SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2025
ORGANIZATION AND MANAGEMENT SERIES NO. 226

FINANCING OF RESEARCH AND DEVELOPMENT ACTIVITIES IN POLAND – SELECTED ASPECTS

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Purpose: The aim of the article is to examine and assess changes in the size of expenditures incurred by enterprises in the area of research and development activities in Poland in the years 2018-2023 and to determine Poland's place in the ranking of EU countries in the area of R&D.
Design/methodology/approach: The analysis and assessment of changes in R&D expenditures were made on the basis of calculated indicators of dynamics, pace, and structure. The grouping of EU countries according to the level of R&D intensity was carried out using the Hellwig method. The source of statistical data for the calculations is the Central Statistical Office and Eurostat.
Findings: The results of the research indicate positive changes in the R&D activity of enterprises in Poland. An increase in R&D expenditures is marked, the number of enterprises taking the initiative in R&D is increasing, the number of enterprises using foreign funds in terms of R&D expenditures is increasing.
Research limitations/implications: The research was carried out for the period 2018-2023. In the future, it will be possible to survey the R&D activity of enterprises for another six-year period in order to make a comparative analysis of the changes that have occurred.
Practical implications: The presented results of the research can be a source of motivation for enterprises to undertake R&D activities as well as a stimulus to continue the implementation of initiatives to extend tax relief offers for enterprises undertaking R&D activities.
Social implications: The involvement of enterprises in R&D and the implementation of the latest achievements of science and technology contribute to an increase in the innovativeness of the economy and, at the same time, a rise in the living standards of society. The analysis and evaluation of changes in the R&D area makes it possible to adapt the instruments of state policy to provide greater support for enterprises in undertaking R&D activities.
Originality/value: This paper analyses and assesses changes in the level of outlays incurred by the executive and financing sectors of R&D activity in Poland. It also compares Poland with other EU countries in the area of R&D intensity. The article provides information for both researchers and practitioners dealing with the analysed issues. The article enriches the literature on R&D activity of enterprises.
Keywords: research and development, R&D, innovation.
Category of the paper: research paper.

1. Introduction

Research and development activity is a creative activity involving scientific research or development work undertaken systematically to increase knowledge and its use in the processes of creating new or improved products, services, technologies, and processes (Dz.U. 1992, nr 21, poz. 86; Dz.U. 1991, nr 80, poz. 350).

Undertaking research and development activities and using the solutions obtained in creating process or product innovations is of fundamental importance for the development and progress of society.

Access to financial resources is crucial for the implementation of R&D projects and the commercialization of innovations. It is also important to provide a favourable environment for innovation and strengthening economic growth. Governments can support R&D through appropriate policies and regulations in the field of introducing tax relief for R&D, providing financing for R&D, simplifying implementation procedures. In creating a modern, sustainable and knowledge-based economy, the European Union policy plays an important role, setting priorities and directions for economic development. In the developed development strategies, goals are also set in the area of R&D, and their implementation is financed from EU funds.

The article presents issues related to R&D expenditures incurred in Poland in the years 2018-2023. The aim of the article is to analyse and assess changes in the level of expenditures incurred by enterprises in the area of research and development activities and to place Poland in the designated ranking of EU countries in the area of intensity of R&D activities.

2. Research and development as a source of innovation for companies

Contemporary businesses operate in a dynamically changing environment, which influences the search for new sources of competitiveness. A company's ability to create and implement innovation is crucial to its development. One source of innovation is R&D.

The literature on the subject emphasises the key importance of the R&D work undertaken for the strategic management of the enterprise (Schumpeter, 1960; Penc, 1999; Janasz et al., 2002; Stanisławski, 2017; Dolińska, 2010). There are three types of research within the research and development area: basic, applied and developmental (Szopik-Depczyńska, 2009).

Conducting research and development activities and implementing the latest scientific and technological achievements contribute to an increase in the innovativeness of the economy, which is consequently reflected both in an increased ability to compete on international markets and in a higher standard of living for society (Stankiewicz, 2006; Pangsy-Kania, 2007; Tidd, Bessant, 2011).

