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EUROPEAN REGIONAL DEVELOPMENT FUND AS AN INSTRUMENT STIMULATING INNOVATIVE DEVELOPMENT – EVIDENCE FROM POLAND

Iwona PAWLAS

University of Economics in Katowice, Faculty of Economics, Department of International Economic Relations / Poland

Abstract

Poland has been operating within the European Union structures since May 2004. It joined the EU as a collection of 16 poor provinces (with per capita GDP below 75 % of EU average) and a poor member state (with per capita GNI below 90 % of EU average). Therefore, Poland has become the number one beneficiary of EU Policy of Economic, Social and Territorial Cohesion. The development of the Polish economy has been significantly supported financially through both structural funds and Cohesion Fund. The need for innovation-led development in post-crisis period has been stressed by both OECD and the European Union. An attempt has been made in the paper to evaluate the implementation of EU Policy of Economic, Social and Territorial Cohesion in the field of innovation development and creation of innovative economy. Selected projects co-financed through European Regional Development Fund have been presented. Moreover, the innovativeness of Poland against the background of other EU Member States has been studied.

Keywords: Poland, European Union, innovation, innovativeness, European Regional Development Fund

1. Introduction

Gradual opening of the Polish economy resulted in its accession into the European Union structures in 2004. However, Poland joined the EU as a poor country (in 2004 its per capita GNI amounted to just 42% of EU15 average) and a collection of 16 poor provinces (their per capita GDP ranged from a bit over 30% to less than 70% EU15 average). Moreover, innovativeness of the Polish economy was very low in comparison to other EU Member States. This is why, the possibility to use both EU structural funds (especially European Regional Development Fund) and Cohesion Fund has been of vital importance for promotion of economic development of Poland's economy. Global financial crisis 2008+ and economic instability in the world economy created new challenges for enterprises, national economies, regional integration groupings and international economic organizations. Attempts have been made to develop new sources of growth, new strategies and new models of development. They brought a new approach to innovation activity and innovation policy. The OECD Innovation Strategy 2010 and OECD

Renewed Innovation Strategy 2015 underlined the role of innovation in the process of overcoming negative effects of the crisis, creating sustainable growth and upgrading economies to the next stage of economic development. The European Union stressed the significance of innovation and innovative development both in Lisbon Strategy and Europe 2020 Strategy. Dynamic technological development observed in the 21st century, as well as rising intensity of international competition accompanied by growing dynamics of globalization processes and increased technological interconnectedness in the globalized world necessitated strengthening the actions directed towards the creation of more innovative European Union, capable of competing successfully in a global market. An attempt has been made in the paper to diagnose and assess the implementation European Union Policy of Economic, Social and Territorial Cohesion in the field of innovation development and creation of innovative economy in Poland. Selected projects co-financed through European Regional Development Fund in Poland within Operational Program Innovative Economy 2007-2013 have been presented. Moreover, the plans regarding Operational Program Smart Growth 2014-2020 have been presented. Additionally, the innovativeness of Poland against the background of other EU Member States has been studied.

2. Innovation and innovativeness – theoretical aspects

Innovation activity is defined as “every scientific, technological, organizational, financial and commercial step which actually leads or is intended to lead to the implementation of innovations”. Innovation activities do include research and development (R&D) activity which is not directly related to the development of a specific innovation (OECD 2005, p. 47). In the 21st century, creation of high level of competitiveness requires intensive research and development (R&D) activity as well as creation and diffusion of innovation. Thus, the higher the level of innovativeness the better the prospects for pro-competitive development of a national economy. Innovation is a broad category, which entails product innovation, process innovation, organizational innovation and marketing innovation. Product innovation means the introduction of a new or significantly improved good or service in the market. In the case of process innovation, a new or significantly improved solution or method is used in production or delivery process, e.g. significant changes in techniques, equipment, software are introduced. Marketing innovation means the implementation of new instruments and new strategies into marketing activity, i.e. in product design or packaging, product placement, product promotion or pricing. Organizational innovation means the introduction of a new organizational method in business practices, workplace organization or external relations (OECD 2005, p. 47). The pace of technical and technological changes implementation and the effectiveness of innovation diffusion considerably influence the future position of a national economy. One should stress the significance of public and private expenditure devoted on research and development. Moreover, the construction of effective state of national system of innovation is necessary. National system of innovation can be defined as a network of private and public institutions (government, enterprises, universities, scientific institutes, research and development institutions, as well as the ones responsible for information transfer) whose activity and interactions initiate, modify and ease the diffusion of new technologies. A properly constructed national system of innovation can make dynamic growth and competitive development possible even in the situation of limited internal assets, thanks to appropriate combination of imported technology and internal adaptation processes enriched with R&D activities. On the other hand, however, structural weaknesses of national system of innovation may result in wasting limited internal assets, due to adopting wrong

