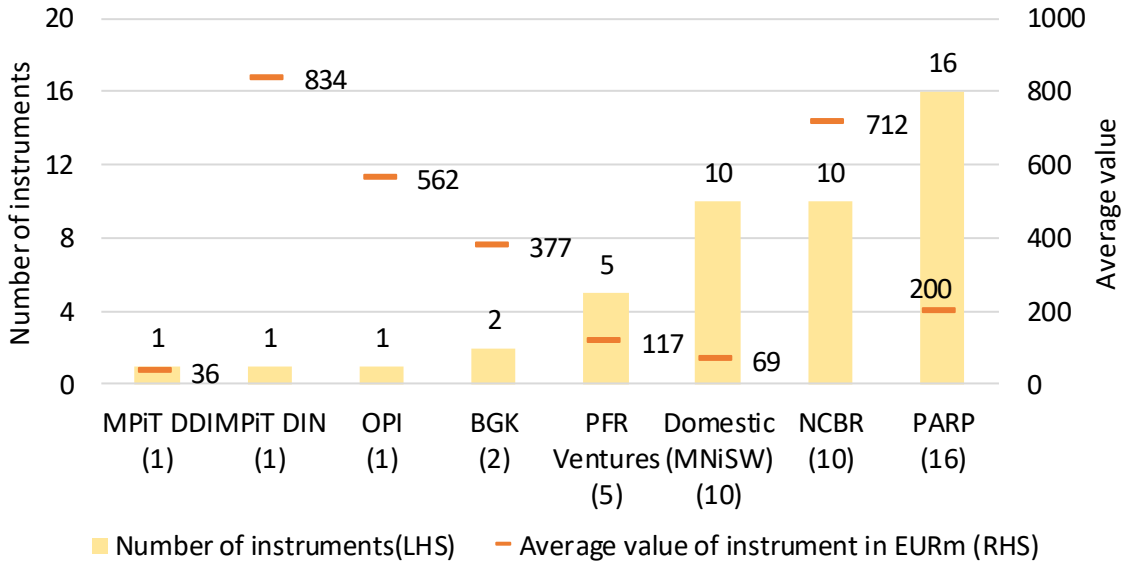
- Polish Development Fund (PFR) Ventures – development of risk capital market,
- Bank Gospodarstwa Krajowego (BGK) – provision of financial instruments,
- National Information Processing Institute (OPI) – management of national data processing infrastructure,
- Innovation Department of the Ministry of Entrepreneurship and Technology (MPiT DIN) – oversight and programming of national STI policy,
- Investments Development Dept. of the Ministry of Entrepreneurship and Technology (MPiT DDI) – establishment and maintaining of international trade connections.

Figure 20. Value distribution of national and domestic instruments per implementing agency (regional programs excluded)



Source: World Bank analysis

Figure 21. Number of instruments per implementing domestic and national agency with average value [EURm]

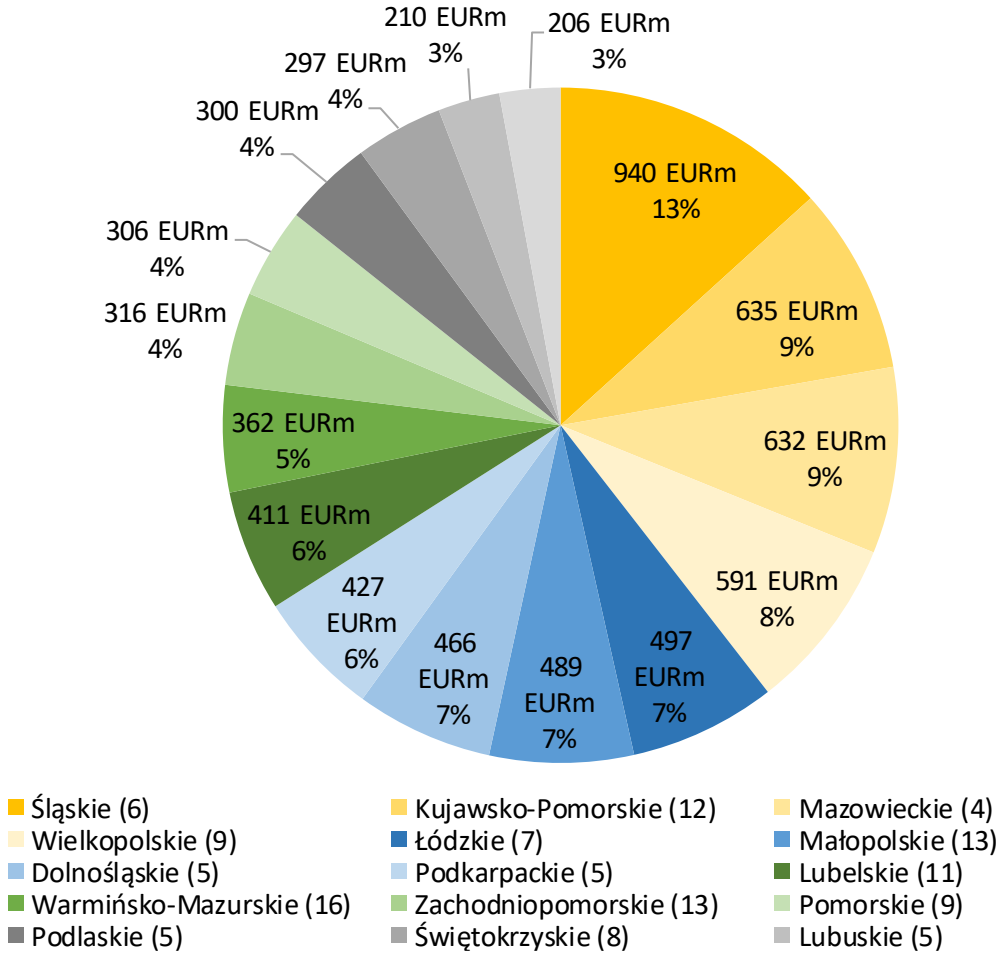


Source: World Bank analysis

Regional instruments

Each of the 16 Polish regions manage its own regional operational program covering 10 out of 11 Thematic Objectives (interventions in the area of Thematic Objective 11 – *Enhancing institutional capacity of public authorities and stakeholders and efficient public administration* are implemented only on the national level.[6] The size of regional STI budgets depends on two factors. First, the general financial allocation for all policy objectives is decided by the EU, based on the population of the region and its level of economic development. Second, each regional Marshal's Office designs its ROP distribution among investment priorities in compliance with EU regulations. The biggest regional SME and innovation budget is €940 million in the Śląskie Region (covering 12 percent of the population). The smallest is €206 million in the Opolskie Region (covering three percent of the population).

Figure 22. Value distribution of regional programs per voivodship [EURm]



Source: World Bank analysis

Note: Summary statistics present the total value of the STI budgets within Regional Operational Programs.

[6] The list of priorities of the European Structural and Investment Funds are described in the following website https://ec.europa.eu/regional_policy/en/policy/what/glossary/t/thematic-objectives.

Thematic Objective 1 (R&D and innovation) and Thematic Objective 3 (SMEs) account for on average 19 percent of the total budget of regional programs (Table 2). Each managing institution allocates financing between policy areas based on ex-ante evaluations carried out by external consultants and negotiations with the European Commission and the MIiR. As a result, the share of ROPs dedicated to Thematic Objectives 1 and 3 varies significantly between voivodships and constitutes from 15–26 percent of ROP budgets.

Table 2. Share of STI policy in total budget managed by national and regional agencies[7]

	TO1 Innovation	TO3 SMEs	Total STI policy	Total value (EURm)
National	16%	7%	24%	13,091
Mazowieckie	14%	8%	23%	632
Opolskie	14%	10%	24%	206
Kujawsko-Pomorskie	10%	16%	26%	635
Śląskie	10%	11%	21%	940
Podlaskie	9%	11%	20%	300
Regional average	*8%*	*11%*	*19%*	*443*
Małopolskie	8%	6%	14%	489
Łódzkie	8%	11%	19%	497
Pomorskie	8%	7%	14%	306
Wielkopolskie	7%	10%	17%	591
Świętokrzyskie	7%	12%	19%	297
Dolnośląskie	7%	11%	18%	466
Warmińsko-Mazurskie	7%	15%	21%	362
Lubuskie	5%	14%	19%	210
Podkarpackie	5%	12%	17%	427
Zachodniopomorskie	5%	13%	18%	316
Lubelskie	5%	11%	16%	411

Source: World Bank analysis

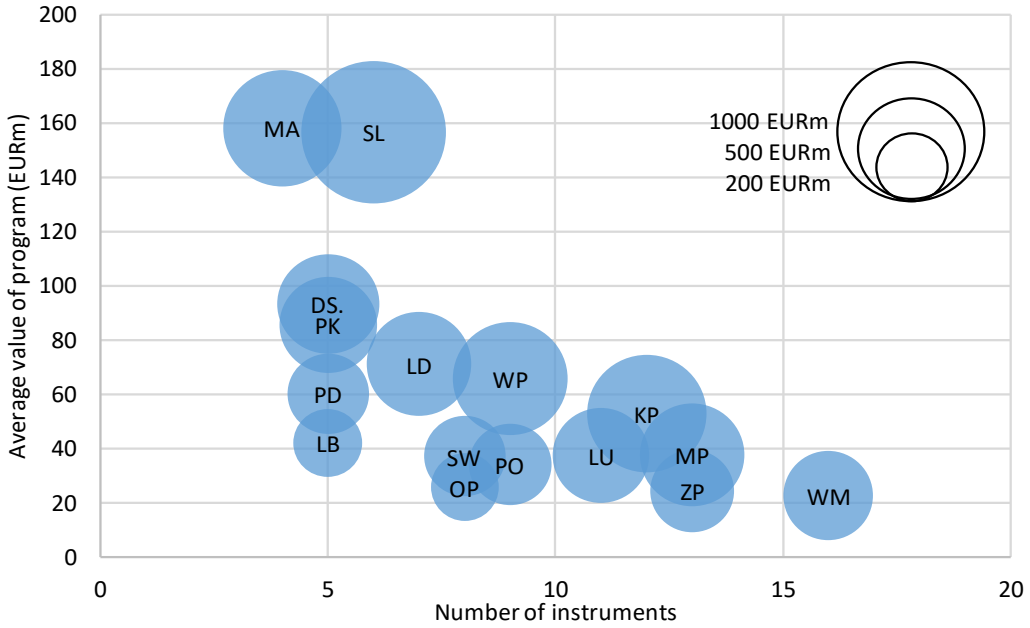
Regions independently divide allocated budgets into individual interventions. Even though the number of instruments varies from four to sixteen between regions, the scope of interventions is similar because instruments can cover one or multiple objectives. Usually all related instruments in a region are managed and implemented by the same group of people, so decisions about fragmentation of individual instruments do not significantly impact their functionality.

The average budget of an instrument is inversely correlated with the number of interventions managed by each voivodship. Thus, in regions with the highest numbers of instruments, each instrument averages

[7] Total budget on national level is comprised of the value of funds available in OP Development of Eastern Poland, OP Digital Poland, OP Infrastructure and Environment, OP Smart Growth and OP Technical Assistance. The total budget on regional level is equal to the value of respective regional operational programs.

about 20 million euro, which is a result of different structuring of programs among managing authorities (Figure 23).

Figure 23. Value distribution of regional instruments per implementing agency [8]



Source: World Bank analysis

2.3.2 Support instrument objectives

STI support instruments are generally well aligned with national priorities included in the SRD.[9] The highest number of instruments contributes to achieving the first two objectives of the SRD, namely "Increase global competitiveness of the Polish industry" and "Development of innovative companies". However, relatively few instruments are clearly linked to reducing barriers for SMEs and internationalization of the economy. The division between strategic objectives is similar among all types of instruments (national, domestic and regional), which indicates that the same policy goals are targeted at all levels.