The innovations introduced help companies gain new international markets and at the same time create opportunities to compete on a global level. In the process of creating an innovative economy, research and development work is of key importance, which discovers new phenomena and mechanisms, creating a basis for future technological innovations, transforms scientific discoveries into specific technologies and implemented solutions in practice, and uses the results of research and development to improve products and services.

3. Research methods

In order to assess changes in R&D expenditures by individual executive sectors, a comparative analysis of the formation of calculated indicators was used: structure, dynamics, and pace of change. The analysis covered entities from four executive sectors: business, government, higher education, and private non-commercial institutions. The analysis of R&D expenditure financing was conducted for the following five sectors: enterprises, government, higher education, private non-commercial institutions, and abroad. Moreover, the intensity of R&D expenditures in Poland was compared with other EU countries. In this respect, a comparative analysis was conducted of the values of the calculated indicators for Poland and other European Union countries.

In order to group EU countries by their level of R&D intensity and to place Poland in comparison with these countries, the Hellwig method was applied (Hellwig, 1968)

On the basis of the calculated synthetic index, a ranking of EU countries in the area of R&D activity was created. Four groups of countries with the highest, high, low and lowest levels of R&D intensity were distinguished. The following indicators were used to measure the level of intensity: R&D outlays, R&D outlays *per capita*, the ratio of outlays to GDP, the share of funds from abroad, R&D personnel, the rate of change of the outlays incurred.

The data source for the calculations is the CSO database and Eurostat. The research was conducted for the period 2018-2023.

4. Research findings and their analysis

4.1. Changes in the level of R&D expenditure of executive sectors

There were 7549 businesses operating in the R&D sector in 2023. Compared to 2018, this number increased by 1770 entities (*i.e.*, by approximately 30%). Between 2018 and 2023, the number of enterprises implementing R&D increased annually. Compared to the previous year, the largest increase in the number of entities with R&D activities (by about 16%) occurred

in 2021 (Table 1). The largest share - more than 92% in terms of conducting R&D activities was attributed to entities in the business executive sector, followed by entities in higher education, government sector (2.8%) with a share of 3.4% (Figure 1). The smallest number of entities engaging in R&D is in the private non-commercial institutions sector (1.6%).

Table 1.
Entities with R&D activities

Specification	Year					
	2018	**2019**	**2020**	**2021**	**2022**	**2023**
Number of entities	5779	5863	6381	7370	7431	7549
Change rate [previous year =100%]		1.5	8.8	15.5	0.8	1.6

Source: own study.

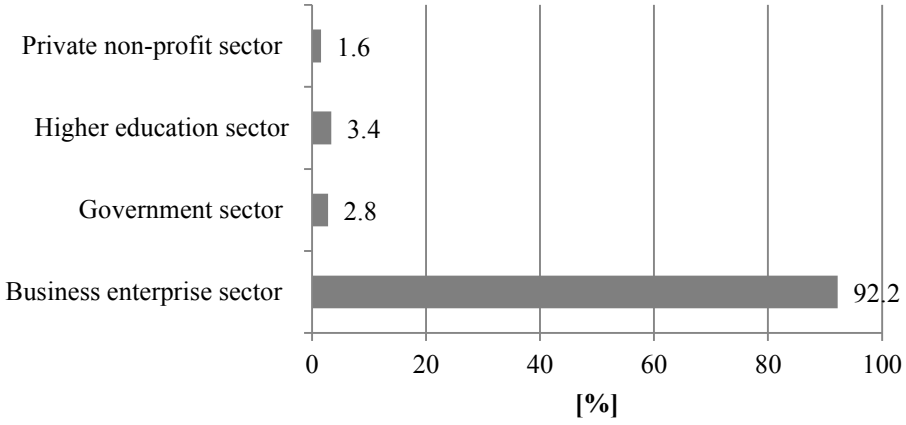

Figure 1. Structure of entities with R&D activities by executive sectors (2023).
Source: own study.

Compared to 2018, expenditures on research and development activities in 2023 increased by over 107% and amounted to PLN 53.1 billion. In the period under review, expenditures increased annually, with a smaller increase (7%) compared to the previous year noted in 2020. The average annual growth rate of expenditures on R&D in the period 2018-2023 was 19.9% (Table 2). The R&D intensity index increased year by year. In 2023, its value was 1.56% and increased by 0.35 percentage points compared to 2018.