aims or using inappropriate methods (Freeman 1987, p. 1). Since mid 1990s the 5th generation model of innovation has been prevailing (the so-called system integration and networking innovation model). The 5th generation model of innovation emphasizes fast innovation as an important factor determining competitiveness, stresses the importance of both vertical linkages with suppliers and customers along the whole innovation process and horizontal linkages adopting a whole variety of forms (joint ventures, consortia, alliances). Innovation is not sequential but cross-functional by nature and often multi-actor (Rothwell 1994, pp. 7-31).

The significance of innovation and attempts of promoting innovative development and stimulating the creation of knowledge-based economy have already been underlined by the European Union in its New Cohesion Policy 2007-2013. The New Cohesion Policy 2007-2013 focused on three main objectives:

- Convergence;
- Regional competitiveness and employment;
- European territorial cooperation.

The priority themes for funding in 2007-2013 period included: research and innovation, information society, support for enterprises and workers, transport, energy, environment and climate change, health, culture and tourism, employment and social inclusion, as well as education and training. The first two priority themes focused on innovation to a great extent, while others did embrace some pro-innovative actions (CECOP – CICOPA Europe 2008).

Global financial crisis 2008+ and economic instability in the world economy resulted in new approach to innovation activity, innovation strategy and innovation policy. In 2010 OECD revealed its Innovation Strategy, which focused on building a sustainable, job-rich recovery and moving on to the next phase of human progress, i.e. the era of green growth. The OECD Innovation Strategy 2010 consisted of five crucial elements, namely:

- Empowering people to innovate;
- Unleashing innovation in firms;
- Creating and applying knowledge;
- Applying innovation to address global and social challenges;
- Improving the governance of policies for innovation (OECD 2010).

Five years later OECD experts launched a renewed innovation strategy. The OECD Innovation Strategy 2015 embraced the following five priorities for innovation policy:

- Strengthen investment in innovation and foster business dynamism;
- Invest in and shape an efficient system of knowledge creation and diffusion;
- Seize the benefits of the digital economy;
- Foster talent and skills and optimize their use;
- Improve the governance and implementation of policies for innovation (OECD 2015, p. 2).

Innovation strengthens growth and dynamism of an economy (Pilewicz 2014). What's more, in post-crisis period innovation can help transform economies towards smarter, more inclusive and more sustainable ones. OECD Strategy is reflected in Europe 2020 Strategy adopted by the EU for the period 2010-2020, which consists of three priorities:

- Smart growth, i.e. developing an economy based on knowledge and innovation;
- Sustainable growth, i.e. promoting a more resource efficient, greener and more competitive economy;

- Inclusive growth, i.e. fostering a high-employment economy delivering social and territorial cohesion (European Commission 2010, p. 3).

The current actions and policies of the EU must fall in line with Europe 2020 Strategy (Dhéret 2011). Therefore, EU Policy of Economic, Social and Territorial Cohesion fully reflects Europe 2020 Strategy (Gasz 2015). Thematic objectives of EU Policy of Economic, Social and Territorial Cohesion for the period 2014-2020 include:

- Strengthening research, technological development and innovation;
- Enhancing access to and use and quality of information and communication technologies;
- Enhancing the competitiveness of small and medium enterprises;
- Supporting the shift towards low-carbon economy;
- Promoting climate change adaptation, risk prevention and management;
- Preserving and protecting the environment and promoting resource efficiency;
- Promoting sustainable transport and improving network infrastructures;
- Promoting sustainable and quality employment and supporting labour mobility;
- Promoting social inclusion, combating poverty and any discrimination;
- Investing in education, training and lifelong learning;
- Improving the efficiency of public administration (European Commission 2014a).

