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Evolution of R&D state aid in Poland in the context of Multiannual Financial Perspectives

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Abstract
The aim of this article is to identify legislative-programmatic changes, as well as the scope and directions of research & development (R&D) aid granted in Poland after the accession to the European Union, in the context of Multiannual Financial Perspectives. The changes introduced into relevant legislation in the EU and Poland, and aid programmes implemented throughout three Multiannual Financial Perspectives were analysed. This was followed by in-depth statistical analysis of changes in granting state aid for R&D in Poland. The authors found in this study a strict correlation between R&D aid in Poland and changes arising from the successive financial perspectives. Small enterprises have been the greatest beneficiaries of these changes.
Keywords: state aid for R&D, research and development, Poland, European Union.

Ewolucja B+R w Polsce w kontekście Wieloletnich Ram Finansowych

Streszczenie
Celem artykułu jest identyfikacja zmian legislacyjno-programowych oraz zakresu i kierunków udzielonej pomocy na badania i rozwój (B+R) w Polsce po akcesji do Unii Europejskiej w kontekście Wieloletnich Ram Finansowych. W związku z tym zostały przeanalizowane zmiany

odpowiednich aktów prawnych w UE oraz w Polsce, a także programy pomocowe wdrażane w trakcie trzech wieloletnich perspektyw finansowych. Następnie dokonano pogłębionej analizy statystycznej zmian w udzielaniu pomocy publicznej na B+R w Polsce. Przeprowadzone badanie pozwoliło ustalić, iż pomoc finansowa dla B+R w Polsce była ściśle skorelowana ze zmianami wynikającymi z kolejnych perspektyw finansowych, z których w największym stopniu skorzystali mali przedsiębiorcy.
Słowa kluczowe: pomoc publiczna na B+R, badania i rozwój, Polska, Unia Europejska

State aid for research and development (R&D) falls within the concept of permitted state aid in connection with identified market failure. This in particular concerns the unwillingness of entrepreneurs to undertake high-cost activities accompanied by a relatively high risk of the expected results not being achieved, while ignoring at the same time the positive external effects of R&D transfer to other entities in the economy. Research is not possible without adequate funds (Szwacka-Mokrzycka, Miara 2018), which can be raised from either the private or the public sphere. In the latter case, the European Commission (EC) has taken the position that R&D aid meets the criteria set forth in both Article 107(3)(b) TFEU: "aid to promote the execution of an important project of common European interest", and Article 107(3)(c) TFEU: "aid to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest". The EC has developed guidelines for this aid, spelling out precise criteria for its identification and terms for granting it, both with regard to the beneficiaries and to the forms of such aid. At the same time, views have been expressed in literature highlighting the difficulty in evaluating the necessity of support for co-financed projects under R&D aid, which is a consequence mainly of the specificity of the projects themselves (Nowak-Salles 2020).

R&D aid is often perceived as a stimulus for conducting research-and-development activities and for supporting enterprise innovation (Blauberger 2009; Di Bucci 2014). In consequence, it has become, beside public procurement, one of the major instruments of the state's economic policy, including the sphere of innovation (Dragos, Racolta 2017).

In becoming a Member State of the European Union, Poland too came under rules governing state aid, although existing studies indicate only a relatively small share of R&D aid in the total value of state aid offered in Poland, as compared to other EU Member States. Whereas the old Member States, in pursuance of a succession of Union strategies, have strengthened research-and-development activities, Poland has for many years continued to grant regional aid for new investments or for the creation of new jobs (Ambroziak 2021 2022).

The aim of this article is to identify legislative and programmatic changes, as well as the scope and directions of R&D aid granted in Poland after the accession to the European Union, in the context of the series of financial perspectives. In this connection, changes to EU legislation concerning the conditions for granting state aid for R&D were analysed; the analysis also covered the legislation excluding the obligation to notify

the EC of such aid. This analysis has made it possible to trace the evolution of R&D aid grants in Poland throughout the course of three Multiannual Financial Perspectives (MAFPs) (2004–2006, 2007–2013 and 2014–2020): from existing aid, in connection with accession to the EU, through individual aid, to aid granted under aid programmes. The next step was to analyse changes to the relative intensity of this aid in Poland in proportion to GDP, compared to other EU Member States and enterprises' internal R&D investments in the country. Analysis of data on R&D aid grants in Poland throughout the successive MAFPs revealed a structure of aid put in order of purposes and beneficiaries in the context of their importance to the country's economy.

The study is concentrated on R&D aid and follows the 2005–2021 period as the most illustrative of legal changes and changes to R&D grants, except for several data concerning other Member States or the situation in Poland, in the case of which the study period was shortened by one year due to availability limitations. Statistical data covered by the analysis originate both from the Polish Office of Competition and Consumer Protection (OCCP), as well as the EC (Scoreboard), as at 31 August 2022. The data on state aid are exclusive of COVID-19-related aid, the latter being of extraordinary nature and significantly distorting the picture of intervention in all EU Member States (more extensively see: Dziembała, Kłos 2021; Ambroziak 2022). Due to the lack of availability of comparable data in other states in the world, including within the EU, this is a unique study and a decisively novel publication.