The largest R&D expenditures are incurred by the business sector. In 2023, they amounted to more than PLN 34 billion and, compared to 2018, they increased by more than 102% (Figure 2). This was followed by significant R&D expenditure by the higher education sector, which spent nearly PLN 18 billion in 2023 and this was an increase of around 119% compared to 2018. The higher education sector ranks third and the non-profit sector fourth in terms of R&D expenditure incurred.

Table 2.
The amount of expenditure [PLN billion] on R&D and the dynamics of their changes

Specification	Year					
	2018	**2019**	**2020**	**2021**	**2022**	**2023**
Gross domestic expenditure on R&D (GERD) [PLN billion]	25.6	30.3	32.4	37.7	44.7	53.1
Change rate GERD [previous year =100%]		18.1	7.0	16.3	18.7	18.8
Relation of GERD to GDP [%]	1.21	1.32	1.39	1.43	1.44	1.56

Source: own study.

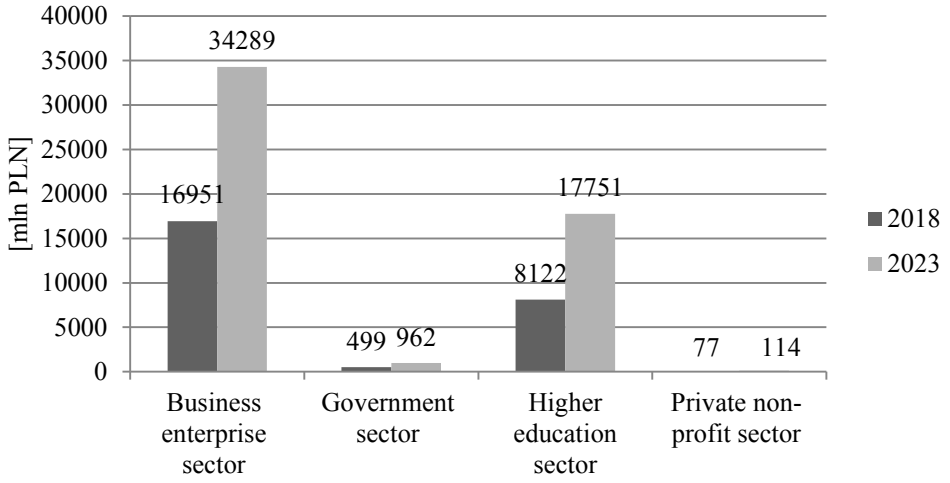

Figure 2. Expenditures on R&D of executive sectors in 2018 and 2023.

Source: own study.

In the structure of expenditures incurred by each executive sector on R&D, the share of two sectors is particularly significant (Figure 3).

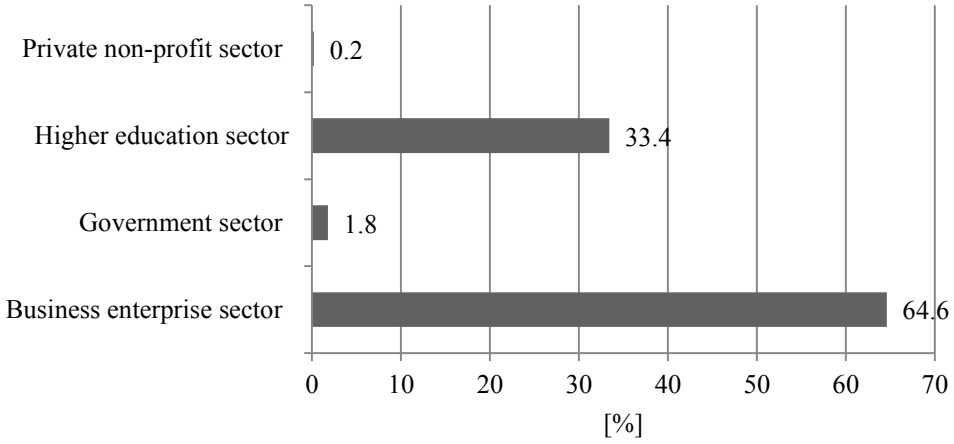

Figure 3. Structure of expenditures on R&D of executive sectors in 2023.

Source: own study.