The first three thematic objectives are strongly connected with the 1st Priority of Europe 2020 Strategy. Thematic objectives 4 to 7 reflect the 2nd Priority of Europe 2020 Strategy. The remaining thematic objectives – 8 to 11 are tied to the 3rd Priority of Europe 2020 Strategy.

3. Operational Program Innovative Economy 2007-2013 and Operational Program Smart Growth 2014-2020 - Instruments Supporting the Development of Poland

Poland should be viewed as the number one beneficiary of EU Policy of Economic, Social and Territorial Cohesion. For the period 2007-2013 Poland was granted EUR 67 billion for the implementation of this policy, of which EUR 33.7 billion from European Regional Development Fund (Komisja Europejska 2007). As far as the period 2014-2020 is concerned, financial assistance from the EU designed for the implementation of Policy of Economic, Social and Territorial Cohesion in Poland amounts to EUR 77.6 billion, including EUR 40.6 billion from European Regional Development Fund (European Commission 2014b). Many experts believe that the current multiannual financial perspective is the last one so advantageous for Poland as far as both overall financial support from the EU and its financial assistance regarding the implementation of EU Cohesion Policy in Poland are concerned. Therefore, it is of vital importance to undertake every effort to make the best possible use of the EU funds in Poland in order to promote the Polish economy's development and upgrade its innovativeness and competitiveness.

The instruments of EU Policy of Economic, Social and Territorial Cohesion actively supported upgrading of Poland's economy innovativeness. Operational Program Innovative Economy 2007-2013 constituted one of the main elements of National Cohesion Strategy of Poland. It aimed at supporting creation and diffusion of innovations and promoting innovativeness of Poland's economy. OP Innovative Economy offered direct support to enterprises, research institutions and scientific entities, as well as systemic support for the development of business support institutions. OP Innovative Economy offered financial assistance in the area of product, process,

marketing and organizational innovativeness. The specific objectives of OP Innovative Economy included:

- Increasing innovativeness of enterprises;
- Improvement of competitiveness of Polish science;
- Strengthening the involvement of science in economic development;
- Increasing the share of innovative products of the Polish economy in international market;
- Creation of permanent and better workplaces;
- Increased use of information and communication technologies in the Polish economy (Ministry of Development 2007a).

The budget of OP Innovative Economy amounted to EUR 10.186 billion, in that EUR 8.658 billion from European Regional Development Fund and EUR 1.528 billion from the state budget of Poland. Moreover, private financial sources amounting to EUR 2.400 billion were invested in projects related to OP Innovative Economy. Therefore, the total budget of OP Innovative Economy 2007-2013 equalled EUR 12.586 billion. With respect to the majority of projects realized under OP Innovative Economy, the EU financial support amounted to 85% of total eligible cost (Ministry of Development 2007a; Ministerstwo Rozwoju 2017).

OP Innovative Economy consisted of the following axes:

- Priority Axis 1. Research and development of modern technologies (14.95%);
- Priority Axis 2. R&D infrastructure (14.16%);
- Priority Axis 3. Capital for innovation (3.04%);
- Priority Axis 4. Investments in innovative undertakings (36.43%);
- Priority Axis 5. Diffusion of innovation (4.37%);
- Priority Axis 6. Polish economy in the international market (4.03%);
- Priority Axis 7. Information society – establishment of electronic administration (9.24%);
- Priority Axis 8. Information society – increasing innovation of the economy (11.76%);
- Priority Axis 9. Technical assistance (2.03%) (Ministry of Development 2007b).