Table 3. Description of variables in the "Strategic alignment" area

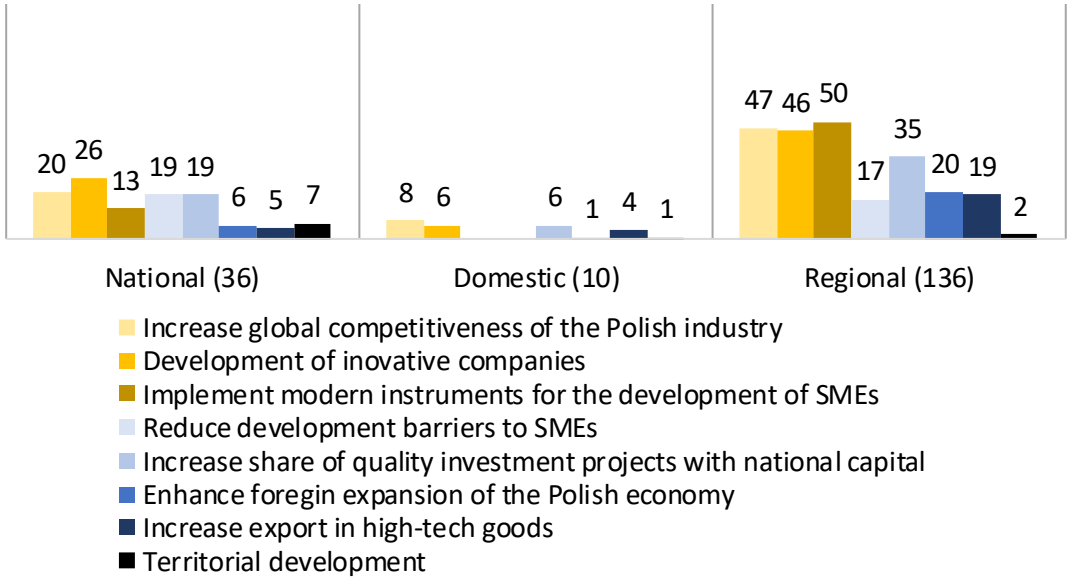
Variables	Definition

[8] Acronyms stands for: DS – Dolnośląskie, KP - Kujawsko-pomorskie, LU – Lubelskie, LB – Lubuskie, LD – Łódzkie, MP – Małopolskie, MA – Mazowieckie, OP – Opolskie, PK – Podkarpackie, PD – Podlaskie, PM – Pomorskie, SL – Śląskie, SW – Świętokrzyskie, WM - Warmińsko-mazurskie, WP – Wielkopolskie, ZP – Zachodniopomorskie.

[9] The Strategy for Responsible Development defines the economic policy of the Government of Poland. It was adopted by the parliament in the first quarter of 2017 and is based on four main themes: (i) sustainable economic growth increasingly driven by knowledge, data and organizational excellence, (ii) socially sensitive and territorially sustainable development, (iii) effective state and economic institutions contributing to growth as well as (iv) social and economic inclusion.

Increase global competitiveness of the Polish industry	Reindustrialization of Polish economy based on implementation of innovative technologies.
Development of innovative companies	Increased level of sophistication of products and services provided by Polish firms.
Implement modern instruments for the development of SMEs	Development of effective ways of public intervention to support entrepreneurship and firm creation.
Increase share of quality investment projects with national capital	Growth of the investment rate through nationwide support for savings and regulatory changes.
Enhance foreign expansion of the Polish economy	Stimulation of export activity with support for direct investments of Polish firms abroad.
Increase export in high-tech goods	Boost international trade in high-tech products and services.
Territorial development	Particular focus on projects aimed at maintaining and increasing social cohesion.

Figure 24. Distribution of instruments per strategic objective (by number)



Source: World Bank analysis

Note: The total number of instruments is shown in brackets.

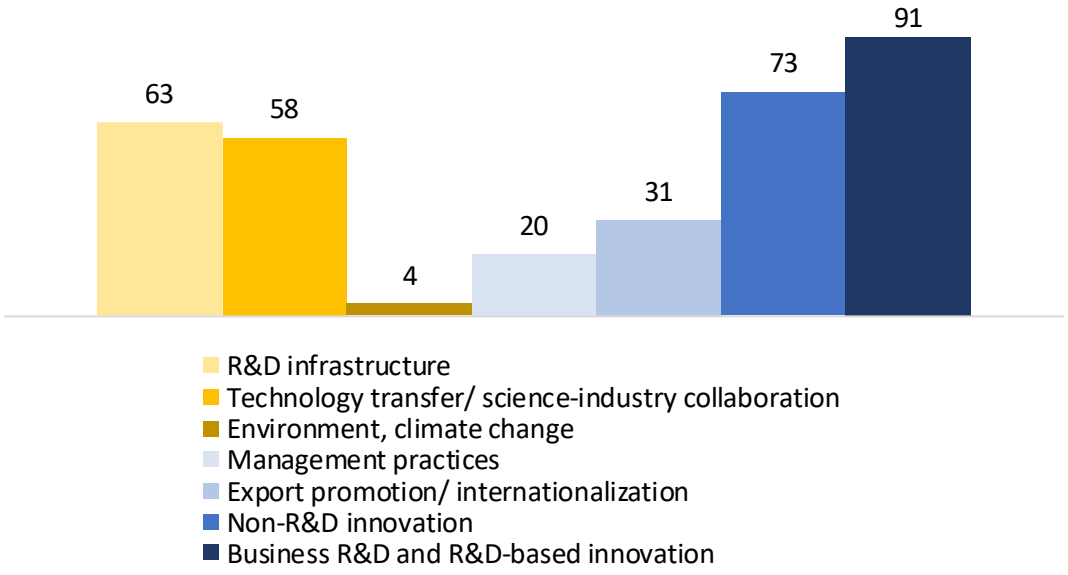
Instruments were also categorized based on SME and innovation-related objectives (Table 4). Most objectives are covered by many instruments. Instruments at all levels of governance focus on business R&D and R&D-based innovation (91 out of 182 instruments) and technology transfer/science-industry collaboration (58 instruments). Multiple regional and national instruments cover non-R&D innovation (73). R&D infrastructure is the most frequent objective for regional instruments (59 regional instruments and 63 in total). On average, there are three to four regional instruments for each of the most widely documented objectives, in addition to the national instruments available in each region. A beneficiary

from an average region can select from a total of six R&D infrastructure instruments, 14 technology transfer instruments, and 28 R&D-based or 22 non-R&D innovation interventions.

Table 4. Description of variables in the "Objective" area

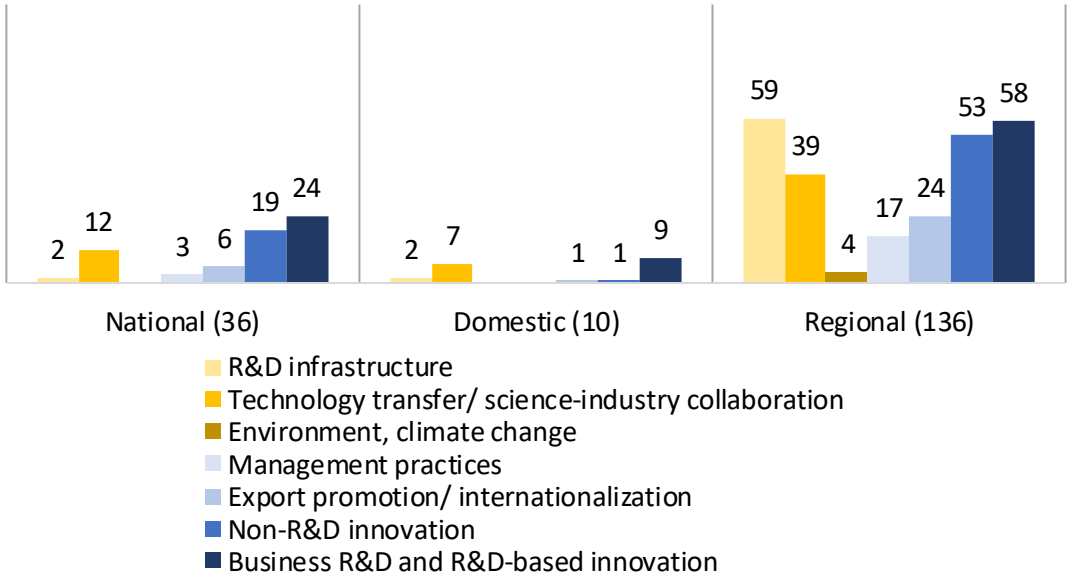
Variables	Definition
R&D infrastructure	Equipment to support economically relevant R&D.
Technology transfer / science-industry collaboration	Transfer of existing technology with the aims of collaboration between academia and the private sector.
Environment, climate change	Introduction of technologies to reduce consumption of raw materials or development of eco-friendly solutions.
Management practices	Improved practices related to different management areas (e.g., operations, human resources, leadership).
Export promotion / internationalization	Preparation for entering and operating in foreign markets.
Non-R&D innovation, technology adoption	Adoption and diffusion of existing technology for wider non-research use.
Business R&D and R&D based innovations	Promotion of R&D and creation of new products and processes by business enterprises.

Figure 25. Distribution of instruments by objective (by number)



Source: World Bank analysis

Figure 26. Distribution of national, regional and domestic instruments per objective (by number)



Source: World Bank analysis

Over 60 percent of instruments cover multiple objectives. Eighty-two percent of R&D infrastructure instruments have an additional objective, which is more likely to be technology transfer, non-R&D, and R&D infrastructure. Only three instruments focus solely on technology transfer, whereas 72 percent of the instruments that cover technology transfer also cover business R&D and 48 percent of them cover R&D infrastructure. Export promotion instruments are the most focused, with over half supporting only this particular objective. There are 22 instruments supporting management practices, but only two focus on this objective only and most are linked with non-R&D innovation.

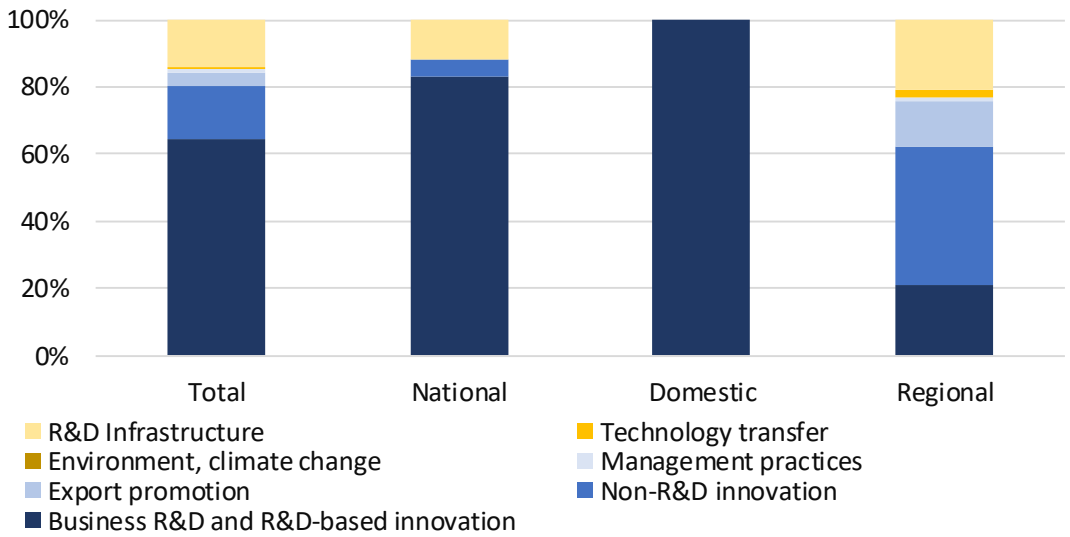
Table 5. Cross-tabulation of instruments by objective

	R&D infr.	Tech. transfer	Environment	Mgmt. practices	Export promotion	Non-R&D innovation	Business R&D	Total
R&D infr.	11*	28	2	2	0	16	39	63
Technology transfer		3*	0	6	5	6	42	58
Environment, climate change			1*	0	0	4	3	4
Management practices				2*	3	12	5	22
Export promotion/internationalization					16*	11	1	31
Non-R&D innovation						22*	25	73
Business R&D and R&D-based innovation							17*	91

*Note: For example, 28 in the second column indicates that 28 instruments have both R&D infrastructure and technology transfer objectives. Instruments can fulfil multiple objectives; therefore, the numbers do not add up to the total number. * indicates single objective.*

72 out of 182 instruments tackle one objective. For these instruments, budgets per objective could be calculated. Business R&D support dominates national instruments, whereas regional interventions focus also on technology transfer, non-R&D innovation and R&D infrastructure.

Figure 27. Budget distribution for 72 instruments with single objective



Source: World Bank analysis

Data on disbursed financing provides additional evidence on overlapping instruments that address similar objectives on the national and regional levels.[10] The database of beneficiaries supported from 2014-2020 European Funds in Poland includes information about *category of intervention* for each implemented project.[11] Categories of intervention provide a more detailed breakdown of European Structural and Investment Funds (ESIF) funds and are complementary to the objective category of the portfolio mapping analysis.[12] Overlaps exist between TO1 and TO3 projects financed on the national and regional levels. Especially under Thematic Objective 1, regional authorities replicate some part of interventions undertaken by national agencies as a part of the Smart Growth Operational Programme (Figure 28, Figure 29). Additionally, overlaps concern returnable support instruments on the regional level.