One of the sources of financing of R&D aid was European funds. The Multiannual Financial Perspectives, the first in 2004–2006 (MAFP I), the second in 2017–2013 (MAFP II), and the third in 2014–2020 (MAFP III) are not co-extensive with the periods of disposal of such funds by the entities granting state aid in Poland. Holding competitions, selecting the projects and signing the contracts deferred the EU aid financing by approximately two years. In consequence, although this study includes an analysis of the legal bases within the time-frame delineated by the successive financial perspectives, for the purposes of statistical analysis aid grants are considered respectively in the 2005–2008, 2009–2015 and 2016–2021 time-frames.

Importantly, ever since the beginning, it has been possible to grant aid for R&D projects covering fundamental research, industrial research, and development works; nonetheless, prior to MAFP II, there was no reporting obligation concerning such aid in a breakdown according to the various types of R&D activities, which prevented the authors from being able to demonstrate the respective proportions of their financing under MAFP I.

The first part provides a concise overview of the literature on state aid for R&D in the EU, with an emphasis on Poland. It is more a presentation of the main areas of study of R&D aid and theoretical underpinnings of the bases of its admissibility. The evolution of the EU legal framework and of the most important Polish aid programmes involving R&D aid was then analysed, in a breakdown corresponding to the successive financial perspectives. The next section offers statistical analysis of the volume and significance of R&D aid in Poland compared to all EU Member States, followed by in-depth study of

the distribution of such aid in Poland and the beneficiaries, having regard for their size and importance to the country's economy. The final section gathers conclusions based on the study together with recommendations for economic policy in the area of R&D state aid.

State of art, and research methods used

The EC has modified its approach to state aid significantly in recent years. Firstly, it has been gradually departing from *ex-ante* in favour of *ex-post* evaluation, as clearly manifested both by the introduction of *General Block Exemption Regulation* (GBER) in 2008 (see: European Commission 2008) and its comprehensive amendment, including the addition of research infrastructure as a new objective, in 2014 (see: European Commission 2014b). The matter of legislative changes and primarily the legal consequences of the introduction of GBER came to dominate the subject literature (Heimler, Jenny 2012; Biondi, Righini 2014; von Wendland 2015; Ambroziak 2016; Kopeć 2020). Some existing legal-economic studies have dealt with the effectiveness of the various R&D aid instruments, such as tax incentives (Pérez Bernabeu 2014), as well as links to European funds (Galletti 2016).

As regards the situation in Poland, the available studies demonstrate that immediately its accession to the EU, compared to the EU-15 countries, its aid structure differed in many aspects, first and foremost because of the re-organisation needs of Poland's economy. The completion of the pertinent processes was to re-orientate the allocation of state aid towards horizontal aid, including support for R&D. During the years that followed, Poland as well as the other EU Member States faced an economic crisis. However, the recession period did not at all lead to increased restructuring or investment aid; instead, it led to increased R&D aid (Ambroziak 2021). Unfortunately, the implementation of the industrial policy in Poland, including the innovation policy, did not correspond to goals linked to elevating the technological level of advancement of the Polish economy (Radło, Spałek 2017). The factual industrial policy, as studied from the perspective of sectoral destinations of state aid, did not fully correspond to the stated goals of Poland's industrial policy, which was because of misallocation. In consequence, R&D aid was not always conducive to the improvement of the competitive position relative to foreign companies (Podsiadło 2017).

The available evaluation studies of R&D aid indicate a downward trend in the number of beneficiaries of selected financial-aid instruments, with a simultaneous upward trend in the number of serial aid recipients, improved recipient preparation for absorption of grants, as well as an increasing number of micro-entrepreneurs and newly-established entities among the applicants. Despite the comprehensive approach taken, the available research covers selected R&D aid programmes without indicating differences between the various financial perspectives or positioning within the changing EU legislation. This research gap is filled by the present article, which captures the changes both in

Polish aid programmes and in R&D aid granted as conditioned by the evolution of EU legislation in the context of Multiannual Financial Perspectives. It is the first study of this type in Poland due to the limited access to disaggregated data in other Member States of the European Union.

To this end, critical and comparative analysis of the source documents and original legal acts issued by Polish authorities, and the EU institutions (the European Commission, and the Council of the European Union) was conducted to establish a legal framework for national aid schemes for R&D&I applied in 3 consecutive Multiannual Financial Perspectives in Poland. In economic part of the research, authors carried out a comparative statistical analysis of data about state aid for R&D&I granted in Poland in the period 2004–2020.