Table 1. Structure of OP Innovative Economy 2007-2013 and Its Implementation

Priority axes	Total allocation (EUR million)	ERDF (EUR million)	National public source (EUR million)	Number of concluded agreements	Value of concluded agreements (EUR million)	Contracting level (%)	Use of EFRD allocation (%) as of March 2017
I. Research and development of modern technologies	1757.6	1294.2	228.4	1461	1680.0	116.85	105.2
II. R&D infrastructure	1442.2	1225.9	216.3	166	1520.0	112.0	110.9
III. Capital for innovation	309.3	262.9	46.4	305	332.0	111.0	97.6
IV. Investments in innovative undertakings	5547.5	3153.9	556.6	2030	3380.0	97.5	93.8
V. Diffusion of innovation	444.9	378.1	66.7	552	440.1	105.6	102.7
VI. Polish economy in the international market	469.6	349.0	61.6	5022	411.4	105.96	114.7
VII. Information society – establishment of electronic administration	940.8	799.6	141.1	40	868.4	97.0	87.0
VIII. Information society – increasing innovation of the economy	1466.9	1018.2	178.7	7569	1170.0	103.3	100.5
IX. Technical assistance	207.2	176.1	31.1	235	203.9	103.3	89.8
TOTAL	12585.9	8657.9	1526.9	17380	10005.8	-	-

Source: (Ministerstwo Rozwoju 2017).

Monitoring Committee of OP Innovative Economy 2007-2013 accepted the final report regarding the implementation of OP Innovative Economy in Poland on March 23rd, 2017 (Komitet Monitorujący PO IG 2017). Table 1 presents details regarding OP Innovative Economy 2007-2013 and its implementation as of March 2017. OP Innovative Economy 2007-2013 was very popular among potential beneficiaries. Almost 47500 formally correct applications were presented. Their value amounted to EUR 25.6 billion, i.e. 267% of the programme's allocation. Finally, 17380 agreements were concluded with a value of co-financing equalling over EUR 10 billion, including EUR 8.6 billion from European Regional Development Fund.

The highest levels of contracting were observed in the case of 1st priority axis: Research and development of modern technologies (117%), 2nd priority axis: R&D infrastructure (112%).

The executed payments to beneficiaries amounted to EUR 9.5 billion, in that EUR 8.1 billion from European Regional Development Fund as of the end of December 2016, i.e. 98.95% of the allocation of OP Innovative Economy. The highest levels of payments to beneficiaries were noted in the 1st priority axis: Research and development of modern technologies (106% of allocation) and the 2nd priority axis: R&D infrastructure (110.9% of allocation) (Ministerstwo Rozwoju 2017).

For the next programming period, i.e. 2014-2020, Operational Program Smart Growth was prepared which replaced OP Innovative Economy. OP Smart Growth fully falls in line with Europe 2020 Strategy, and in particular with its 1st Priority – Smart Growth. The budget of OP Smart Growth amounts to EUR 10.19 billion, including EUR 8.61 billion from European Regional Development Fund and EUR 1.58 billion from the public sources Polish (Ministerstwo Rozwoju 2015).

OP Smart Growth consists of the following priority axes:

- Priority Axis I. Support for R&D activity of enterprises (44.69%);
- Priority Axis II. Support for the environment and capacity of enterprise for R&D&I activity (12.11%);
- Priority Axis III. Support for innovation in enterprises (25.55%);
- Priority Axis IV. Increasing the research potential (14.20%);
- Priority Axis V. Technical assistance (3.45%) (Ministry of Infrastructure and Development 2014, pp. 30-31).

Each priority axis of Operational Programme Smart Growth has two financial envelopes: one for 15 provinces of Poland with maximum co-financing rates amounting to 85% and the other one for Mazovia Province with maximum co-financing rates amounting to 80% (Ministry of Infrastructure and Development 2014, p. 29). The structure of OP Smart Growth 2014-2020 is presented in table 2. The 1st and 2nd priority axes are crucial, for they account for over 70% of the budget of OP Smart Growth.

Table 2. Structure of OP Smart Growth 2014-2020 (EUR million)

Priority axis	Total allocation	ERFD financial support	National public financial engagement
I. Support for R&D activity of enterprises	4553.91	3849.93	703.98
II. Support for the environment and capacity of enterprise for R&D&I activity	1232.99	1043.15	189.84
III. Support for innovation in enterprises	2603.55	2200.88	402.67
IV. Increasing the research potential	1446.98	1222.97	224.01
V. Technical assistance	351.56	296.99	54.57
TOTAL	10188.99	8613.92	1575.07

Source: (Ministerstwo Infrastruktury i Rozwoju 2014).