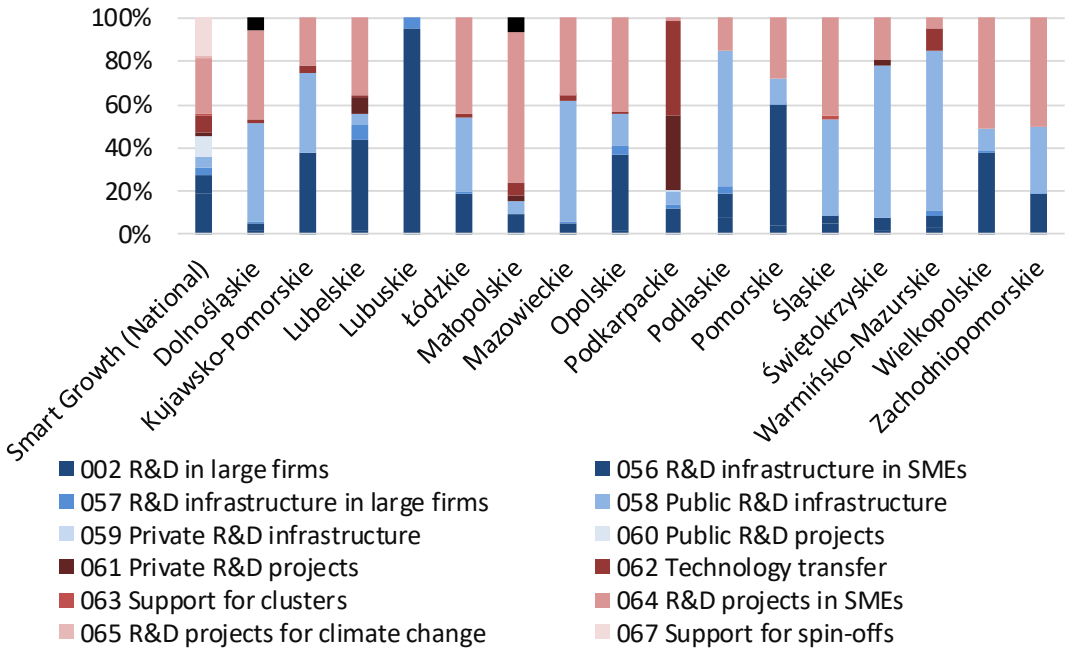
[10] All portfolio mapping figures, except Figure 28 and Figure 29, are based on data of financial allocations for the entire period of the financial perspective 2014-2020. During the financial perspective, Managing Authorities can modify allocations among Thematic Objectives and categories of intervention to the extent allowed in the Partnership Agreement. For this reason, final budget distribution could be different from data on allocations. Figures 28 and Figure 29 present information on disbursed funds as of March 31, 2019.

[11] Data source: https://www.funduszeeuropejskie.gov.pl/strony/o-funduszach/projekty/lista-projektow/lista-projektow-realizowanych-z-funduszy-europejskich-w-polsce-w-latach-2014-2020/, accessed March 31, 2019

[12] Categories of intervention are specified in Annex I of Regulation (EU) 215/2014 and constitute a third level of ESIF classification along Thematic Objectives and Investment Priorities:

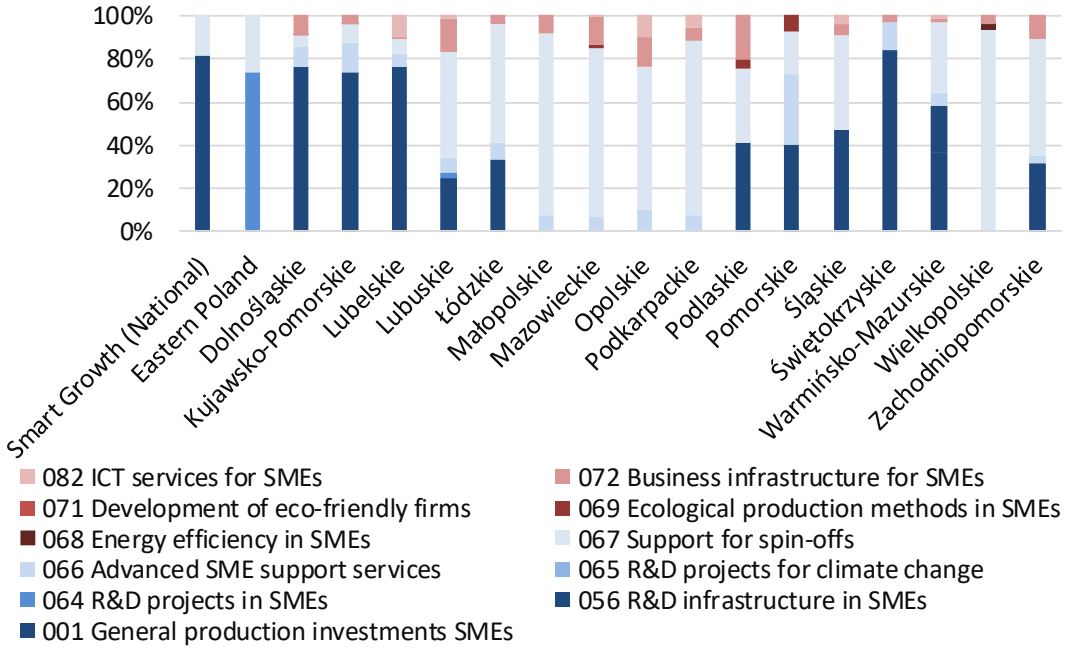
- 10 Thematic Objectives, specified in Regulation (EU) No 1303/2013
  - 38 Investment Priorities, specified in Regulation (EU) No 1301/2013
    - 105 Categories of intervention (one category is present both in TO1 and TO3)
      - 13 Categories for Thematic Objective 1, as of March 31, 2019
      - 11 Categories for Thematic Objective 3, as of March 31, 2019

Figure 28. Thematic Objective 1 - Distribution of disbursed financing across categories of intervention (as of March 31, 2019)



Source: World Bank analysis

Figure 29. Thematic Objective 3 - Distribution of financing granted across categories of intervention (as of March 31, 2019)



Source: World Bank analysis

2.3.3 Types of projects and firms that are eligible for support

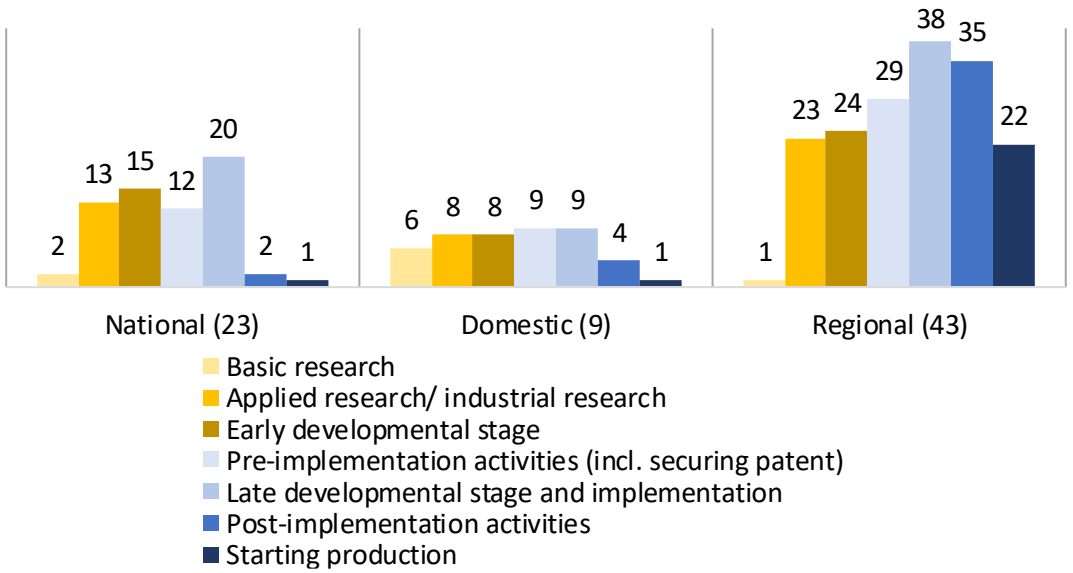
The portfolio mapping methodology distinguishes 7 phases of R&D processes, corresponding to Technology Readiness Levels (Table 6). First, considering the stages of R&D processes supported by instruments, it appears that out of 36 national instruments, 23 (64 percent) include support for business R&D. On the regional level, 43 (out of 136 total) instruments support firm R&D processes. In the case of domestic interventions, only one instrument is not aimed at business R&D. The majority of instruments focus on supporting companies from applied research through the late developmental and implementation stage (Figure 30). On the regional level, support for post-implementation and starting production are often included as well. No support for basic research is provided under instruments co-financed under Thematic Objectives 1 and 3. Basic research funding is focused on universities or research institutions under instruments managed by the National Centre of Science (NCN). Coverage of R&D stages also varies by region (

Figure 31). No region covers individually all stages of R&D processes and only one supports basic research projects.

Table 6. Description of variables in the "Supported phase of R&D process" area

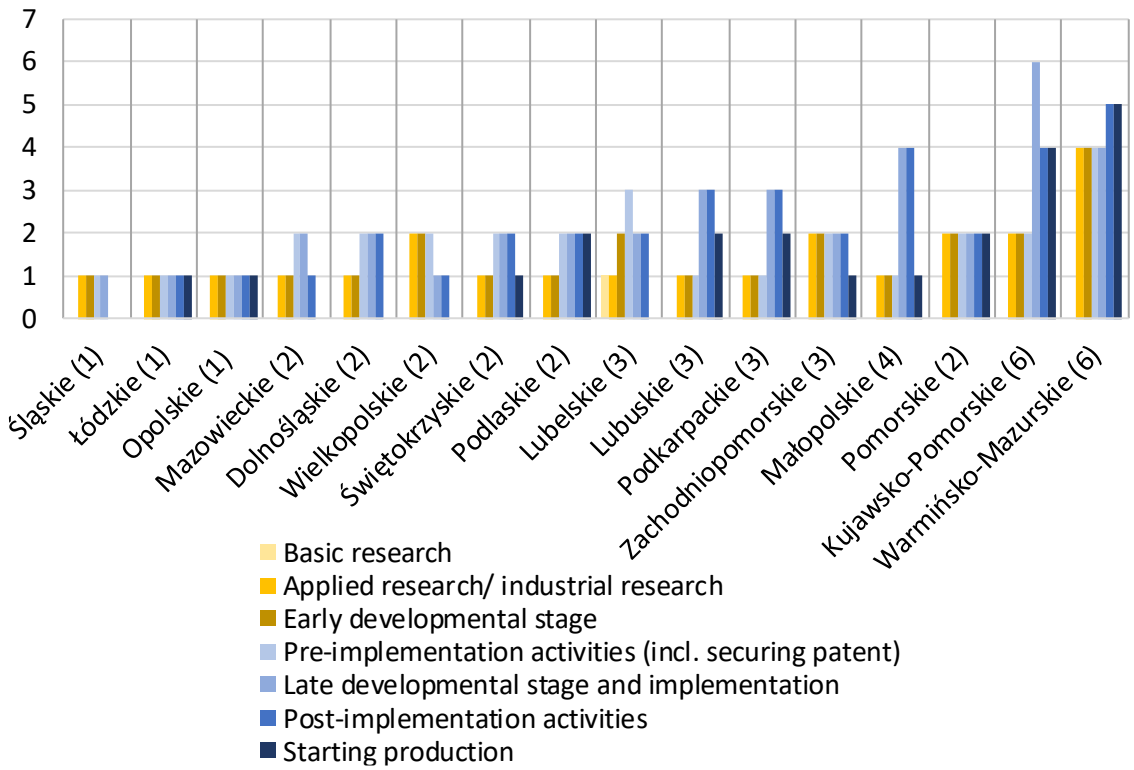
Variables	Definition
Basic research	Basic principles observed, technology concept formulated. Technology Readiness Level (TRL): 1-2
Applied research/ industrial research	Experimental proof of concept. TRL: 2-3
Early developmental stage	Laboratory and relevant environment validation of technology. TRL: 3-5
Pre-implementation activities (incl. securing patent)	Relevant environment demonstration of technology. TRL: 5-6
Late developmental stage and implementation (incl. validation in real settings)	System prototype demonstration in operational environment. TRL: 6-8
Post-implementation activities	System completion and qualification, actual proof operation in operational environment. TRL: 8-9
Starting production	Completion of all Technology Readiness Levels.