The share of the business sector is the largest, accounting for nearly 65%, and is almost double the share of the higher education sector (around 33%). The government sector accounted for PLN 962 million (1.8%). The lowest expenditures are in the private non-commercial institutions sector, whose share was 0.2% (PLN 114 million).

4.2. Changes in the funding of R&D expenditures

In 2023, the business sector allocated more than PLN 29 billion to finance R&D expenditures. This sector financed R&D expenditure to the greatest extent (over 50%). Between 2020 and 2023, its share increased annually from 50.6% to 54.8% in covering R&D costs (Table 3).

Table 3.
Structure of expenditures on R&D by funding sectors

Specification		Year					
		2018	2019	2020	2021	2022	2023
Business sector	[%]	53.3	50.7	50.6	51	54.8	54.8
Government sector		35.4	38.8	39	37.4	33.5	31.9
Higher education sector		4.1	3	2.7	3	3.3	3.5
Private non-profit sector		0.2	0.5	0.5	0.4	0.3	0.3
Rest of the world		7	7	7.2	8.2	8.1	9.5

Source: own study.

More than one-third of R&D expenditures were covered by the government sector - becoming the second most used source of funding for the expenditures analysed. From 2020, a decrease from 39% to 31.9% of this sector's share in the R&D funding structure was marked.

In covering R&D expenditure, the third place was occupied by funds from abroad, whose share increased from 7% (in 2018) to 9.5% (in 2023).

The higher education and private not-for-profit sectors financed R&D expenditures to a lesser extent. In the financing structure, their shares were in the ranges [2.7%; 4.1%] and [0.2%; 0.5%], respectively.

Table 4.
Dynamics of change in R&D expenditure of the three main funding sectors [previous year = 100%]

Specification		Year					Pace of change
		2019	2020	2021	2022	2023	
Business sector	[%]	12.5	6.9	17	27.5	18.6	20.8
Government sector		29.4	7.4	11.6	6.2	13.3	16.9
Rest of the world		18.3	8.9	32.4	17.7	39.8	29.4

Source: own study.

The considered main sectors financing R&D expenditure marked an annual increase in the volume of financed expenditures compared to the previous year (Table 4). Over the period 2018-2023, the highest average annual growth rate in the financing of expenditure incurred was marked by foreign countries (29.4%), followed by the business sector (20.8%).

The business sector accounts for the largest share of R&D expenditure. It is also the sector that finances the largest share of expenditure in this area. Table 5 shows the changes in the structure of sources of funding for the business sector.

Table 5.
Structure of sources of funding expenditures on R&D for the business sector

Year	Business sector	Government sector	Higher education sector	Private non-profit sector	Rest of the world
	[%]				
2018	78.58	13.5	0.01	0.01	7.9
2019	78.69	13.4	0.01	0.1	7.8
2020	78.89	13.6	0.2	0.01	7.3
2021	79.1	12.7	0.1	0.1	8
2022	81.6	10	0.1	0.1	8.2
2023	83.3	9.4	0.1	0.1	7.1

Source: own study.

In the business sector, the three main sources of funding for its R&D expenditure are business, government, and foreign countries. The share of businesses in financing the R&D expenditure incurred has increased every year. In 2023, more than 83% of the expenses incurred were covered by companies. Compared to 2018, the share of this source of funding increased by 4.7 pp. In contrast, the government's share of funding from the business sector decreased by 4.1 pp, with a share of 9.4% in 2023. Foreign funds in the financing of the business sector in 2023 accounted for 7.1 pp of the expenditures incurred.

In 2023, 1,438 entities used foreign funds for R&D activities (Figure 4). They accounted for 19% of entities conducting R&D activities. Compared to 2018, the number of these entities increased by 406 (about 39%) and their share among entities engaging in R&D increased by about 1.1 pp.