4. Selected Projects co-financed through European Regional Development Fund in Poland in the Field of Innovative Economy Creation: Case Studies

The implementation of EU Cohesion Policy in Poland helped to speed up the process of Poland's economy convergence with the EU countries. The reduction of development gap was observed in the post-crisis period and was connected with a relatively high level of economic growth in Poland in comparison to other EU economies. One should, however, underline a real threat for further development of the Polish economy, related to the phenomenon of the "middle income trap". Avoiding this threat requires changing the model of Poland's economic development - from imitative to innovative. Projects co-financed through European Regional Development Fund in the field of innovative economy creation seem to be of great importance for stimulating innovation activity in Poland. Selected examples of the projects in the area of innovative economy development co-financed through European Regional Development Fund in Poland from 2007 to 2017 were described below.

A good example of the project in the area of innovation and innovative economy creation is: "Telediagnosics of arteriovenous fistula in the model of electronic services - innovative products in the telemedicine industry". Nefron Ltd. was a beneficiary of the project. The project was realised under OP Innovative Economy, Priority VIII: Information society – increasing innovation of the economy, Action 8.1: Support for economic activity in the field of electronic economy. The total value of the project amounted to PLN 654.7 thousand, with funding from the European Regional Development Fund of as much as 381.99 thousand (58.3%) (Portal Funduszy Europejskich 2013). The project can be seen as an answer to problems of patients with kidney illness. Patients whose renal function is significantly reduced, haemodialysis should be used to purify the blood from toxins found in it. For this purpose, a direct connection between the artery and the vein (fistula) is performed. Later, however, patients must take special care of their health and often check their condition. The support received from European Regional Development Fund was used by Nefron Ltd. to create a smartphone application that checks the functioning of arteriovenous fistula in 10 seconds. Thanks to its application, the patient can independently perform the examination at any time of the day or night and regardless of the place where he is. As a result, the frequency of doctor's appointments can be significantly limited. In addition to that, a base of recreation facilities (hotels, resorts, sanatoriums) that meet safety standards and conditions for haemodialysis and peritoneal dialysis patients was built. (Nefron 2017a, Nefron 2017b).

Another example of the project in the area of innovation and innovative economy development is: "Creation of Research & Development Centre at American Heart of Poland Ltd.". American Heart of Poland Ltd. was a beneficiary of the project. The project was realised under OP Innovative Economy, Priority IV: Investments in innovative undertakings, Action 4.5: Support for investments of high importance for the economy. The total value of the project amounted to PLN 36.31 million, with funding from the European Union of PLN 18.16 million (50.01%). The investment included two investments: a modern Department of Cardiac Surgery and Laser Endoscopy in Bielsko-Biała and Experimental Laboratory in Kostkowice. Research and Development Centre at American Heart of Poland S.A. is the only centre for preclinical and clinical research in the field of cardiology in Poland. The Center conducts research on the treatment of valve defects, heart failure and in the area of coagulation disorders and anticoagulant

therapy. The achieved results allow the application of new, innovative medical technologies in clinical practice and more effective diagnostics of patients suffering from cardiovascular diseases (Portal Funduszy Europejskich 2012a, American Heart of Poland 2017).

An interesting example of the project in the area of innovation and innovative economy creation is: “Establishment of the CLIMATIC Research and Development Centre in the field of clean room ventilation”. CLIMATIC Ltd. was a beneficiary of the project. The project was realised under OP Innovative Economy, Priority IV: Investments in innovative undertakings, Action 4.5: Support for investments of high importance for the economy, Sub-Action 4.5.2: Support for investment in modern services sector. The total value of the project amounted to PLN 15.34 million, with funding from the European Union of PLN 5.32 million (34.68%). The CLIMATIC Research & Development Centre carries out R&D activity in the field of clean room ventilation. The works include microbiological and chemical tests. The Climatic Research & Development Centre also undertakes research on laminar ceiling, recirculation modules, wall construction systems, ventilation and air-conditioning systems with automatic control and pressure gradation systems, as well as research regarding decontamination effectiveness (Portal Funduszy Europejskich 2012b).