Legal basis for R&D aid, and Polish R&D aid schemes

Beginning with accession to European structures, all of the Union legislation on state aid, including R&D aid, became the law of the land. The key document was the *Community Framework for State Aid for Research and Development* (see: European Commission 1996, 1998, 2005), later – *Community Framework for State Aid for Research, Development and Innovation – R&D&I* (see: European Commission 2006b, 2014a), setting out the criteria considered by the EC when evaluating the aid measures, for which notification was submitted. The *Framework...* specified four categories of R&D activities eligible for aid: fundamental research, industrial research, pre-competitive development activities (development works), and technical feasibility studies preceding the latter two categories of R&D activities. All costs incurred directly in connection with the implementation of an R&D project were considered to qualify.

The permitted intensity of such aid ranged from 25% to 100%, depending on the type of activities undertaken and their proximity to the market. The underlying reason was the correct assumption that the more advanced the R&D works, the greater the probability of an adverse impact distorting competition. Accordingly, the intensity of aid for fundamental research was greater than that of aid for industrial research or development works. Moreover, the aid could be increased in specific cases, e.g. due to the size of the beneficiary (preference for SMEs), broad dissemination of project results, projects completed as part of effective collaboration (e.g. among partners from two different Member States or between enterprises and public research institutions) or a less developed location (the less developed the region relative to the EU average, the greater the intensity of aid permitted) (see: *Table 1*).

Table 1: Intensity of permitted R&D aid in 2004–2020 (% and/or percentage points).

	I MFP: 2004-2006		II MFP: 2007-2013		III MFP: 2014-2020	
Framework	SME/large		small/medium/large		small/medium/large	
Fundamental research	**100%**		**100%**		**100%**	
Industrial research	Max75%	60/**50%**	Max 80%	70/60/**50%**	Max 80%	70/60/**50%**
- collaboration - dissemination of results	+10 p.p.	70/60%	+15 p.p.	80/75/65%	+15 p.p.	80/75/65%
- region „a"	+10 p.p.	70/60%	-		-	
- region „c"	+5 p.p.	65/55%	-		-	
- accordance with objectives of current framework programme for R&D	+15 p.p.	75/65%	-		-	
- abovementioned objectives + collaboration	+25 p.p.	75/75%	-		-	
Experimental development (%)	Max50%	35/**25%**	Max 80%	45/35/**25%**	max 80%	45/35/**25%**
- collaboration	+10 p.p.	45/35%	+15 p.p.	60/50/40%	+15 p.p.	60/50/40%
- dissemination of results			-			
- region „a"	+10 p.p.	45/35%	-		-	
- region „c"	+5 p.p.	40/30%	-		-	
- accordance with objectives of current framework programme for R&D	+15 p.p.	50/40%	-		-	
- abovementioned objectives + collaboration	+25 p.p.	50/50%	-		-	
Feasibility study for fundamental research	-		-		70/60/**50%**	
Feasibility study for industrial research	**75%**		75/75/**65%**			
Feasibility study for experimental development	**50%**		50/50/**40%**			
Research infrastructure	-		-		**50%**	
Block exemptions	only SME		small/medium/large		small/medium/large	
Fundamental research	**100%**		**100%**		**100%**	
Industrial research	Max75%	**60%**	Max 80%	70/60/**50%**	max 80%	70/60/**50%**
- collaboration - dissemination of results	+10 p.p.	70%	+15 p.p.	80/75/65%	+15 p.p.	80/75/65%
- region „a"	+10 p.p.	70%	-		-	
- region „c"	+5 p.p.	65%	-		-	
- possible multi-sectoral application	+15 p.p.	75%	-		-	
Experimental development	Max50%	**35%**	Max 80%	45/35/**25%**	Max 80%	45/35/**25%**
- collaboration - dissemination of results	+10 p.p.	45%	+15 p.p.	60/50/40% -	+15 p.p.	60/50/55%
- region „a"	+10 p.p.	45 p.p.	-		-	
- region „c"	+5 p.p.	40 p.p.	-		-	
- possible multi-sectoral application	+15 p.p.	50 p.p.	-		-	
Feasibility study for fundamental research (%)	**75%**		-		70/60/50%	
Feasibility study for industrial research (%)			75/75/**65%**			
Feasibility study for experimental development (%)			50/50/**40%**			
Research infrastructure (%)	-		-		**50%**	

Source: authors' own elaboration.

Furthermore, immediately prior to Poland's accession to the EU, the European Commission had introduced a new legal solution enabling R&D aid grants without mandatory notification under Article 108 TFEU. The latter involved aid for R&D projects and aid for the technical analysis of the feasibility of industrial research and pre-competitive works. For such aid, the allowed intensity remained at substantially the same level as in the general framework. The significant difference, however, was that the exemption applied only to aid for SMEs (see: *Table 1*).

Already prior to official accession to the EU, Poland had notified the EC of measures identified as satisfying the criteria for state aid, which, due to no objections from the EC, became *existing* aid — consistent with the internal market and acceptable following accession. These measures extended to R&D aid schemes, under which the Minister of Science had been granting aid for R&D projects even since 2004.