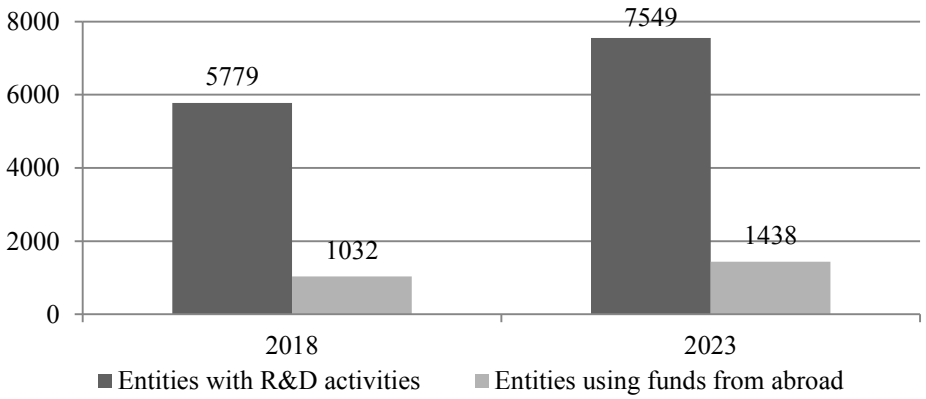

Figure 4. Entities in R&D activities using funds from abroad.

Source: own study.

Table 6.
Share of main sources of foreign funds in financing R&D expenditures

Specification		Year					
		2018	2019	2020	2021	2022	2023
Funds from EU	[%]	57.4	66.7	73.6	77.7	82	86
Funds from enterprises		35.8	27.0	19.9	16.4	12.5	9.9
Budgetary funds in project co-financed from EU funds		14	12.5	25.1	17.1	9.5	12.7

Source: own study.

In the structure of foreign financing of R&D works, the largest share and its annual increase is attributed to funds from EU funds (Table 6). Compared to 2018, their share increased by 28.6 percentage points and in 2023 reached the level of 86%. The second foreign source used in financing R&D activities were funds from enterprises, the share of which decreased year by year from the level of 35.8% (in 2018) to 9.9% (in 2023).

Budget funds of projects co-financed by the EU constitute the third main source of foreign financing of R&D activities. Their share fluctuated between 9% and 25.1%.

Table 7.
Share of foreign sources of funds in financing R&D expenditures by the business sector

Specification		Year					
		2018	2019	2020	2021	2022	2023
Funds from EU	[%]	49.7	58.7	65.0	71.0	80.9	66.3
Funds from enterprises		46.1	37.1	29	25	17.1	19.0
Budgetary funds in project co-financed from EU funds		9.4	8.5	-	10.8	5.2	5.0

Source: own study.

In the business sector, the largest share of foreign R&D funding was marked by EU funds (Table 7). It increased from 49.7% (in 2018) to 80.9% (in 2022). In 2023, there was a 14.6 pp decrease in the share of this source of funding compared to 2022.

Corporate funds represent the second significant source of foreign R&D funding for the business sector. However, between 2018 and 2022, their share decreased annually from 46.1% to 17.1 %. Compared to 2018, the share of these funds decreased by 27.1 pp in 2023. The business sector also benefited from budgetary measures with EU co-financed projects. The share of these measures fluctuated between [5%; 10.8%].

4.3. Research and development activity of Poland in comparison with EU countries

In 2023, the R&D intensity rate in the European Union was 2.2%. Poland, with an indicator value of 1.56, ranked 13th in the EU (Figure 5). Table 8 shows the selected characteristics of R&D expenditures of EU countries.