Figure 30. Distribution of instruments by R&D stage (by number)



Source: World Bank analysis

Figure 31. Number distribution of regional instruments by supported phase of R&D process and implementing agencies (number of implemented instruments in brackets)



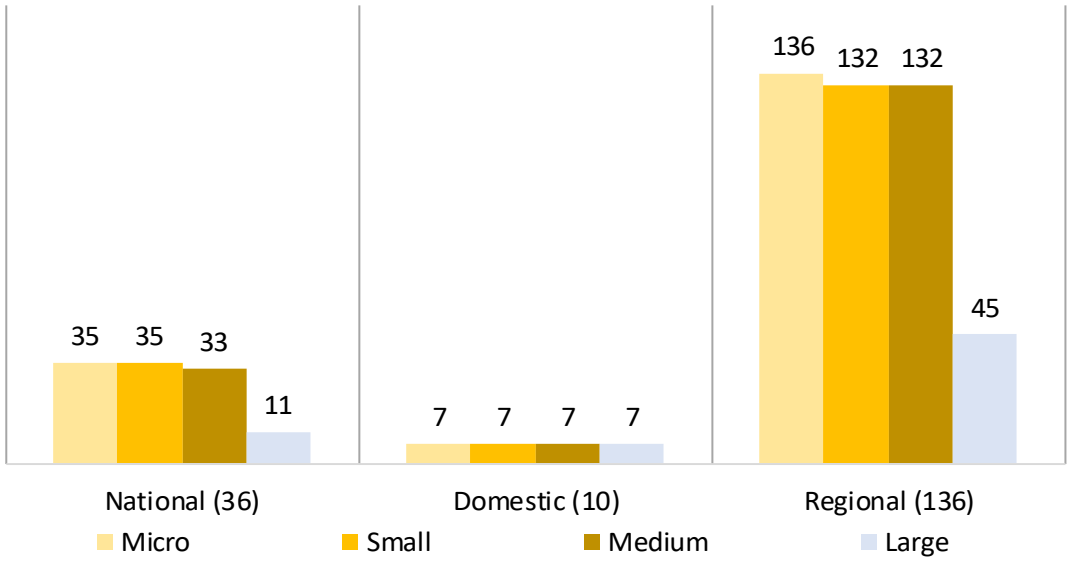
Source: World Bank analysis

With respect to the distribution of funds based on firm size (Table 7), most instruments are open to micro, small and medium applicants (Figure 32). Approximately one-third of national and regional instruments are available also for large companies. This is a result of the Common Provisions Regulation (CPR), which limits provision of support under Thematic Objective 3 to SMEs. Domestic instruments are not subject to the CPR and some other EU regulations; thus, they are less restrictive in term of enterprise size.

Table 7. Description of variables in the "Firm size" area

Variables	Definition
Micro	Less than 10 employees, full-time equivalent (FTE) or Turnover <EUR 2m or Balance sheet total <EUR 2m
Small	Between 10-49 employees, FTE or Turnover <EUR 10m or Balance sheet total <EUR 10m
Medium	Between 50-249 employees, FTE or Turnover <EUR 50m or Balance sheet total <EUR 43m
Large	More than 250 employees, FTE or Turnover over EUR 50m or Balance sheet total over EUR 43m

Figure 32. Number distribution of national, regional and domestic instruments per firm size

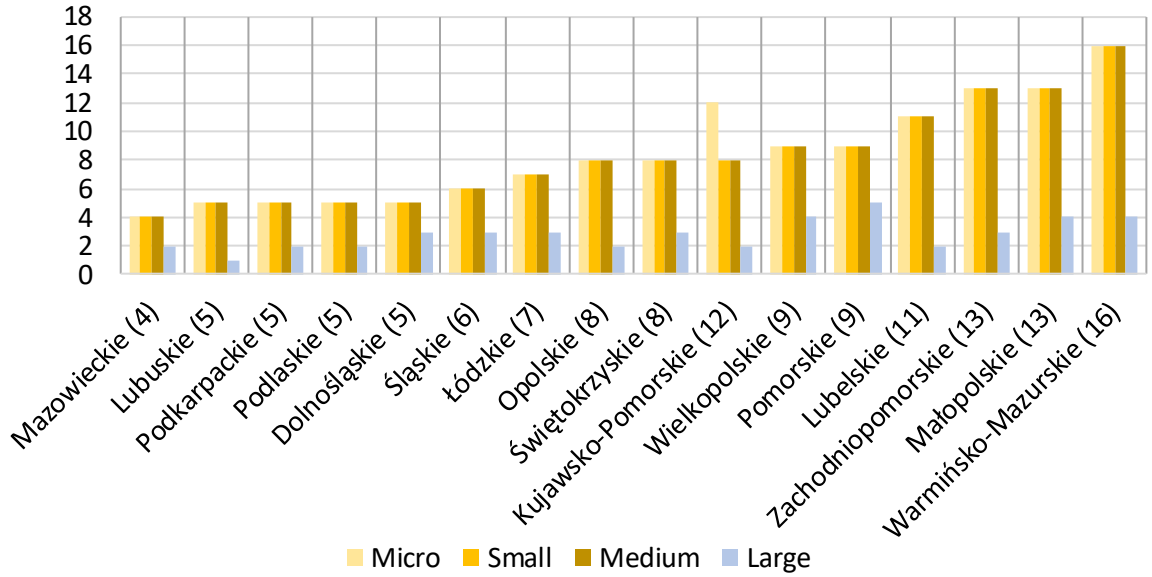


Source: World Bank analysis

Similar to the national level, the availability of regional instruments by firm size is related to the division between Thematic Objective 1 and Thematic Objective 3 instruments. In all voivodships except one, every TO3 instrument is open for micro, small and medium-sized companies. Kujawsko-Pomorskie region

implements 4 instruments dedicated only for micro firms (acceleration instrument and support for creation of spin-out and spin-off companies), on top of measures available for small and medium sized companies. In selected measures, there are separate calls for applicants of based on firm life cycle, but there is little use of such schemes for firm size.

Figure 33. Number distribution of regional instruments by firm size and implementing agency



Source: World Bank analysis
Note: the number of implemented instruments is provided in the brackets.

The sectoral orientation of EU co-financed instruments is determined by European regulations. Interventions implemented under Thematic Objective 1 (Research and innovation) are limited to companies that fall within national or regional smart specializations.[13] Under Thematic Objective 3 (SME development) some interventions are open to all SMEs, regardless of the sector of activity.[14] All NCBR instruments focus on firms within smart specializations, as do 11 out of the 16 PARP instruments. Six out of the 10 domestic instruments (which are not bound by the CPR) have a narrower sectoral focus.[15] (Table 8, Figure 34)

[13] Smart specializations are strategic areas for intervention based on an analysis of the strengths and potential of the economy and an Entrepreneurial Discovery Process (EDP) with wide stakeholder involvement. In Poland, smart specializations were identified in each of the 16 regions, as well as on the national level. More information on smart specializations is available at: http://s3platform.jrc.ec.europa.eu/

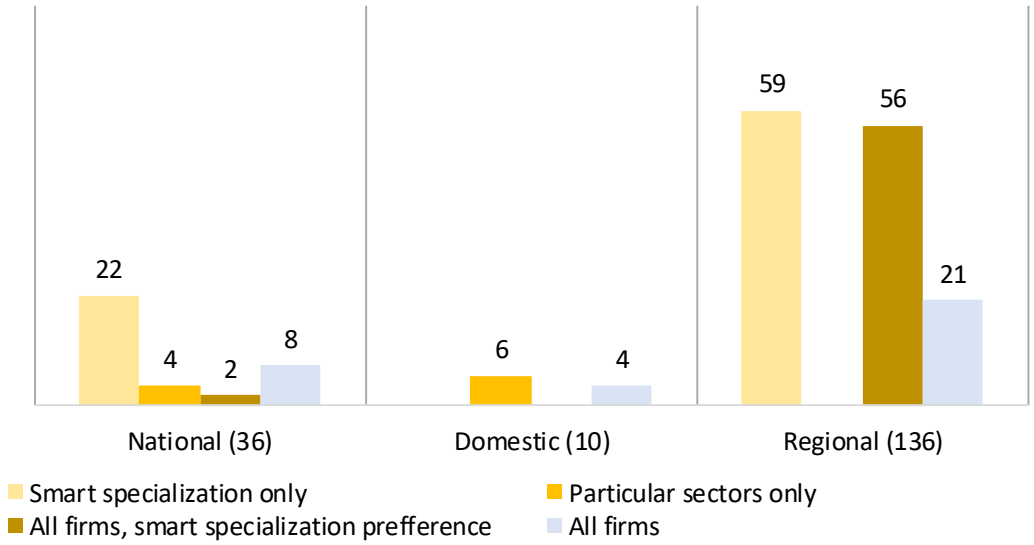
[14] As detailed in Article 18 of Regulation (EU) 1303/2013

[15] Common Provisions Regulation generally prohibits implementation of narrow sectoral programs co-financed from the ESIF.

Table 8. Description of variables in the "Preferred sector orientation" area

Variables	Definition
Smart specialization only	Only firms that are aligned with EU methodology that promotes regional specialization based on the locally available comparative advantages.
Particular sectors only	Only firms that are operating in specifically designated sectors of the economy.
All firms, smart specialization preference	All firms are eligible, enterprises aligned with national or local smart specializations (S3) are granted bonus points during solicitations.
All firms	All firms are eligible, no sector is promoted in any way.

Figure 34. Distribution of national, regional and domestic instruments by preferred sector orientation (by number)



Source: World Bank analysis

With respect to the stage of business development, the highest number of instruments is available for mature companies (Figure 35). Out of 182 instruments, 146 are open for mature firms, with 108 intended only for this type of enterprise.[16] The focus on mature firms is higher at the regional level compared to national interventions. The portfolio of national instruments is more complementary, aimed at supporting newly established companies from their infancy. Some regions also have instruments or dedicated solicitations for young companies that have been operating for less than 24 months. However, there are only 25 instruments that are explicitly intended for non-mature firms. Of these 25 instruments, three are

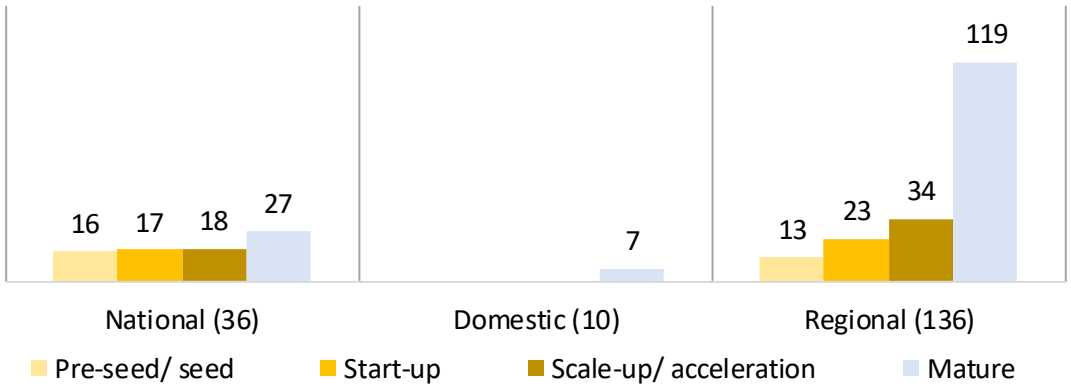
[16] The stage of development denotes the intended target group of the instrument. Regulations usually do not prohibit young companies from applying, but the selection criteria may make them unlikely to succeed.

solely focused on pre-seed, another three on startups, and 19 on multiple early stages. All domestic instruments focus on mature companies.

Table 9. Description of variables in the "Firm life cycle" area

Variables	Definition
Pre-seed / seed	Refers to the stage where the idea, innovation, or business venture is in its initial stage, only as a proposal.
Start-up	Refers to the stage where an idea already has gone through prototyping or is in the pre-commercial / commercial stages of the development cycle; typically, business enterprises at this stage must be less than 5 years old
Scale-up / acceleration	Refers to the stage where a business/idea is already commercialized and is being scaled up for growth and expansion. Most firms at this stage require financing, either by debt or equity.
Mature	Refers to the stage where a business is in the post-scale-up or consolidation phase.