Poland did not take advantage of Union-level legal solutions until two years after accession, preparing its first major R&D aid programme concerning industrial research and pre-competitive works (see: Regulation 2007). In principle, that kind of aid could be allocated to such purposes under the notification exemption, but only for SMEs. In view of this, Polish authorities accordingly decided to notify the EC of the draft programme, and the Commission accepted it in 2006 (see: European Commission 2006a). Under the programme, R&D aid was granted in the form of subsidies for enterprises in each size category, among them significantly for institutions of higher education, research institutions and science consortia.

Upon the onset of the 2007–2014 financial perspective, the EC introduced a new *Community Framework for State Aid for R&D&I* (European Commission 2006b). Other than expanding the scope of applicability to include innovation, no significant changes were made regarding R&D aid. The system of additional bonuses was streamlined (which included a departure from increasing the intensity for projects pursued in less developed regions) and certain innovative activities were counted as development works (allowing for the preparation of prototypes for potential commercial use and pilot programmes in cases when the prototype was a commercial end product with production solely for the purposes of demonstration and validation being too expensive) (see: *Table 1*).

Moreover, in keeping with the experience of the preceding years, the EC gathered the then-existing exemptions from the mandatory notification, including those relating to R&D, in a single regulation (European Commission 2008). Unlike the preceding perspective, allowance was made for R&D aid without mandatory prior notification also for large enterprises. Furthermore, the rules governing the admissibility of aid for R&D were harmonized with those defined in the Framework; notification thresholds at EUR 20 million for projects mainly involving fundamental research, EUR 10 million for industrial research, and EUR 7.5 million for development works became, in principle, the sole remaining demarcation line between the two legal bases.

From the moment the regulation came into force (European Commission 2008), the entirety of R&D aid in Poland was granted only on the terms of the *General Block Exemption Regulation*, i.e. without the need for prior notification to the EC. The rules for the

admissibility of R&D aid appeared to have already solidified, and thus they ceased to present any significant interpretative challenges, and the lack of necessity of EC approval unquestionably accelerated the granting of R&D aid in Poland. The new legal solutions along with the enablement of European funds resulted in an efflorescence of R&D aid programmes. Other than the Minister of Science, the grantors included the National Centre for Research and Development (NCRD), National Science Centre (NSC), Polish Agency for Enterprise Development (pl. PARP), chief executives of voivodships, National Fund for Environmental Protection and Water Management (pl. NFOŚiGW), fiscal offices, and entities implementing projects under regional operational programmes. The outcome of the above was a noticeable fragmentation of the aid (two programmes under MAFP I and II — not including changes and extensions — under MAFP II). Also noteworthy, however, was the emergence of two aid programmes soon to become the key legal basis for R&D aid grants in Poland. The latter concerned NCRD support for R&D projects involving fundamental research, industrial research or development works along with technical feasibility studies (55% of all R&D aid during the period, see: Regulation 2010) and project financing from PARP limited to industrial research or development works – 31% (see: Regulation 2008).

During the next financial perspective, for the years 2014 to 2020, there were both amendments to Union legislation and the corresponding adaptation of national law. On the EU level, the EC adopted a new *Community Framework for State Aid for R&D&I* (European Commission 2014a) and a new regulation governing block exemptions (European Commission 2014b). The novelty was that both of the documents defined the conditions for the admissibility of investment aid for the construction or modernisation of research infrastructure. In this case, the underlying assumption was to provide financing for facilities providing R&D services to multiple users on objective terms and at market prices. Such infrastructure could not be dedicated to any single enterprise or several enterprises. Although no limitations were introduced as to the ownership of such infrastructure (which could belong either to public or private entities), it would appear that public entities more often made the decision to create it. Significantly, the previous notification thresholds under the EU regulation were doubled (European Commission 2014b), solidifying even further the principle of Polish R&D aid grants not requiring prior EC approval.

The 2014–2020 period did not bring any major changes to Poland's mechanism for R&D grants. The significant fragmentation of grantors operating under different aid programmes continued, with the most aid being granted by the NCRD (85% of the sum total of the relevant aid), providing financing for R&D projects and feasibility studies (Regulation 2015b). Second place went to institutions managing regional operational programmes, which, in addition to providing financing for R&D projects and feasibility studies (Regulation 2015a), also supported the construction of research infrastructure at the regional level (Regulation 2016). During that period, the largest portion of all aid went to industrial research (49%) and development works (46%) (see: *Table 2*). The Polish Medical Research Agency (pl. ABM) joined the ranks of R&D grantors. The number of aid programmes, however, did not change, and continued to be 11, not counting extensions.

Table 2: Key R&D aid programmes in Poland under the successive EU financial perspectives.