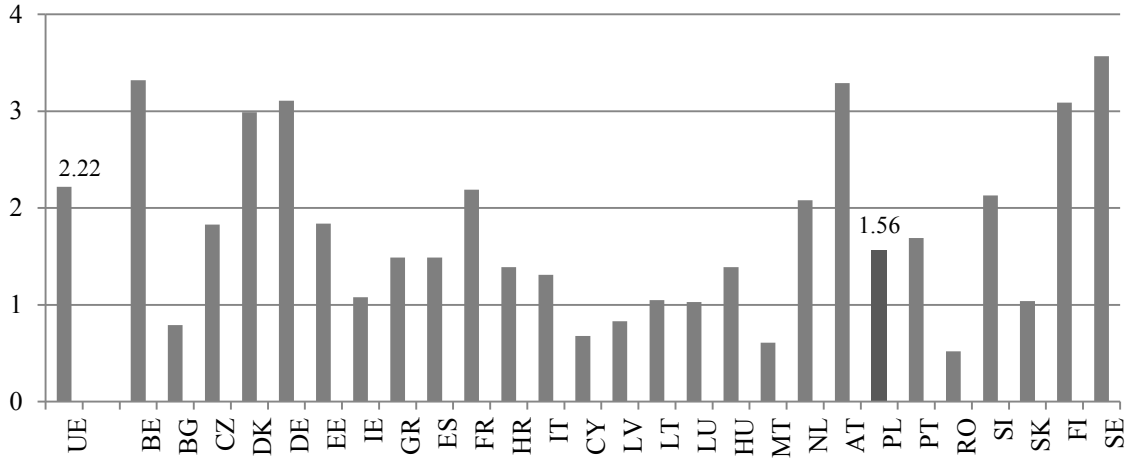

Figure 5. Relation of GERD to GDP in EU countries (2023).

Source: own study.

Table 8.

Characteristics of R&D expenditures of EU countries: average expenditures, average annual rate of change of R&D expenditures, average expenditures per capita (2018-2023) and share of national R&D expenditures in EU R&D expenditures

Specification	Average expenditures [EUR billion]	Average annual rate of change of R&D expenditures [%]	Average expenditures per capita [EUR]	Share of national R&D expenditures in EU in 2023 [%]
UE	331	6.5	454	100
Belgium	16.6	10.7	930	5.2
Bulgaria	0.6	15.3	48	0.2
Czechia	4.8	9.7	244	1.5
Denmark	9.8	5.8	980	2.9
Germany	114	5.5	877	34.1
Estonia	0.5	17.7	168	0.2
Ireland	4.2	7.3	655	1.4
Greece	2.6	11.4	103	0.9
Spain	17.3	10.6	185	5.9
France	55.7	4.4	516	16.2
Croatia	0.7	21.2	68	0.3
Italy	26.3	2.5	262	7.3
Cyprus	0.2	12.5	75	0.1
Latvia	0.2	14.8	32	0.1
Lithuania	0.6	16	78	0.2
Luxembourg	0.8	3.8	624	0.2
Hungary	2.3	7.3	163	0.7
Malta	0.1	14	105	0.1
Netherlands	19.4	7.6	681	5.8
Austria	13.3	6.9	961	4
Poland	8.3	18	112	3.1
Portugal	3.5	13	161	1.2
Romania	1.2	13	31	0.4
Slovenia	1.1	11.1	340	0.4
Slovakia	0.9	14.2	81	0.3
Finland	7.3	7	814	2.2
Sweden	17.6	5.4	1168	5.1

Source: own study.

Between 2018 and 2023, the EU's average R&D expenditure was €331 billion. The leaders in this area were Germany (€114bn), France (€55.7bn) and Italy (€26.3bn). Poland's outlays amounted to EUR 8.3 billion and accounted for 3.1% of EU outlays. Sweden had the highest R&D outlays *per capita* (EUR 1168), followed by Denmark (EUR 980) and Austria (EUR 961). In Poland, these outlays accounted for nearly 25% of the EU average outlays and amounted to €112. In turn, in terms of the average annual growth rate of R&D outlays, Poland ranked third (18%) after Croatia (21.1%) and Estonia (17.7%).

Table 9 shows the evolution of the value of the synthetic index of the level of R&D intensity in EU countries, the place obtained by a given country and the division of EU countries into four groups depending on the intensity of R&D activities in 2018-2023.

Table 9.
The values of the synthetic index of the level of R&D intensity for individual EU countries and their place in the ranking and group

Country	Synthetic index	Place	Group
Germany	0.6152	1	I
France	0.4732	2	
Austria	0.3253	3	II
Belgium	0.3208	4	
Sweden	0.3204	5	
Netherlands	0.3070	6	
Italy	0.2949	7	
Finland	0.2727	8	
Czechia	0.2545	9	
Spain	0.2504	10	
Denmark	0.2492	11	
Ireland	0.2241	12	III
Slovenia	0.2179	13	
Poland	0.1949	14	
Lithuania	0.1822	15	
Hungary	0.1793	16	
Greece	0.1773	17	
Bulgaria	0.1667	18	
Portugal	0.1656	19	
Estonia	0.1593	20	
Latvia	0.1524	21	
Croatia	0.1517	22	
Cyprus	0,1439	23	
Luxembourg	0.1379	24	
Slovakia	0.1283	25	
Romania	0.0920	26	IV
Malta	0.0839	27	

A higher index value indicates a better position of the country in the intensity level studied.