Another example of the project in the area of innovation is: “In the footsteps of Cracow's European identity - a tourist route through the basement of the Main Market Square”. Cracow urban commune was a beneficiary of the project. The project was realised under OP Innovative Economy, Priority VI: Polish economy in the international market, Action 6.4: Investments in tourist products of supra-regional importance. The total value of the project amounted to PLN 37.92 million, with funding from the European Union of PLN 13.55 million (35.73%). The project covered the underground of the Main Market Square in Cracow with an area of approx. 5000 sq. metres. The underground tourist trail created as part of the project is a unique tourist attraction on the national and global scale. The idea of the project was to show the role and importance of Cracow in the Middle Ages, as one of the most important commercial, economic, financial and cultural centres of the then world. The scope of the project included two main parts, and in particular:

- construction works, i.e. works aimed at preparing the underground of the Main Market Square in Cracow to be a displaying role,
- the exhibition part, including the arrangement and equipment of individual museum zones and facilities for tourist traffic (with the use of innovative forms of communication: models, staging, wax figures, holographic presentations, screens, time capsules and multimedia stations).

Moreover, the project included the establishment of a multimedia forum, a tourist information centre and a section for children with didactic aids related to the subject of the project (Portal Funduszy Europejskich 2015; Podziemia Rynku 2017).

5. Innovativeness of Poland against the Background of Other European Union Member States

Poland's innovativeness is still rather low in comparison to majority of EU Member States. Table 3 presents innovation summary index for Poland and the EU from 2010 to 2016. Poland's performance relative to the EU ranged from 54.89% in 2013 to 59.36% in 2009. In 2015, it amounted to a bit over 56% (European Commission 2016).

Table 3. Innovation summary index for Poland and the EU from 2010 to 2015

Economy	2008	2009	2010	2011	2012	2013	2014	2015
Poland	0.290	0.298	0.299	0.291	0.296	0.286	0.291	0.292
EU28	0.495	0.502	0.511	0.514	0.519	0.521	0.523	0.521
Poland relative to EU28 (%)	58.59	59.36	58.51	56.62	57.03	54.89	55.64	56.05

Source: European Commission 2016, p. 94.

In 2016 the methodology of calculating innovation summary index changed considerably. Table 4 present innovation summary index as well as all dimensions and indicators – Poland's performance relative to EU 2010 in 2010 and 2016. In 2010 the overall summary innovation index for Poland accounted for just 52.8% of the EU average. In 2016, it was 2 percentage points higher. The best situation in Poland was observed in the case of:

- Population with tertiary education: 125% relative to EU 2010 in 2010 and as much as 167.1% relative to EU 2010 in 2016;
- Broadband penetration: 122.2 % relative to EU in 2010 in 2016;
- Non-R&D innovation expenditures: around 190% relative to EU in 2010 in both 2010 and 2016;
- Design applications: 128.1% relative to EU in 2010 in 2016;
- Employment in fast-growing enterprises: 128.6% relative to EU in 2010 in 2010 and 111.9% relative to EU in 2010 in 2016.

Table 4. Innovation summary index, innovation dimensions and indicators: Poland vs. European Union – 2010 and 2016 (EU=100)