The programme's number and name	Gross value of aid [mln PLN]	Share of aid per financial perspective (%)
MAFP I (2 aid programmes)	**599.7**	**100.0**
PL 35/2004 - Aid program for R&D works carried out by entrepreneurs	280.7	46.8
N 528/2005 - Industrial research and pre-competitive development	206.6	34.4
There aid (granted on the same legal regulations as PL 35/2004, reported without number of decision)	112.8	18.8
MAFP II (11 aid programmes)	**4 324.8**	**100.0**
SA.32233(2011/X) - Conditions and procedure for granting state aid and *de minimis* aid through the National Centre for Research and Development (next as SA.35857(2012/X))	2 358.6	54.5
SA.32221(2011/X) - Financial aid for research, advisory services and training provided by PARP under the Innovative Economy Operational Programme (next as SA.32863(2011/X), SA.35010(2012/X), SA.37089(2013/X))	1 063.7	24.6
Other programmes	902.5	21.2
MAFP III (11 aid programmes)	**24 723.2**	**100.0**
SA.41471(2015/X) – Providing public aid through the National Centre for Research and Development (next as SA.58757(2020/X))	20 611.2	83.4
SA.42839(2015/X) – Aid for fundamental research, industrial research, experimental development and feasibility studies under the regional operational programmes for 2014-2020 (next as SA.59139(2020/X))	2 827.0	11.4
Other programmes	1 285.0	5.2
Sum of R&D aid	**29 674.7**	**100.0**

Source: authors' own elaboration.

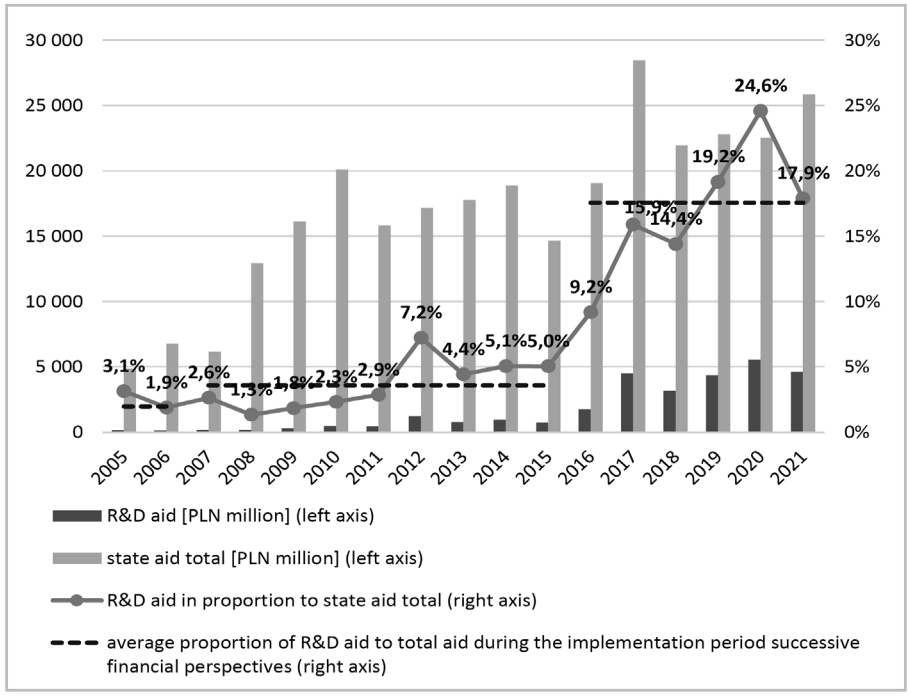
In addition to R&D aid provided under aid programmes, during the discussed period *ad-hoc* aid was also granted (PLN 582.6 million), the value of which, however, constituted only 2% of the total value of the relevant type of aid. It was mainly aid for research infrastructure, granted by the National Information Processing Institute — National Research Institute (pl. OPI — PIB). The latter organ financed large nationwide or international strategic infrastructure projects using funds from the *Operational Programme Intelligent Development*. Under MAFP II, the Commission was notified of 73 such aid cases, to a sum total of PLN 60.5 million, and under

MAFP III 125 cases to a total of PLN 521.1 million. This means a near-doubling of the number of cases of *ad-hoc* R&D aid granted, and an increase in the value more than eightfold during the last financial perspective as compared to the immediately preceding one. However, these are not significant amounts relative to the total volume of R&D aid.

Importance of R&D state aid in Poland

The volume of R&D aid granted in Poland has been systematically increasing, from PLN 153.1 million in 2005 to PLN 5.5 billion in 2020. A total of PLN 29.6 billion was granted in R&D aid in the studied period, corresponding to 6.8% of all state aid (see: *Figure 1*). During the first years following accession, the nominal value of R&D aid was relatively insignificant. A significant increase, to almost PLN 300 million, was to occur only in 2009, which marked the beginning of the first aid programme operated by the Minister of Science (Regulation 2007); subsequently, in the latter half of MAFP II and from 2016 onward under MAFP II, the volume of aid exceeded PLN 1.7 billion.