Source: own study.

In the analysed period 2018-2023, Poland ranked 14th among EU countries in the analysed ranking. Group I (*i.e.*, the most developed countries in R&D) included Germany and France. The highest value of the index characterises Germany (0.6152). Group II (highly developed countries in R&D) includes nine countries: Austria, Belgium, Sweden, the Netherlands, Italy, Finland, the Czech Republic, Spain and Denmark. Group III includes 14 countries, among

which is Poland. This is a group with a low level of R&D intensity. In addition to Poland, this group includes Ireland, Slovenia, Lithuania, Hungary, Greece, Bulgaria, Portugal, Estonia, Latvia, Croatia, Luxembourg, and Slovakia. Group IV (*i.e.*, the least R&D-intensive countries) is composed of Romania and Malta.

Poland is ranked 3rd in Group III (after Ireland and Slovenia). Undertaking work to create appropriate conditions for the rapid development of the R&D sector remains one of the greatest challenges and may increase the value of the analysed index and improve Poland's place in the ranking of the level of R&D intensity of EU countries and its qualification to Group II - highly developed countries in the area of R&D activity.

It is necessary to increase the activity of enterprises in investing in R&D activity and to increase the involvement of enterprises in the development and commercialisation of pioneering products and services. Tax breaks, subsidies and EU funds - as support mechanisms for these enterprises - can be helpful in this respect.

The offer of tax incentives is a key tool to encourage entrepreneurs to undertake and implement R&D intentions and thus move towards an economy based on knowledge and innovation. Currently, companies investing in R&D can benefit from special tax breaks: for prototyping, for robotisation, for supporting innovative employees, R&D, IP-Box (Janiszewska, Janiszewski, 2020; Gomułowicz, Małecki, 2011).

Another very important mechanism for supporting entrepreneurs in undertaking R&D activities is the possibility to obtain funding for R&D works from European Funds. The European Funds for a Modern Economy 2021-2027 programme is currently being implemented, with a budget of approximately EUR 10 billion. The FENG programme is a continuation of the Intelligent Development 2014-2020 programme, under which more than €8 billion was used for scientific research, development work and the implementation of their results (Ministry of Funds and Regional Policy, 2022).

Financial support for the implementation of ground-breaking R&D projects that will advance technology, find solutions to global challenges and at the same time strengthen Europe's competitiveness is the European Union's Horizon Europe framework programme for 2021-2027 (Regulation of the European Parliament and of the Council of the EU, 2021). The budget for this programme is more than €95 billion. It is the European Union's continuation of the 2014-2020 Horizon framework programme for research and innovation, which had a budget of €80 billion.

5. Summary

A key element of any country's economic strategy is the implementation of innovation policies to promote research, development and implementation of new technologies. The implementation of innovative solutions and setting future directions of development in this area is the basis for increasing the competitiveness of the economy, creating jobs, improving the quality of life and solving global climate change challenges. The results of research and development have a direct impact on the innovations implemented in various sectors of the economy. However, there are significant risks associated with conducting R&D activities. Therefore, it is fundamental for the development of the R&D sector to support it by offering various types of tax relief, as well as creating opportunities to obtain funding for ongoing research and the implementation of innovative solutions.

In the analysed period 2018-2023, the number of enterprises engaging in R&D projects in Poland increased. Outlays incurred on R&D were also increasing. More than 50% of these outlays were incurred by the executive sector of enterprises, followed by the government sector with a share of more than 30%. During the period under review, an increase in the share of foreign funds in financing R&D outlays was marked. In 2023, the share of these funds accounted for approximately 10%.

The business sector primarily uses its own funds to finance R&D (over 83% in 2023), followed by government funds (over 9% in 2023) and foreign funds. The number of companies using foreign funds increased during the period under review. The largest proportion of these entities benefited from EC funds.

In the period under review, significant differences were observed between EU countries in terms of their R&D activity. Against the background of the EU countries, Poland was ranked 13th in terms of the amount of expenditure on R&D to GDP, and in the ranking of the level of R&D intensity carried out in the article, Poland was ranked 14th. Despite a significant improvement in R&D activity, in this ranking Poland was placed in Group III which is composed of countries with a low level of R&D intensity. In this group, Poland was ranked 3rd (after Ireland and Slovenia), which, in the case of an increase in R&D activities, gives a good chance to qualify for Group II - highly developed countries in the area of R&D activity.