Figure 35. Distribution of instruments by stage of business development (by number)



Source: World Bank analysis

Table 10. Cross-tabulation of instruments by stage of business development

	Pre-seed/seed	Startup	Scale-up acceleration	Mature	Total
Pre-seed/seed	3*	24	18	13	29
Startup		3*	26	18	40
Scale-up/acceleration			0*	40	52
Mature				108*	146

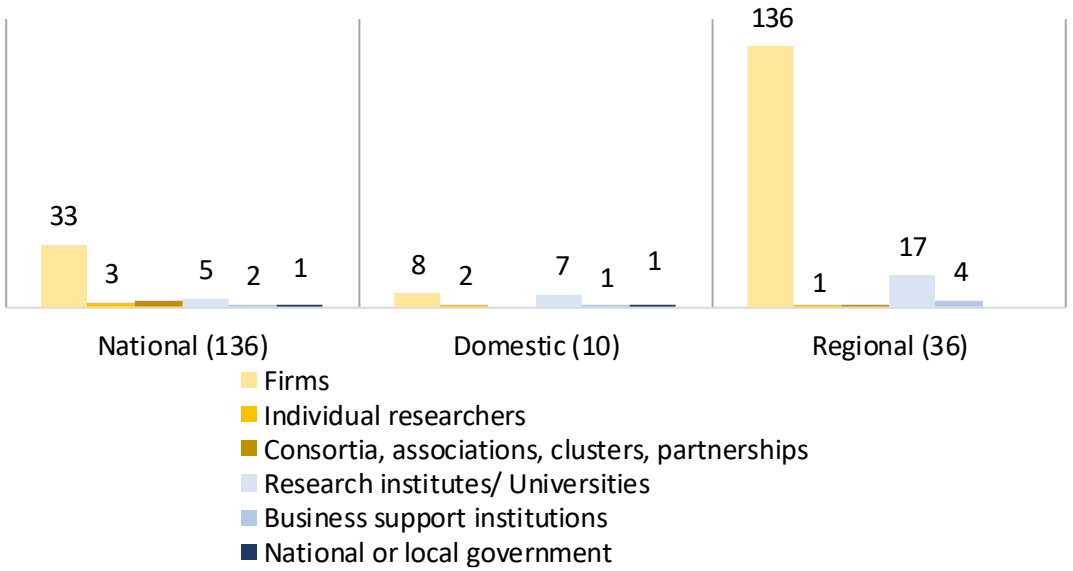
Note: For example, 24 in the second column indicates that 24 instruments support both startup and pre-seed/seed stages. Instruments can fulfill multiple stages; therefore, the numbers do not add up to the total number.
** indicates single objective*

Firms are by far the largest type of "final recipients" of support instruments. Universities and research institutes are the second largest type. All higher education institutions that are supported under Thematic Objective 1 must engage in cooperation with private enterprises or provide services that address firm demand. Seven instruments are designed with business support institutions (BSIs) as final recipients—a significant change compared to the 2007-2013 financial perspective where the focus on BSIs was higher. Individual researchers are final recipients of six instruments and another six instruments focus on enhancing cooperation within consortia.

Table 11. Description of variables in the "Final recipients" area

Variables	Definition
Firms	Formal business enterprises regardless of size.
Individual researchers	Individual people.
Consortia, associations, clusters, partnerships	Industry groups or local/regional associations.
Research institutes / universities	Higher education institutions.
Business support institutions	Entities providing support for entrepreneurs and helping enterprises to be more competitive.
Financial institutions	Intermediaries between Managing Institutions and firms in the implementation of returnable support instruments.
National or local government	National and/or local municipalities or other government units.

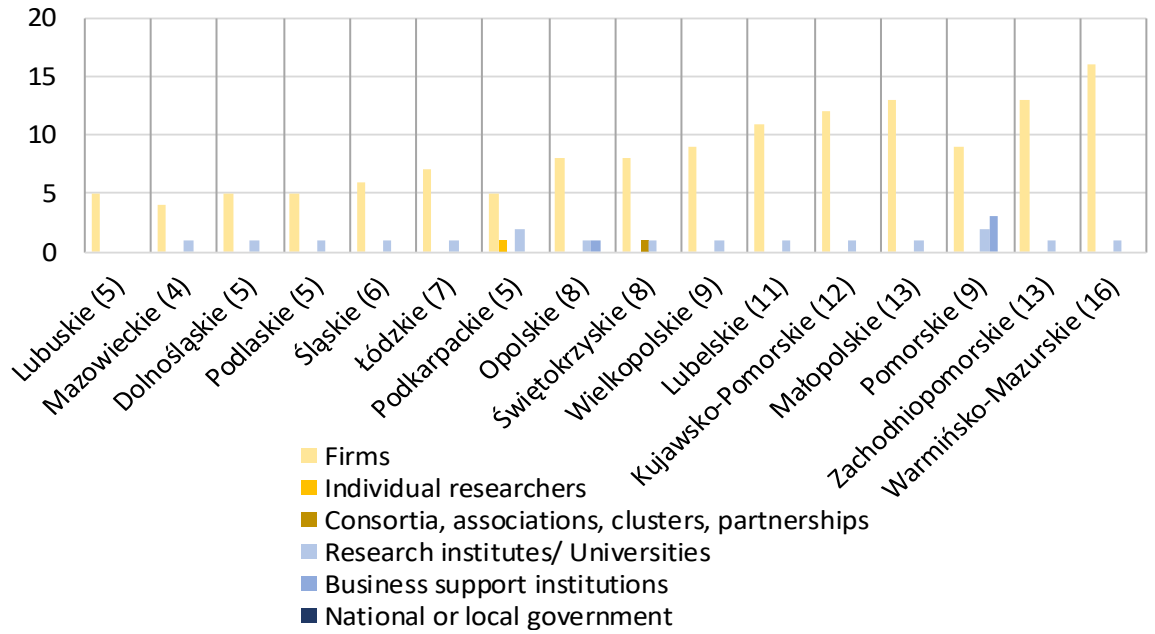
Figure 36. Number distribution of national, regional and domestic instruments by final recipients (number of implemented instruments in brackets)



Source: World Bank analysis

In regions, the concentration of financial allocations is even more geared towards individual firms than on the national level (93 percent among regional instruments compared to 86 percent among national instruments). The second most popular category of final recipients was universities and research institutes. All regions except Lubuskie implement at least one instrument of this type. Individual researchers are final recipients of only one regional program implemented by Podkarpackie voivodship.

Figure 37. Number distribution of regional programs per final recipients and implementing agencies



Source: World Bank analysis

2.3.4 Support mechanisms

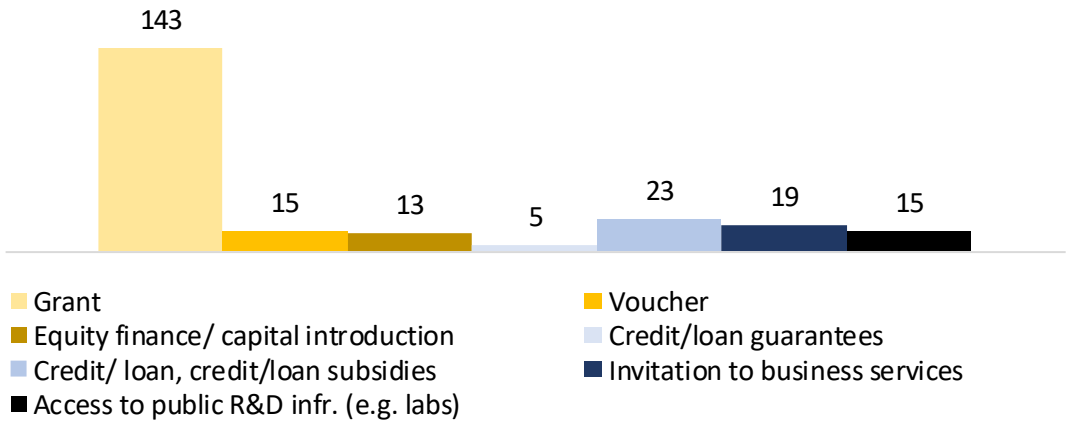
Over three-fourths of all the instruments use matching grants, and about eight percent use vouchers (Figure 38). Compared to the previous financial perspective, the role of returnable instruments, i.e. credit/loans and credit guarantees, increased. From 2007–2013, 10 percent of the total EU co-financed budget for entrepreneurship and innovation was distributed through returnable support, compared to 15 percent during 2014–2020. Equity finance is offered mostly by central institutions. Non-financial support is limited to invitations to business services and public R&D infrastructure (with the latter offered almost exclusively by regions, through financing university laboratories that are available for firms for business R&D).

Table 12. Description of variables in the "Form of support" area

Variables	Definition
Grant	Direct allocation of funding from public agencies to innovation actors to finance part of a project.[17]
Voucher	Small grants allocated to non-innovative SMEs to purchase services from external knowledge providers. The main objective is to induce non-innovator SMEs to start collaborating with knowledge organizations and providers.
Equity finance / capital introduction	Benefactor provides funding in exchange for ownership (of a certain percentage) in the enterprise/entity. It is a type of investment in which small and young innovation intensive companies sell equity (shares) to raise capital.
Credit / loan guarantees	Monetary support guaranteed by benefactor if enterprise fails to achieve its goal (as long as stated objective/s is/are related to innovation, SMEs and entrepreneurship). Credit guarantee schemes (CGSs) work to cover some portion of the losses experienced by lenders when firms default on loans.
Credits and loans	Refers to funds provided to the beneficiary, for which the funds (plus interest) must be paid at agreed date.
Invitation to business services	Services related to advising the private sector on how to improve its current practices, including expansion and diffusion of already-existing technologies
Public R&D infrastructure	Infrastructure that supports development of quality research for the public/society, e.g. in public laboratories and universities.

[17] All analyzed grants are matching grants. The maximum share of EU funding in the budget of grant schemes is regulated by the CPF and depends on the level of development of country/region compared to the EU average (measured in GDP per capita PPP). Poland as a whole, and all Polish regions except Masovia, are in the category of "less developed regions" (under 75% of EU average), thus the maximum share of EU funding in a grant is 85%. Masovia is in the category of "more developed regions" (over 100% of EU average), thus the maximum share of EU funding in a grant is 60%. The remaining funds have to be provided either by the beneficiary (which is usually a private firm) or by state/regional budget (e.g. when a public university is the beneficiary).

Figure 38. Distribution of instruments per form of support (by number)

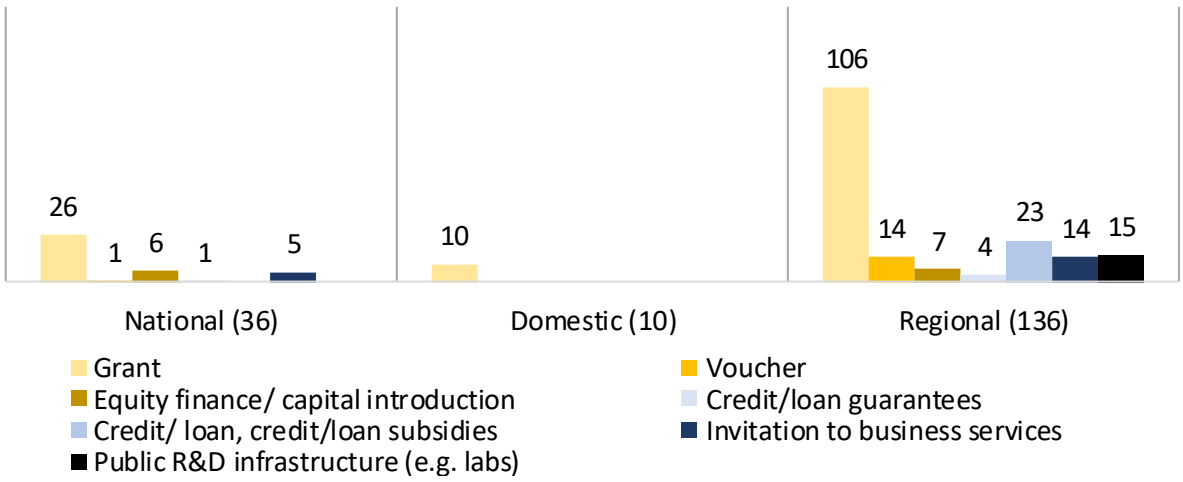


Source: World Bank analysis

Note: one instrument can use multiple mechanisms of fund disbursement.

Regional programs are more diversified than national ones in terms of form of support. With the exception of risk capital programs implemented by PFR Ventures, the vast majority of centrally implemented interventions are based on grants. National agencies responsible for designing ESIF co-financed interventions, unlike regional institutions, rarely use returnable (e.g. credit/loan) support instruments. Such decisions are motivated by the fact that a number of returnable instruments financed from national resources are implemented centrally by the National Economy Bank. All domestic instruments operate as grant programs. Domestic programs are not subject to many regulatory restrictions related to EU funds. Thus, they can be a natural space for policy innovation and the piloting of novel instruments. This opportunity is not fully taken advantage of by only using grant mechanisms.