Figure 1: State aid for R&D in 2005–2021 (PLN million).[1]

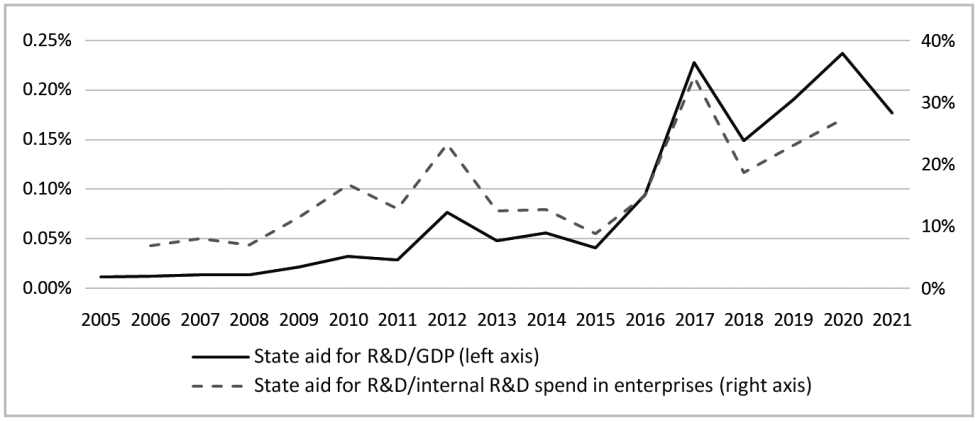


Source: authors' own elaboration.

[1] *Clarification:* data on state aid total do not include crisis aid granted in 2020–2021 in relation to the COVID-19 outbreak, or aid granted in the banking sector to IDEA Bank SA in 2021 — decision SA.60520(2020/N), or *de-minimis* aid.

The increase in the intensity of R&D aid was accompanied by increases in both GDP and the internal R&D spending in enterprises (see: *Figure 2*). Throughout MAFPs I and II, aid intensity in proportion to spending was relatively greater than the intensity in proportion to GDP, and since 2016 it has decreased significantly. As noted previously, the volume of R&D aid during MAFP III increased at a particularly fast rate, with companies' own R&D spending increasing at a much slower pace. This may imply that a portion of companies' own R&D expenditure was replaced by aid measures, especially coming from the EU.

Figure 2: Intensity of R&D state aid in Poland in 2005–2021.



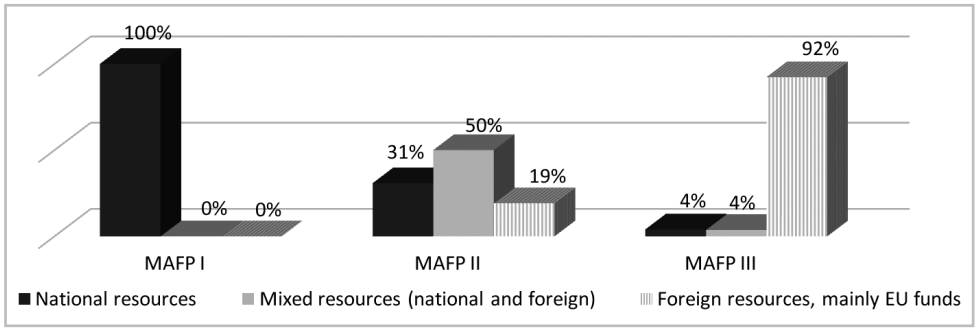
Source: authors' own elaboration.

Analysis of the proportion of R&D aid to the GDPs of EU Member States shows that the trajectory of the changes occurring in Poland differs markedly from the one observed in other states in Central and Eastern Europe or the largest European economies. A similar value of R&D aid in proportion to GDP in Poland (0.02%) immediately following accession to the EU was also observed in Slovakia (0.01%) but slightly higher in the Czech Republic (0.09%), Spain (0.03%) or Belgium, the Netherlands and Hungary (0.05%). Throughout the MAFP, one could observe a marked increase in this proportion in countries such as the Czech Republic (to 0.17%) and Belgium (0.25%), whereas in Poland this aid still did not play a significant role relative to GDP (max 0.02%). Only under MAFP III, Poland began to see a significant increase in the proportion of R&D aid to the national GDP, the latter reaching 0.25% in 2017 and 2020.

The visible link to the Multiannual Financial Perspectives is the result of the fact that sums originating from EU funds are also regarded as state aid if they satisfy the criteria for recognition as such pursuant to Article 107(1) TFEU. In consequence, when analysing state aid in Poland, including R&D aid, one has to consider both the central budget and the local budget and EU sources. External sources, especially EU funds, were first used for R&D financing in Poland in 2008, and the scale increase in the following years (under MAFP II) (see: *Figure 3*). In the years that followed, in order to comply with the requirements of fund-related regulations, R&D projects were financed almost exclusively

by *mixed sources* (national and cross-border sources at a proportion of 15%/85% — see: Council Regulation (EU) No 1083/2006). Starting from 2015, i.e. the commencement of the distribution of the funds under MFAP III, the proportion of foreign sources began to exceed 90% of total R&D aid in Poland.