References

1. *Database Eurostat*. Retrieved from: http://ec.europa.eu/eurostat/databrowser/view/rd_e_gerdtot/default/table?lang=en&category=scitech.rd.rd_e, 15.02.2025.
2. Dolińska, M. (2010). *Innowacje w gospodarce opartej na wiedzy*. Warszawa: PWE.
3. Gomułowicz, A., Małecki, J. (2011). *Podatki i prawo podatkowe.* Warszawa: LexisNexis, p. 106.
4. GUS (2019). *Research and experimental development in Poland in 2018*.
5. GUS (2020). *Research and experimental development in Poland in 2019.*
6. GUS (2021). *Research and experimental development in Poland in 2020*.
7. GUS (2022). *Research and experimental development in Poland in 2021*.
8. GUS (2023). *Research and experimental development in Poland in 2022*.
9. GUS (2024). *Research and experimental development in Poland in 2023*.
10. Hellwig, Z. (1968). Zastosowanie metody taksonomicznej do typologicznego podziału krajów ze względu na poziom rozwoju oraz zasoby i strukturę wykwalifikowanych kadr. *Przegląd Statystyczny*, *Vol. 15, No. 4*, pp. 307-327.
11. Janasz, W., Janasz, K., Prozorowicz, M., Świadek, A., Wiśniewska, J. (2002). *Determinanty innowacyjności przedsiębiorstw*. Szczecin: Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, p. 41.
12. Janiszewska, M., Janiszewski, J. (2020). Wykorzystanie regulacji podatkowych w działalności innowacyjnej polskich przedsiębiorstw. *Studia BAS*, *no. 1,* pp. 51-73.
13. Ministerstwo Funduszy i Polityki Regionalnej (2022). *Fundusze Europejskie 2021-2027.* Retrieved from: http://www.gov.pl/web/fundusze-regiony/fundusze-ue-2021-27, 15.02.2025.
14. Pangsy-Kania, S. (2007). *Polityka innowacyjna państwa a narodowa strategia konkurencyjnego rozwoju*. Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego, pp. 143-145.
15. Penc, J. (1999). *Innowacje i zmiany w firmie*. Warszawa: Agencja Wydawnicza Placet, pp. 162-163.
16. Rozporządzenie Parlamentu Europejskiego i Rady (UE) 2021/695 z dnia 28 kwietnia 2021 r. ustanawiające program ramowy w zakresie badań naukowych i innowacji „Horyzont Europa" oraz zasady uczestnictwa i upowszechniania obowiązujące w tym programie oraz uchylające rozporządzenia (UE) nr 1290/2013 i (UE) nr 1291/2013, Dz. Urz. UE, L 170/1, 12.05.2021, art. 3.
17. Schumpeter, J. (1960). *Teoria rozwoju gospodraczego*. Warszawa: PWN.
18. Stanisławski, R. (2017). *Open innovation a rozwój innowacyjny mikro, małych i średnich przedsiębiorstw*. Łódź: Wydawnictwo Politechniki Łódzkiej.
19. Stankiewicz, M. (2006). *Zarządzanie wiedzą, jako kluczowy czynnik międzynarodowej konkurencyjności przedsiębiorstwa*. Toruń: TNOiK „Dom Organizatora", pp. 307-328.

20. Szopik-Depczyńska, K. (2009). *Sfera B+R w działalności przedsiębiorstw*. In: W. Janasz (Ed.), *Innowacje w strategii rozwoju organizacji w Unii Europejskiej* (pp. 150-170). Warszawa: Difin.
21. Tidd, J., Bessant, J. (2011), *Zarządzanie innowacjami. Integracja zmian technologicznych, rynkowych i organizacyjnych*. Warszawa: Wolters Kluwer.
22. *Ustawa z dnia 15 lutego 1992 r. o podatku dochodowym od osób prawnych*. Dz.U. 2023 r., poz. 2805.
23. *Ustawa z dnia z dnia 26 lipca 1991 r. o podatku dochodowym od osób fizycznych*. Dz.U. 2024, poz. 226.