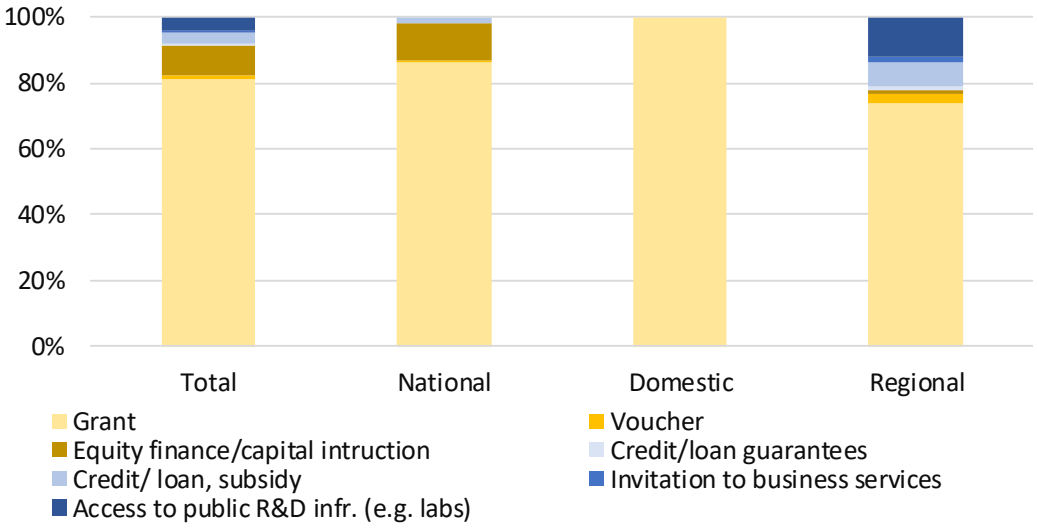
Figure 39. Distribution of instruments by form of support (by number)



Source: World Bank analysis

In terms of value, grants and vouchers comprise more than 85 percent of the total budget (Figure 40). The budget for returnable instruments represents 15 percent of total support, half of which is allocated to risk capital implemented by Polish Development Fund (PFR) Ventures. The diversity of instrument types on the regional level is reflected in the financial distribution. Some forms of support are offered mainly by the regions (for example investments in public R&D infrastructure).[18] The scale of some interventions on the regional level is very small. The average regional risk capital instrument is only €12 million, compared to €252 million at the national level.

Figure 40. Budget distribution for 146 instruments with single form of support



Source: World Bank analysis

2.3.5 Characteristics of regional returnable instruments

In 2014-2020, 22 returnable (i.e. repayable) support instruments are being implemented in Poland as part of 16 regional operational programmes. In four voivodships, funding is additionally provided under the Jeremie 2 initiative.[19] As a result of the above activities, 46 financial products (credits and credit guarantees) are offered to beneficiaries on the regional level. Six out of 10 regions, which initially included

[18] There is only one credit guarantee instrument on the national level (SG OP 3.2.3 *Guarantee Fund*) and one instrument funding public R&D infrastructure (SG OP 4.2 *Development of the Modern Research Infrastructure of the Science Sector*).

[19] Jeremie (Joint European Resources for Micro to Medium Enterprises) is an initiative of the European Commission to promote the use of financial instruments to improve access to finance for SMEs. The second edition of the initiative is being implemented during 2014-2020 in four Polish voivodships: Łódzkie, Mazowieckie, Wielkopolskie and Zachodniopomorskie. More information on the Jeremie 2 initiative can be found at: https://ec.europa.eu/regional_policy/en/funding/special-support-instruments/jeremie/#4.

credit guarantees in respective ROPs, closed such instruments due to competition with the *de minimis* guarantees implemented by the BGK on the national level.[20]

The proliferation of financial products results from the fact that all voivodships designed interventions independently. The justification for returnable financial instruments is provided by ex-ante assessments prepared by external consultants separately for each region. While the individual ex-ante assessments are supposed to capture the local context, they indicate similar market failures in all voivodships. The reasons for this are twofold. First, Poland has one of the lowest internal regional variations of economic conditions among the new high-income countries (HICs).[21] Second, the analytical methodology is similar across ex-ante assessments since it is defined by EU Regulations.[22] Consequently, all regions decided to implement similar types of returnable financial products. These can be assigned to one of four groups:

1. Small loans (TO3) – products aimed at supporting the development of young companies with too short a business history to obtain a loan from a commercial bank at market conditions;
2. Large loans (TO3) – products aimed at supporting investment activities of established firms that might not be viable at (high) market interest rates (which are a result of underdeveloped financial markets);
3. R&D loans (TO1) – products aimed at supporting initiatives that might be too risky in the assessment of a commercial bank, without taking social benefits into account;
4. Credit guarantee (TO3) – products aimed at facilitating SMEs' access to credits offered by commercial banks;

Information on the assignment of returnable financial products to groups can be found in **Annex III – Assignment of regional returnable instruments to product groups**.

Eligible costs in products in Groups 1 and 2 include the purchase of machinery and equipment or other expenditures related to the introduction of firm-level innovations and improvement of general competitiveness. Eligible costs for Group 3 products are limited to purchases of R&D equipment and costs of business R&D projects. 19 out of 46 products also finance working capital to the extent necessary for implementation of the whole project.

EU Regulations require that publicly co-financed returnable financial instruments must respond to an identified market failure. The economic rationale for products in Groups 1, 2 and 4 is related to reducing imperfect information. The rationale for Group 3 interventions also includes supporting projects with positive externalities.

Although the types of returnable financial products are similar across regions, the parameters of individual products vary. Each Managing Authority independently sets value thresholds of eligible projects, target

[20] As the *de minimis* guarantees instrument is fully financed from the national sources, and mainly aim to support economic stability, not to support SMEs or innovation, it is not included in the scope of Portfolio Mapping analysis.
[21] World Bank Group. 2017. *Lessons from Poland, Insights for Poland: A Sustainable and Inclusive Transition to High Income Status.*
[22] Article 37(2) of the Regulation (EU) No 1303/2013 specifies the scope of the ex-ante assessment. Article 39(4)a includes details on estimating the financing gap, which is the basis for determining the value of financial contributions to returnable support instruments.

population, length of repayment, grace period, and interest rate. Within products of the same type, differences in parameters are small, as shown in Table 13.

Table 13. Types and parameters of returnable financial products implemented as a part of ROPs

Types of products			Parameters				
Group	**Target population**	**Number of implemented products**	**Minimum value** (PLNk)	**Maximum value** (PLNk)	**Average min. interest rate** (%)	**Max. repayment period** (years)	**Max. grace period** (months)
1. Small loan	Micro, small	19	0	100-500	1.3%	3-7	3-12
2. Large loan	SME	20	0-500	1000-4000	1.2%	4-10	3-18
3. R&D loan	SME	3	0-200	1200-5000	0.5%	7-10	2-12
4. Credit guarantee	SME	4	0	500-2000	0.0%	7-10	N/A

Source: World Bank analysis

Small differences in parameters do not change the functionality of financial products. However, they create an administrative burden that deters various institutions from serving as financial intermediaries. The costs of adjusting internal procedures to varying product parameters in each region makes this activity unprofitable for commercial banks. During a meeting with representatives of the BGK, which serves as a manager of funds of funds for 15 out of 16 Polish voivodships, it was confirmed that no commercial bank is engaged in the distribution of financial products under TO1 and TO3 for the above reason. The necessity to participate in 16 individual selection procedures to distribute products throughout the country disincentivizes commercial banks even further. Given this situation, returnable financial products are distributed mostly by loan funds with local coverage. An additional risk of the lack of standardization is the creation of complex products for which there is little market demand.

Excessive differentiation of the parameters of returnable financial products translates into: (i) an increase in management costs (especially in the case of instruments with low demand), (ii) a shortage of financial intermediaries of adequate quality and sufficient quantity, and (iii) lack of transparency for applicants. Increasing standardization could be beneficial during the upcoming financial perspective, particularly given that more funds may be allocated to returnable support instruments. The needs of companies that can be served by returnable financial products are relatively similar across regions, as indicated by ex-ante assessments and other analyses. Thus, it should be feasible to create a set of nationwide financial products supporting firm growth in individual voivodships. An indicative set of standardized parameters for the four types of products is shown in Table 14.

Table 14. Indicative parameters for standardized returnable financial products

Types of products		Parameters				
Group	**Target population**	**Minimum value** (PLNk)	**Maximum value** (PLNk)	**Min interest rate** (%)	**Max. repayment period** (years)	**Max. grace period** (months)
1. Small loan	Micro, small	0	1000	1.0%	5	6
2. Large loan	SME	1000	2000	1.0%	10	12
3. R&D loan	SME	0	2000	0.5%	7	6
4. Credit guarantee	SME	0	2000	0.0%	7	N/A

Source: World Bank analysis

The management structure of standardized financial products would need to be determined by further analyses and negotiations between regions. One potential scenario suggested by representatives of the BGK is to organize one public tender divided into 16 parts corresponding to individual voivodships. This setup would be permissible under existing regulations and preserves decision-making independence of Managing Authorities.

2.4 Policy mix recommendations and lessons learned

Recommendations on institutions responsible for support to SMEs and innovation

Reduce fragmentation and overlap. There is a need for **increased coordination** between the national and regional authorities to reduce the proliferation of instruments and avoid unnecessary overlaps.[23] The overlaps of objectives, beneficiaries, and support mechanisms could be investigated, and instruments with similar characteristics potentially consolidated. Reducing fragmentation lowers administrative costs as well as **costs for beneficiaries**, as the proliferation of instruments can create confusion among beneficiaries and increase their costs for searching and applying. Reducing fragmentation could also help address the issue of **minimum impact scale**, given that smaller instruments may have difficulty serving a critical mass of beneficiaries and achieving systemic change. On the other hand, smaller instruments could allow for piloting or more responsiveness to local needs. Finding the right balance between efficiency and context alignment requires appropriate analytical capacity, which could be a challenge, particularly at the regional level. The returnable instruments implemented at the regional level exhibit significant potential for standardization, which would require close coordination between various institutions. Recommended actions to enhance coordination are described in the *Functional Analysis Technical Note*.

Recommendations on support instrument objectives

Consider narrowing the focus of regional instruments. One way to address the fragmentation, overlap, and minimum impact scale issues is to focus the regional instruments more on identified regional needs (taking into account that national instruments will still be available to the firms in the region). Cirera and Maloney (2017) developed a hierarchy of the sophistication of instruments to strengthen firm capabilities along a "capabilities escalator". The hierarchy matches the complexity of instruments with the needs of firms and their ability to benefit from the instruments, as well as the ability of public institutions to deliver these programs. For example, if firms in lagging regions struggle with the adoption of basic managerial and organizational practices, as well as machinery upgrading, and undertake little-to-no formal R&D, the capabilities escalator approach suggests a focus on encouraging firms to adopt existing technology and invest in simple organizational changes rather than incentivize advanced research. Thus, there is a case that regional instruments ought to be designed to adapt to local conditions. This may also allow for specializations across regional and national implementing bodies, which would also be helpful in refining the choice of instruments and avoiding overlaps.

Improve support for management and export capabilities, and young firms. Extensive work by Bloom and coauthors, as well as Iacovone and Pereira-Lopez (2017), emphasize the importance of management practices for innovation. Likewise, Grover, Medvedev, and Olafsen (2019) show that firm growth and

[23] Further recommendations on increasing coordination are included in the *Functional Analysis Technical Note*.

innovation is often associated with the so-called 'internal characteristics' of companies, such as export orientation and global linkages of firms, membership in networks, and the quality of managerial skills. While Poland has some instruments that support management practices, it would be worth examining further whether their size and quality is optimal. For export promotion, it would be useful to review whether eligible expenditures are adequate to achieve the objectives. Existing instruments mainly cover the costs of participating in international trade fairs, adjusting operations to the needs of international customers (such as, obtaining certifications), and market research. Boosting the quality and sophistication of exports may require more support, such as connecting domestic suppliers to global value chains, or facilitating linkages with foreign or larger companies that are innately more productive. Finally, the preponderance of support for mature firms raises the question of whether some support could be rebalanced toward young firms.