Figure 3: Structure of sources of financing of R&D aid in 2005–2021.



Source: authors' own elaboration.

Whereas at the beginning of Poland's membership in the EU (and at the same time in the final period of the financial perspective for 2000–2006), the proportion of R&D aid to the total value of state aid was 1.8%, in the next perspective, for 2007–2013, it was 3.9%, and for 2014–2021 it reached 8.7% (see: *Figure 1*). The intensity was not evenly spread in the years that followed, however, with the highest levels in 2017–2019, which is when the financing under MAFP III started, and decisively lowest under MAFP I.

Distribution of R&D state aid in Poland

During MAFP I and at the beginning of MAFP II, no distinction was made between the individual categories of such type of aid in reports, with this type of aid being regarded holistically as aid for research-and-development works (2005–2006) or for the execution of R&D projects (2007–2010) (see: *Table 3*). Only in 2011 did aid for fundamental research, industrial research and experimental development works begin to be treated separately in reports. The largest portion of the aid, both under MAFP II (74% average) and MAFP III (approx. 45% and 50%), went to industrial research and experimental development works. In recent years, the share of the last-mentioned category of aid both in terms of value and proportion to the total sum of R&D aid has been growing. The share of aid for experimental development works increased, and for industrial research decreased, consistently until 2016. Since the introduction of MAFP III, financing of the proportion of both aid categories has remained at a similar but decisively low level. Also, during MAFP I, no aid for feasibility studies was observed, with the first coming only as late as in 2012, of a negligible proportion to the total value of aid (0.2% under MAFP II and 0.03% under MAFP III).

Table 3: Structure of R&D aid in Poland according to purpose during the individual perspectives in 2005–2021 (values in PLN million).[2]

		MAFP I		MAFP II		MAFP III	
		aid value	share (%)	aid value	share (%)	aid value	share (%)
Research and development works	Fundamental research	599.74	100	44.9	1.0	304.5	1.2
	Industrial research			3 199.6	74.0	12 145.9	49.1
	Experimental development			1 069.5	24.7	11 259.1	45.5
Feasibility studies		0	0	10.8	0.2	6.3	0.0
Investment aid for research infrastructures		-	-	-	-	1 007.3	4.1
Total value of aid		599,74	100	4 324.8	100	24 723.2	100

Source: authors' own elaboration.

As already emphasised, under MAFP III, aid for the modernisation or establishment of research infrastructure used for the purposes of business activity was included in the admissible purposes of R&D aid under EU law. The essential criterion is the requirement that such infrastructure be made available to other entities on market terms. The above solution proved to be uninviting to business operators in Poland but attractive to research and scientific centres, which became the main beneficiaries of the aid and operators of the aforementioned research infrastructure.

Within the period under research, the shares of the various forms of aid have remained substantially unchanged: subsidies and reimbursements were prevalent (more than 99.8% of all R&D aid), with only temporary occurrence of aid programmes offering either tax relief or preferential loans. However, the structure of beneficiaries of R&D aid, by contrast, changed significantly in the discussed period from 2005 to 2021 (see: *Figure 4*). Under MAFP I, more than half of the funds went to large enterprises, and only 4.9% – to micro-enterprises. The implementation of complete MAFPs II and III caused the position of both micro- and small enterprises to grow significantly, as they each received one quarter of the sum total of R&D aid granted. The situation differs somewhat for the remaining recipients, including large enterprises,[3] with a recorded increase in this type of aid to 37% under MAFP III at the expense of medium-sized enterprises (14.6%).

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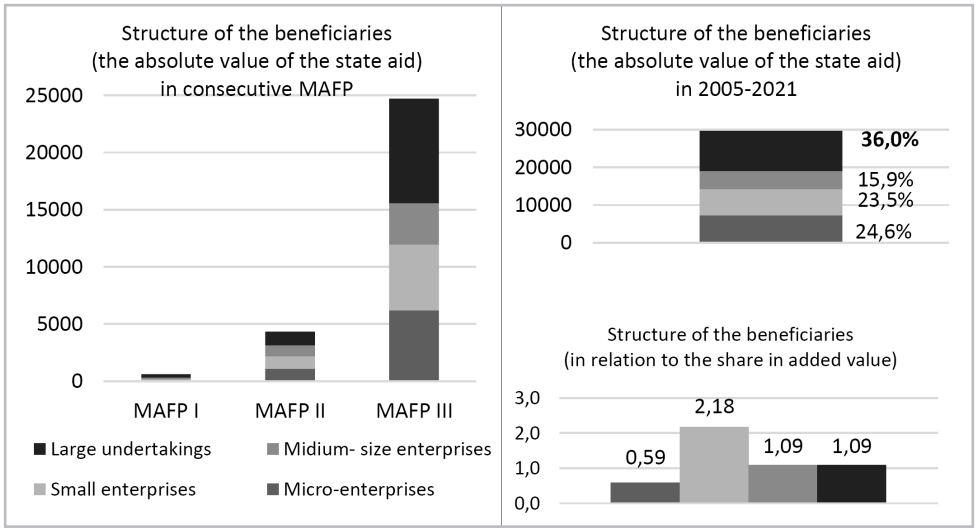
[2] *Note:* separate reporting of items for research and development works appeared in 2011. For the purposes of this study, the sum total of R&D aid at PLN 889.6 million in the initial years of MAFP II was broken down into the various purposes of the research in proportion to the shares recorded in the following years of MAFP II.