Specification	Performance relative to EU 2010 in		Change 2010-2016
	2010	2016	
SUMMARY INNOVATION INDEX	52.8	54.8	2.0↑
Human resources	69.4	77.4	8.0↑
New doctorate graduates	46.2	32.9	-13.2↓
Population with tertiary education	125.0	167.1	42.1↑
Lifelong learning	32.6	26.3	-6.3↓
Attractive research systems	22.7	33.0	10.3↑
International scientific co-publications	44.5	79.8	35.3↑
Most cited publications	26.5	39.2	12.7↑
Foreign doctorate students	9.4	7.4	-2.0↓
Innovation-friendly environment	44.8	83.7	38.9↑
Broadband penetration	77.8	122.2	44.4↑
Opportunity-driven entrepreneurship	21.5	56.5	35.0↑
Finance and support	46.0	51.2	5.2↑
R&D expenditure in the public sector	57.4	68.0	10.6↑
Venture capital expenditures	31.6	30.1	-1.5↓
Firm investments	71.8	85.1	13.3↑
R&D expenditure in the business sector	14.1	38.2	23.9↑
Non-R&D innovation expenditures	190.7	188.8	-1.8↓
Enterprises providing ICT training	35.7	50.0	14.3↑
Innovators	25.0	2.2	-22.8↓
SMEs product/process innovations	24.3	5.9	-18.4↓
SMEs marketing /organizational innovations	25.9	0.6	-25.3↓
SMEs innovating in-house	24.8	0.0	-24.8↓
Linkages	37.4	26.8	-10.6↓
Innovative SMEs collaborating with others	52.1	23.0	-29.1↓
Public-private co-publications	19.2	22.7	3.5↑
Private co-funding of public R&D exp.	40.9	33.3	-7.6↓
Intellectual assets	56.0	77.9	21.9↑
PCT patent applications	31.3	39.6	8.3↑
Trademark applications	51.8	79.7	27.9↑
Design applications	92.5	128.1	35.6↑
Employment impacts	92.2	88.0	-4.2↓
Employment in knowledge-intensive activities	42.3	55.1	12.8↑
Employment in fast-growing enterprises	128.6	111.9	-16.7↓
Sales impacts	68.5	55.2	-13.3↓
Medium and high-tech product exports	93.3	84.2	-9.1↓
Knowledge-intensive services exports	45.0	44.4	-0.6↓
Sales of new-to-market / new-to-firm innovations	66.2	32.7	-33.5↓

Legend: ↓ - worsening of Poland's relative performance between 2010 and 2016 ↑ - improvement of Poland's relative performance between 2010 and 2016, Source: European Commission 2017, p. 62.

The improvement of Poland's performance relative to EU 2010 was observed in the case of the following innovation dimensions:

- Human resource (+8.0 percentage points);
- Attractive research systems (+10.3 percentage points);
- Innovation-friendly environment (+38.9 percentage points);
- Finance and support (+5.2 percentage points);
- Firm investments (+13.3 percentage points);
- Intellectual assets (+21.9 percentage points).

Unfortunately, four other dimensions noted worsened performance of Poland relative to EU 2010 in the analysed period of time:

- Innovators (-22.8 percentage points);
- Linkages (-10.6 percentage points);
- Employment impacts (-4.2 percentage points);
- Sales impacts (-16.7 percentage points).

A more detailed analysis of relative performance of Poland with the implementation of individual indicators showed a considerable improvement in regard to: international scientific co-publications (+35.3 percentage points), most cited publications (+12.7 percentage points), broadband penetration (+44.4 percentage points), opportunity-driven entrepreneurship (+35 percentage points), R&D expenditure in the public sector (+10.6 percentage points), R&D expenditure in the business sector (+23.9 R&D expenditure in the public sector), enterprises providing ICT training (+14.3 percentage points), PCT patent applications (+ 8.3 percentage points), trademark applications (+27.9 percentage points), design applications (+35.6 percentage points) (European Commission 2017).

6. Conclusions

In the conditions of global competition, dynamic changes in the global economy and exhaustive traditional sources of development, innovation activity accompanied by effective diffusion of innovation is considered the right solution for the creation of long-term, global competitive advantage. In the 2nd decade of the 21st century, in post-crisis period it is believed that innovativeness determines economic development of national economies and creating their competitiveness in a globalizing economy. Innovation become a crucial driving force of economic growth. The rising importance of innovation was stressed by OECD in its strategy in 2010 and 2015. The European Union underlined the significance of innovation in Europe 2020 Strategy. Promoting R&D and innovation activity became an important element of EU Cohesion Policy 2007-2013 and was further strengthened in its Cohesion Policy 2014-2014. Considerable weaknesses of Poland in regard to innovation and innovativeness include: imitative nature of innovation, a relatively low level of awareness of innovation, poor linkages between the actors developing and introducing innovations, inadequate financial support for innovation activity, inadequate engagement of SMEs in innovation activity. Therefore, Operational Programme Innovative Economy 2007-2013 and Operational Programme Smart Growth 2014-2020 constitute significant sources of financial means which should promote and stimulate R&D and innovative activity in Poland. It is of vital importance to undertake every effort to make the best possible use of EU funds available for R&D and innovation activity in the current multiannual perspective, for

the next multiannual financial framework is likely to bring reduced funds for Poland (partly due to a number of internal and external challenges facing the EU).

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