Recommendations on support mechanisms

Use an evidence base when choosing support mechanisms. Although Poland has a strong track record of disbursing funds through matching grants, it is important that firms' needs are matched with the choice of instrument. Cirera and Maloney (2017) show that innovation can be spurred using a wide range of instruments, and the efficacy of each instrument is contingent on the context in which it is applied. For instance, vouchers tend to be effective at stimulating behavior change, but evidence of sustained impact is mixed, suggesting that voucher programs are likely to work best as an initial step toward more complex support programs. Likewise, grants are generally effective in producing intended outcomes (e.g., business innovation) and encouraging firms to invest their own resources in the process—and competition-based grants generally outperform entitlement-based grants. However, fewer studies find significant increases in sales, employment, and value added due to grant programs, and outcomes in terms of productivity growth are mixed. (Note: the ROI/Effectiveness section of this analysis—see item 3 in the Project Overview above—finds positive impacts of grant instruments during the 2007-2013 financing perspective on employment, sales, and value-added, but mixed results on productivity.) More details on the importance of strong instrument justifications and the consideration of alternative instruments are included in the *Functional Analysis Technical Note*.

Lessons learned from implementation:

1. The detailed documentation of instruments included in the Detailed Descriptions of Priority Axes required for each operational program in Poland permitted the World Bank team to prepare the first version of the portfolio mapping without the engagement of program staff and managers. On average, filling in the characteristics of STI instruments took on average 4 hours for each regional operational program, and proportionally more for a bigger set of national instruments.

2. Verification of the portfolio mapping data by program managers is critical for two reasons: i) to ensure that the mapping correctly describes instruments' characteristics, and ii) to capture the *intended* (but perhaps unwritten) characteristics of an instrument. For example, regulations usually do not prohibit young companies from applying, but the selection criteria (published at a later stage in solicitation documents) may make them unlikely to succeed.

3. The Detailed Descriptions of Priority Axes are updated periodically. The changes usually focus on budget allocations and less frequently on core instrument characteristics. The portfolio mapping could be updated annually or bi-annually to include the modifications and keep track of changes over time.

4. Budget allocations should be verified during disbursement or ex-post against actual expenditures on specific items: objectives, types of companies supported, stages of firm development, etc. This is particularly important when an instrument has multiple objectives with one general budget allocation.

Annex I – List of portfolio mapping interventions

List of 2014-2020 interventions <u>included in</u> the scope of the analysis

Instrument type	Thematic objective	EU classification	Instrument full name
National	TO1: Strengthening research, technological development and innovation	POIR.01.01.01	Fast track
National		POIR.01.01.02	Pilot lines
National		POIR.01.02.00	Sectorial programs
National		POIR.01.03.01	BRIdge Alfa
National		POIR.01.03.02	BRIdge CVC; part of BRIdge VC managed by NCBR
National		POIR.02.01.00	Support of investments in R&D infrastructure
National		POIR.02.02.00	Open innovations - support of technology transfer, component I
National		POIR.02.02.00	Open innovations - support of technology transfer, component II
National		POIR.02.03.01	Pro-innovative BEI services for SME
National		POIR.02.03.02	Vouchers for innovation
National		POIR.02.03.03	Internationalization of the Key National Clusters
National		POIR.02.03.04	Industrial property protection
National		POIR.02.03.05	Design for entrepreneurs
National		POIR.02.05.00	Acceleration programs
National		POIR.04.01.01	Strategic research programs for economy
National		POIR.04.01.02	Regional science-research agendas
National		POIR.04.01.03	Innovative methods for research management
National		POIR.04.01.04	Application projects
National		POIR.04.02.00	Development of hi-tech research infrastructure for science sector
National		POIR.04.04.00	Increasing staff potential in R&D sector
National	TO3: Enhancing the competitiveness of SMEs	POIR.03.01.01	Investments in innovative start-ups
National		POIR.03.01.02	Group investments by business angels in SMEs
National		POIR.03.01.04	Competitive Polish Innovative Fund of Funds
National		POIR.03.01.05	Supporting SMEs entry to capital markets
National		POIR.03.02.01	Research for the market
National		POIR.03.02.02	Credit for technological innovations
National		POIR.03.02.03	Guarantee fund for innovative companies support
National		POIR.03.03.01	Polish Technological Bridges
National		POIR.03.03.02	Promoting Polish brands
National		POIR.03.03.03	Supporting SMEs promotion of products brands

Instrument type	Thematic objective	EU classification	Instrument full name
National		POPW.01.01.01	Platforms to enhance start of the new ideas
National		POPW.01.01.02	Start-ups development in Eastern Poland
National		POPW.01.02.00	Internalization of SMEs
National		POPW.01.03.01	Innovations implementation by SMEs
National		POPW.01.03.02	Creating 'networked products' by SMEs
National		POPW.01.04.00	Recipe for competitiveness
Domestic	N/A	N/A	Biostrateg
Domestic			CuBR IV
Domestic			CyberSecIdent
Domestic			Gospostrateg
Domestic			Innowacje Społeczne
Domestic			Lider
Domestic			Panda 2
Domestic			StrategMed
Domestic			Tango
Domestic			Techmatstrateg
Regional	TO1: Strengthening research, technological development and innovation	RPDS.01.01.00	Strengthening R&D and implementation potential of universities and research institutions
Regional		RPDS.01.02.00	Innovative firms
Regional	TO3: Enhancing the competitiveness of SMEs	RPDS.01.03.00	Entrepreneurship development
Regional		RPDS.01.04.00	Companies internationalization
Regional		RPDS.01.05.00	Product and services development in SMEs
Regional	TO1: Strengthening research, technological development and innovation	RPKP.01.01.00	Public infrastructure for research and innovations
Regional		RPKP.01.02.01	Support for R&D processes
Regional		RPKP.01.02.02	Support for R&D works with use of financial instruments
Regional		RPKP.01.03.01	Support for R&D processes in university spin-offs/spin-outs
Regional		RPKP.01.03.02	Support for university spin-offs/spin-outs with use of capital inst.
Regional	TO3: Enhancing the competitiveness of SMEs	RPKP.01.04.01	Support for micro companies' development
Regional		RPKP.01.04.02	Support for SMEs through BSI
Regional		RPKP.01.05.01	Loans for SMEs for new business model's development
Regional		RPKP.01.05.02	Enhancing companies' internationalization
Regional		RPKP.01.05.03	Enhancing university spin-offs/spin-outs internationalization
Regional		RPKP.01.06.01	Capital instruments for innovative SMEs
Regional		RPKP.01.06.02	Grants for innovative SMEs
Regional		RPLU.01.01.00	Regional R&D Infrastructure

Instrument type	Thematic objective	EU classification	Instrument full name
Regional	TO1: Strengthening research, technological development and innovation	RPLU.01.02.00	Support for targeted research
Regional		RPLU.01.03.00	R&D infrastructure in enterprises
Regional		RPLU.01.04.00	Technology transfer and commercialization of research
Regional		RPLU.01.05.00	Vouchers for innovation
Regional	TO3: Enhancing the competitiveness of SMEs	RPLU.03.02.00	Equity instruments
Regional		RPLU.03.03.00	Support for spin-offs
Regional		RPLU.03.04.00	Adaptation of the BSI offer to the market needs
Regional		RPLU.03.05.00	Vouchers for advisory services
Regional		RPLU.03.06.00	Economic marketing
Regional		RPLU.03.07.00	Increased competitiveness of SMEs
Regional	TO1: Strengthening research, technological development and innovation	RPLB.01.01.00	Research and innovation
Regional	TO3: Enhancing the competitiveness of SMEs	RPLB.01.02.00	Development of entrepreneurship
Regional		RPLB.01.04.00	Promotion of the region and internationalization of SMEs
Regional		RPLB.01.05.01	Development of the SME sector - grants
Regional		RPLB.01.05.02	Development of the SME sector - financial instruments
Regional	TO1: Strengthening research, technological development and innovation	RPLD.01.01.00	Development of public R&D infrastructure
Regional		RPLD.01.02.01	Enterprise R&D infrastructure
Regional		RPLD.01.02.02	Business R&D projects
Regional	TO3: Enhancing the competitiveness of SMEs	RPLD.02.01.02	Professionalization of BSI
Regional		RPLD.02.02.01	SME business models
Regional		RPLD.02.03.01	Innovations in the SME sector
Regional		RPLD.02.03.02	Financial instruments for the SME sector
Regional	TO1: Strengthening research, technological development and innovation	RPMP.01.01.00	HEI and RI research infrastructure
Regional		RPMP.01.02.01	Business R&D projects
Regional		RPMP.01.02.02	Business R&D infrastructure
Regional		RPMP.01.02.03	Vouchers for innovations
Regional		RPMP.01.03.00	Małopolska regional centers of innovation
Regional	TO3: Enhancing the competitiveness of SMEs	RPMP.03.02.00	Promotion of entrepreneurship and potential of the BSIs
Regional		RPMP.03.03.01	Małopolska regional economic promotion
Regional		RPMP.03.03.02	Internationalization of regional SMEs
Regional		RPMP.03.04.01	Financial instruments for SMEs - firms in early stage of dev.
Regional		RPMP.03.04.02	Financial instruments for SMEs - firms over 24 months
Regional		RPMP.03.04.03	Grants for SMEs - firms in early stage of development

Instrument type	Thematic objective	EU classification	Instrument full name
Regional		RPMP.03.04.04	Grants for SMEs - firms over 24 months
Regional		RPMP.03.04.05	Vouchers for advisory services
Regional	TO1: Strengthening research, technological development and innovation	RPMA.01.01.00	HEI and RI research projects
Regional		RPMA.01.02.00	Business R&D projects
Regional	TO3: Enhancing the competitiveness of SMEs	RPMA.03.02.02	Internationalization of enterprises
Regional		RPMA.03.03.00	Innovations in the SME sector
Regional	TO1: Strengthening research, technological development and innovation	RPOP.01.01.00	Innovations in enterprises
Regional		RPOP.01.02.00	R&D infrastructure
Regional	TO3: Enhancing the competitiveness of SMEs	RPOP.02.01.01	Support of introduction of new products and services
Regional		RPOP.02.01.02	Support of business ICT investments
Regional		RPOP.02.01.03	Support of introduction of new products and services by SMEs in border areas
Regional		RPOP.02.01.04	Support of investments of Social Economy entities
Regional		RPOP.02.03.00	Strengthening of the business environment
Regional		RPOP.02.04.00	Economic cooperation and promotion
Regional	TO1: Strengthening research, technological development and innovation	RPPK.01.01.00	HEI and RI research infrastructure
Regional		RPPK.01.02.00	Industrial research, development works and their implementation
Regional	TO3: Enhancing the competitiveness of SMEs	RPPK.01.03.00	Promotion of entrepreneurship
Regional		RPPK.01.04.01	Grants for SMEs
Regional		RPPK.01.04.02	Financial instruments for SMEs
Regional	TO1: Strengthening research, technological development and innovation	RPPD.01.01.00	Increased marketization of R&D projects
Regional		RPPD.01.02.01	Business R&D projects and support of the transfer of knowledge, innovations, technologies and commercialization of results of R&D projects
Regional		RPPD.01.02.02	Voucher for research services
Regional	TO3: Enhancing the competitiveness of SMEs	RPPD.01.03.00	Investment support for enterprises
Regional		RPPD.01.04.01	Promotion of entrepreneurship and increasing of investment activity of the region
Regional	TO1: Strengthening research, technological development and innovation	RPPM.01.01.01	Expansion through innovation - grant support
Regional		RPPM.01.01.02	Expansion through innovation - financial instruments
Regional		RPPM.01.02.00	Knowledge transfer
Regional	TO3: Enhancing the competitiveness of SMEs	RPPM.02.01.00	Basic and targeted investments - financial instruments
Regional		RPPM.02.02.00	Targeted investments - grant support
Regional		RPPM.02.03.00	Export activity