[3] While in this part of the study we use the term 'large enterprises', it must be emphasised that on the one hand the data obtained from OCCP refer to the category of companies other than SMEs (resulting to some extent from the reporting procedure) (Grzegorzewska 2020), but the data from Statistics Poland define large enterprises solely on the basis of workforce. Moreover, for SMEs, size is determined as at the time of granting, whereas all other entities are taken together. In the years 2005–2021, the latter group included 1,136 entities, but their size potentially could have changed over the years, and thus it is not possible to identify large enterprises alone. In consequence, the generalised conclusions made in reference to large enterprises must be treated with caution, only as an indication of certain trends.

Figure 4: Value of R&D aid granted according to beneficiary size.



Source: authors' own elaboration.

In order to capture the relative distribution of R&D aid among enterprises, consideration was given to the various sizes of beneficiaries in the aid granted and in the added value. In consequence, it appears that the value of R&D aid for small enterprises exceeded double their share in the creation of added value (2.18), whereas aid for medium-sized and large enterprises was substantially balanced in proportion to added value.

Conclusions

The study demonstrates unequivocally that both the value and, in consequence, the intensity of state aid in Poland bears a correlation to the successive Multiannual Financial Perspectives, compelled by amendments to EU legislation. Polish R&D aid grantors, relying primarily on the exemptions provided by the relevant Commission regulations, offered that aid in accordance with the intentions of the Commission and of the European Union as a whole.

Even in the first years of MAFP II, and thus with the arrival of significant EU funds, on the one hand there was significant fragmentation of aid programmes, and on the other hand funds were concentrated in the hands of the NCRD, PARP and the institutions in charge of regional programmes. Ultimately, the Union funds played the greatest role in incentivising and financing R&D activities among Polish enterprises. This is indicated primarily by the 2014–2020 MAFP period, which is when the proportion of R&D aid to the sum total of state aid increased, along with its intensity relative to GDP. The above was the result of a change of direction in EU-fund programming, and, in consequence, increased budgets for priority actions in the R&D area. It appears that this significant

increase in the importance of R&D aid in recent years can be linked to the process of learning and gaining experience by the beneficiaries and by the grantors, although this particular aspect requires further in-depth study. On the other hand, the more developed Member States are departing from R&D aid *sensu stricto* in favour of aid for environmental protection and energy efficiency (Ambroziak 2021).

The identified trends in the structure of R&D allocation according to purpose in Poland indicate the dominance of those categories of aid, granted in the simplest form — subsidies, from which entrepreneurs can derive the most benefit (experimental works and industrial research). Accordingly, the advanced R&D works supported in recent years can be expected to bear fruit in the form of novel solutions, thus making Poland's economy more innovative. At the same time, the form taken by the state aid — direct grants — indicates that the grantors do not create budgets for successive years as could be the case with repayable instruments.

From the value perspective, the beneficiaries were primarily large, followed by small and micro-enterprises. The distribution of R&D state-aid funds was, therefore, somewhat universal, extending to different entities and different purposes. The significant increase in aid granted to small enterprises in proportion to their contribution to added value compared to medium-sized and large enterprises raises doubts from the perspective of the possibility of driving the commercialisation of R&D results and the country's general indicators of innovation performance. On the other hand, this indicates a change of SMEs' position in access to financing over the years. However, one must remain attentive to the doubts concerning the adequacy of the current definition of SMEs. Co-financing was required both for new initiatives supporting industrial research and for experimental works conducted, by their very design, with a view to the eventual introduction of a product to the market. The above means that the market is unsaturated with R&D aid to the extent that all funds offered thus far to enterprises have been used up, with the MAFPs, associated legislative changes, and Polish aid programmes giving direction to R&D aid in Poland in terms of purposes and beneficiaries rather than the other way round.

The discussed area certainly requires continued study of the effectiveness of aid granted both on the individual-enterprise level and the regional level. For it would be expedient to capture the actual impact of R&D aid on the innovation levels of the individual industries, regions and the country as a whole.

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