Instrument type	Thematic objective	EU classification	Instrument full name
Regional		RPPM.02.04.01	Targeted advisory services for SMEs
Regional		RPPM.02.04.02	Support for BSIs - ZIT mechanism
Regional		RPPM.02.04.03	Support for BSIs
Regional	TO1: Strengthening research, technological development and innovation	RPSL.01.01.00	Key regional R&D infrastructure
Regional		RPSL.01.02.00	Business R&D projects
Regional		RPSL.01.03.00	Professionalization of BSIs
Regional	TO3: Enhancing the competitiveness of SMEs	RPSL.03.02.00	Innovation in the SME sector
Regional		RPSL.03.03.00	Support for business investments in ICT
Regional		RPSL.03.04.00	Recapitalization of external sources of financing for firms
Regional	TO1: Strengthening research, technological development and innovation	RPSW.01.01.00	Support for R&D infrastructure
Regional		RPSW.01.02.00	Business R&D projects
Regional		RPSW.01.03.00	Support for BSIs to promote innovation
Regional	TO3: Enhancing the competitiveness of SMEs	RPSW.02.01.00	Support for BSIs to promote entrepreneurship
Regional		RPSW.02.03.00	Creation of new business models
Regional		RPSW.02.04.00	Economic promotion of key sectors of the region's economy
Regional		RPSW.02.05.00	Investment support for SMEs
Regional		RPSW.02.06.00	Recapitalization of financial instruments
Regional	TO1: Strengthening research, technological development and innovation	RPWM.01.01.00	Modern research infrastructure of public HEIs and RIs
Regional		RPWM.01.02.01	Business R&D projects
Regional		RPWM.01.02.02	Cooperation between business and science
Regional		RPWM.01.02.03	Professionalization of BSIs
Regional	TO3: Enhancing the competitiveness of SMEs	RPWM.01.03.01	Incubation of enterprises
Regional		RPWM.01.03.02	Companies in the initial stage of development
Regional		RPWM.01.03.03	Financial instruments for development of new companies
Regional		RPWM.01.03.05	Business services for SMEs
Regional		RPWM.01.03.06	Modern BSI services
Regional		RPWM.01.04.01	Economic promotion of the region
Regional		RPWM.01.04.02	Packaging of products and services
Regional		RPWM.01.04.03	Support for ICT investments of the SME sector
Regional		RPWM.01.04.04	Internationalization of SMEs
Regional		RPWM.01.05.01	Implementation of the results of R&D projects
Regional		RPWM.01.05.02	Recreation of the economic heritage of the region
Regional		RPWM.01.05.03	Financial instruments for increased competitiveness of the region
Regional		RPWP.01.01.00	Support for HEI and RI research infrastructure

Instrument type	Thematic objective	EU classification	Instrument full name
Regional	TO1: Strengthening research, technological development and innovation	RPWP.01.02.00	Strengthening of the innovative potential of enterprises
Regional	TO3: Enhancing the competitiveness of SMEs	RPWP.01.03.01	Support for business incubation
Regional		RPWP.01.03.02	Improvement of the quality of business incubation
Regional		RPWP.01.03.04	Support for entrepreneurship and infrastructure for economic development
Regional		RPWP.01.04.01	Comprehensive support for the development of enterprises in foreign markets
Regional		RPWP.01.05.01	Financial instruments for improvement of the competitiveness of the region
Regional		RPWP.01.05.02	Strengthening the competitiveness of the key areas of the regional economy
Regional		RPWP.01.05.03	Improvement of competitiveness of enterprises through improved energy efficiency
Regional	TO1: Strengthening research, technological development and innovation	RPZP.01.01.00	Business R&D projects
Regional		RPZP.01.02.00	Business R&D infrastructure
Regional		RPZP.01.03.00	Development of public research infrastructure
Regional	TO3: Enhancing the competitiveness of SMEs	RPZP.01.04.00	Implementation of the results of R&D projects
Regional		RPZP.01.05.00	Investments of enterprises supporting the development of regional and smart specializations
Regional		RPZP.01.06.00	Creation of new jobs in the area of the Special Inclusion Zone
Regional		RPZP.01.07.00	Investments of enterprises within the ZIT framework for Szczecin Metropolitan Area
Regional		RPZP.01.08.00	Investments of enterprises within the ZIT framework for Koszalin-Kołobrzeg-Białograd Area
Regional		RPZP.01.09.00	Financial instruments for investments of enterprises
Regional		RPZP.01.14.00	Strengthening the position of the regional economy domestically and internationally
Regional		RPZP.01.15.00	Support of business cooperation
Regional		RPZP.01.16.00	Increasing access to the BSIs services
Regional		RPZP.01.17.00	Support for companies in the initial stage of development

List of 2014-2020 interventions excluded from the scope of the analysis

The reason for excluding selected TO1 and TO3 instruments is related to the fact that they are not targeted directly to firms, but either to agencies engaged in managing STI policy (national interventions) or local government units (regional interventions).

Instrument type	Thematic objective	EU classification	Instrument full name
National	CT1: Strengthening research, technological development and innovation	POIR.02.04.01	Centre of analysis and pilot implementation of new support instruments
National		POIR.02.04.02	National Smart Specializations monitoring
National		POIR.04.03.00	International Research Agendas Programme (IRAP)
Regional	CT3: Enhancing the competitiveness of SMEs	RPKP.01.04.03	Development of investment areas
Regional		RPLU.03.01.00	Development of investment areas
Regional		RPLU.03.08.00	Development of investment areas within the Lublin Functional Area
Regional		RPLB.01.03.00	Creation and development of investment areas
Regional		RPLD.02.01.01	Investment areas
Regional		RPMP.03.01.00	Creation of new and development of existing investment areas
Regional		RPMA.03.01.00	Support for SMEs (development of investment areas)
Regional		RPOP.02.02.00	Preparation of investment areas
Regional		RPOP.01.05.00	Promotion of entrepreneurship (development of investment areas)
Regional		RPPD.01.04.02	Increase of investment attractiveness of Białystok Functional Area
Regional		RPPM.02.05.00	External investors
Regional		RPSL.03.01.01	Creation of brownfield investment areas
Regional		RPSL.03.01.02	Creation of investment areas
Regional		RPSK.02.02.00	Creation of new investment areas
Regional		RPWM.01.03.04	Investment areas
Regional		RPWP.01.03.03	Infrastructure for economic development
Regional		RPWP.01.04.02	Economic promotion of the region (development of investment areas)
Regional		RPZP.01.10.00	Infrastructure for economic development
Regional		RPZP.01.11.00	Infrastructure for economic development – ZIT strategy for Szczecin Area
Regional		RPZP.01.12.00	Infrastructure for economic development – ZIT strategy for Koszalińsko-Kołobrzeg-Białogard Functional Area
Regional		RPZP.01.13.00	Infrastructure for economic development – ZIT strategy as part of local government contracts

Annex II – Detailed description of portfolio mapping categories

Categories and variables in the portfolio mapping matrix were adapted to the Polish context prior to collecting data.[24]

General	Instrument full name
	Instrument short name (for the purpose of this review)
	EU classification
	Measure / submeasure
	Program
	Short description
	Thematic Objective
	Priority Axis
	Managing Authority
	Directorate / Department
	Intermediate bodies
	Contact person
	Website / URL
	Planned program start-end dates
	Number of projects supported (as of August 5th, 2018)
Form of support	Grant
	Voucher
	Equity finance / capital introduction
	Credit / loan guarantees
	Credit / loan, credit / loan subsidies
	Open innovation instruments
	Invitation to business services
	Access to public R&D infrastructure (e.g. labs)
Alignment of the program with national objectives[25] (or broader expected outcome of the program)	Increase global competitiveness of the Polish industry
	Development of innovative companies
	Implement modern instruments for the development of SMEs
	Reduce development barriers to SMEs
	Increase share of quality investment projects with national capital
	Enhance foreign expansion of the Polish economy
	Increase export in high-tech goods
	Territorial development
Intervention objective / support usage	R&D infrastructure
	Technology transfer / science-industry collaboration
	Environment, climate change
	Management practices
	Export promotion / products and services internationalization
	Non-R&D innovation, technology adoption / diffusion, increasing company operations effectiveness, i.e. organizational / marketing innovations
	Business R&D and R&D-based innovation

[24] Portfolio mapping methodology implemented in Poland built on the *Quality of the Policy Mix – Guidance Note,* World Bank Group

[25] Variables in *Alignment of the program with national objectives* reflect the main aims of Poland's Strategy for Responsible Development.

	Has the instrument objective changed over the life of the program (y/n), and if so, why?
Supported R&D and implementation phases (applicable only to instruments that support objective of business R&D)	Basic research
	Applied research / industrial research
	Early developmental stage
	Pre-implementation activities (incl. securing patent)
	Late developmental stage and implementation (incl. validation in real settings)
	Post-implementation activities
	Starting production
Target stage of business development	Pre-seed / seed
	Start-up
	Scale-up / acceleration
	Mature
Preferred sector orientation	Smart specializations
	Sector focused
	Horizontal
Geographic coverage	National
	Regional
Beneficiaries type	Firms
	Female-owned firms
	Individual researchers
	Consortia, associations, clusters, partnerships
	Research institutes / universities
	Business support institutions
	Financial institutions
	National or local government
Target group / final recipients of support	Firms
	Female-owned enterprises
	Individual researchers
	Consortia, associations, clusters, partnerships
	Research institutes / universities
	Business support institutions
	Financial institutions
	National or local government
Enterprise size	Micro
	Small
	Medium
	Large
Support value parameters	Minimal beneficiary input as % share of eligible costs
	Minimum eligible costs (EUR)
	Maximum eligible costs (EUR)
Budget source and split	Total value of all support programs under management (EUR)
	Total program value (EUR)
	Out of which EU funding (EUR)
	Out of which national public funding (EUR)
	Our of which national private funds (EUR)
	EU share
	Financing mix
Concluding remarks	Comments

Annex III – Assignment of regional returnable instruments to product groups

Instrument name	Product group	EU Measure
Mikropożyczka Inwestycyjno-Obrotowa	Small loan	Jeremie 2 (Łódzkie)
Pożyczka Rozwojowa	Small loan	RPDS.01.05.00
Mikropożyczka	Small loan	RPPM.02.01.00
Mikropożyczka	Small loan	RPWP.01.05.01
Pożyczka dla mikroprzedsiębiorstw	Small loan	RPKP.01.04.01
Mikropożyczka	Small loan	RPZP.01.09.00
Mała Pożyczka Inwestycyjna	Small loan	RPOP.02.01.01
Mała Pożyczka	Small loan	RPLU.03.07.00
Pożyczka mała	Small loan	RPMA.03.03.00
Pożyczka Standardowa-Innowacyjna	Small loan	RPPK.01.04.02
Pożyczka na rozwój	Small loan	RPKP.01.06.01
Pożyczka Rozwojowa	Small loan	RPPM.02.01.00
Pożyczka Standardowa	Small loan	RPPK.01.04.02
Pożyczka Rozwojowa	Small loan	RPDS.01.05.00
Pożyczka Rozwojowa	Small loan	RPWP.01.05.01
Mała Pożyczka Inwestycyjna	Small loan	RPWP.01.05.01
Mała Pożyczka	Small loan	RPLB.01.05.02
Mała Pożyczka Rozwojowa	Small loan	RPLB.01.05.02
Pożyczka Obrotowo Inwestycyjna	Small loan	RPZP.01.09.00
Pożyczka Inwestycyjno-Obrotowa	Large loan	Jeremie 2 (Mazowieckie)
Pożyczka Rozwojowa	Large loan	Jeremie 2 (Wielkopolskie)
Pożyczka Inwestycyjna	Large loan	Jeremie 2 (Zachodniopomorskie)
Pożyczka inwestycyjna z premią	Large loan	RPWM.01.05.03
Pożyczka inwestycyjna	Large loan	RPKP.01.06.01
Duża Pożyczka	Large loan	RPLU.03.07.00
Pożyczka Inwestycyjna	Large loan	RPPM.02.01.00
Pożyczka Profilowana	Large loan	RPPM.02.01.00
Pożyczka na wsparcie	Large loan	RPSL.03.04.00
Pożyczka dla MŚP	Large loan	RPSW.02.06.00
Pożyczka rozwojowa	Large loan	RPWM.01.03.03
Pożyczka na Zmianę Modelu Biznesowego	Large loan	RPKP.01.05.01
Pożyczka dla start-upów	Large loan	RPMP.03.04.01
Pożyczka	Large loan	RPMP.03.04.02
Pożyczka na Inwestycje Rozwojowe	Large loan	RPPD.01.03.00
Pożyczka Inwestycyjna	Large loan	RPZP.01.09.00
Duża Pożyczka	Large loan	RPLB.01.05.02
Duża Pożyczka Inwestycyjna	Large loan	RPOP.02.01.01
Pożyczka duża	Large loan	RPMA.03.03.00
Pożyczka na rozwój	Large loan	RPSL.03.04.00
Pożyczka Inwestycyjna (B+R)	R&D loan	RPOP.01.01.00
Pożyczka na badania i rozwój	R&D loan	RPKP.01.02.02
Pożyczka na innowacje	R&D loan	RPPM.01.01.02
Poręczenie	Credit guarantee	RPWM.01.03.03
Poręczenie	Credit guarantee	RPDS.01.05.00
Poręczenie	Credit guarantee	RPPM.02.01.00
Poręczenie	Credit guarantee	RPWP.01.05.01

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