

Utilizing Tax Mechanisms to Foster Research and Development Activities in Enterprises in Poland*

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Abstract

The article delineates the intricacies associated with utilizing fiscal policy instruments to enhance research and development (R&D) activities within enterprises. It elucidates the economic rationale for such support and underscores the pivotal role of economic rejuvenation processes. Additionally, it discusses potential interventions in tax system design capable of mitigating adverse factors affecting enterprises' research initiatives. Using the example of the Polish economy, it is shown that despite numerous tax incentives, expenditures on research and development, and consequently the innovation of the Polish economy, remain at an unsatisfactory level. To elucidate the reasons for this state of affairs, an analysis of legal acts was conducted and correlated with the effects in the form of R&D expenditures. There is still a lack of assessment of the effectiveness of tax tools in countries with low levels of innovation. Ultimately, the manuscript concludes with recommendations for reforming selected elements of the Polish tax framework, aimed at stimulating increased business engagement in the field of R&D.

Keywords: tax system, tax deductible, R&D, firms

Introduction

In the array of tools comprising the state's economic policy aimed at fostering industrial and service sector development to spur economic growth, tax mechanisms assume a prominent role. These mechanisms incentivize enterprises to augment expenditures in research and development (R&D), thereby positioning themselves to gain a competitive edge in an increasingly globalized economy.

The utilization of tax systems in pursuit of economic and social objectives is extensively documented in the literature, with tax concessions playing a pivotal role, particularly in the structural transformation of economies in Central and Eastern Europe. The popularity of incorporating tax elements in supporting enterprises' pro-development policies stems from their proven efficacy and relatively straightforward implementation procedures. Leveraging existing tax frameworks facilitates cost reduction in the implementation of such measures at both central and enterprise levels. Additionally, these tools afford enterprises greater flexibility in directing their research and development activities compared to subsidies or preferential credit schemes.

The application of tax constructs to bolster research and development activities extends benefits to all segments of the economy, irrespective of size or geographical location. Unlike subsidies, tax-based incentives enjoy greater popularity and entail minimal subject or object administrative decisions.

Tax incentives aimed at bolstering private sector investment in research and development are increasingly adopted by a growing number of countries. Among OECD member states, the utilization of such incentives expanded from 12 countries in 1995 to 76 in 2018 (OECD, 2020). Noteworthy beneficiaries of these solutions include Brazil, China, Russia, India, Singapore, and the Republic of South Africa.

Tax relief linked to R&D activities enables enterprises to alleviate tax burdens and other administrative and legal obligations. It is essential to note that these incentives are typically realized post-R&D expenditures, contrasting with direct subsidies. Various countries employ a combination of indirect and direct tools to enhance their economic competitiveness through increased innovation. The significance of tax incentives is underscored by their prevalence in countries such as Australia, Austria, Belgium, Canada, Denmark, France, Ireland, Japan, Korea, and the Netherlands, where support via the tax system surpasses direct subsidies and bailouts.

This article aims to demonstrate the rationale for supporting enterprises in R&D activities, elucidate elements of the tax system conducive to identifying inefficiencies, and explore fiscal tools for stimulating investment in research and development. To achieve these objectives, a critical analysis of the literature and legal enactments is conducted.

Support justification

Research based on statistical data proves that, investing in R+D is a crucial factor of economic growth. Analyses prepared by the United States House Committee on the Budget showed that, investments in research and development are nearly as efficient as investments in capital goods (CBO, 2005). It is so, because of the total productivity growth of productive factors. In a group of seven industrialised countries: the USA, Japan, Germany, France, Great Britain, Italy and Canada in the period of 1971 – 1990, each 100\$ invested in R+D, led to the growth of GDP by 123\$ (Coe, Helpman, 1995). Research conducted on the basis of the member countries in the period of 1980 – 1998, allows to claim that, each 100\$ additionally spent in enterprises on research and development increased GDP of a certain country by about 113\$ (Guellec, De La Potterie, 2001).

Research-and-development investments also bring social benefits. These benefits treated as external effects are often bigger than investments returns, gained from enterprises themselves.

External effects can be of double-sided kind: as a transfer of knowledge or financial benefits. On the ground of knowledge transfer there is, among others, impossibility of a total blockade of knowledge and information flow by patent protection. As a result, investment of one company can speed up creating knowledge by other companies. Application of gained knowledge from others, allows to improve competitiveness of a certain enterprise through increasing efficiency and product or process modifications. Knowledge transfer contributes to improvement of market position for bigger number of enterprises than these ones, which were engaged in research-and-development activities.

From the perspective of an enterprise receiving external knowledge, transfer can come from:

- enterprises from the same branch,
- enterprises from other branches,
- universities,
- public research institutions,
- enterprises, universities, institutes from other countries.

Empirical research allows to identify several significant features of knowledge flow. Knowledge transfer is particularly crucial in branches which base their development on R+D expenditures and highly-skilled

employees (Audretsch, Feldman, 1996). The stronger knowledge flows, the less distance is between a subject generating knowledge and enterprises being its recipients. Although, it also depends on the forms of widespreading knowledge, still a basic significance has a physical distance (Fleming, King, Juda, 2007). It is possible to explain this through the meaning of work's easiness change by specialists from a certain field, and through the meaning of interpersonal contacts. Such a thesis seems to confirm geographical location of many industrial clusters, which developed in the neighbourhood of one or more universities (Audretsch, Feldman, 1996).

Indirect financial effects take place when knowledge generated in a certain subject influences on financial results of a run business activity of other enterprises. Such a statistical phenomenon is often difficult to distinguish, although its influence on all branches is undeniable. About side financial effects R+D, one can say, when a consumer or an enterprise acquires improved products thanks to research-and-development expenditures. An assessment conducted on the basis of productivity or usability growth by a buyer is higher than a market price, which is taken by a seller (Griliches, 2002). Computers and telephones constitute an example of goods, which brought benefits on the level of communities and economies, and the benefits only in a limited level were taken by enterprises, which did these innovations. Observation of variable costs in enterprises benefiting from innovations studied by others, shows that, it is a principal source of enterprises' development. Research carried out in a group of American enterprises introduce that, such savings can even arise to 1000% (Bernstein, Nadiri, 1988).

Social benefits are difficult to measure. As a sum of benefits resulting from knowledge transfer and external financial effects, they are much bigger than private effects of expenditures given for research and development. Averaged assessments of researchers concerned with this problem, allow to define private benefits in relation to the benefits of social expenditures R+D for 2 to 1 (Hall, Mairesse, Mohnen, 2012).

Existence of big social returns of investments directed to research and development is a crucial argument to run active economic policy directed toward the support of this process. Lack of countries' support will lead to less interest of enterprises about investments in R+D. Their decisions in this direction will be dictated only by private returns, omitting social benefits.

There are three single, however combined with each other types of research: basic, applied and development ones. Basic research are conducted in order to widen general knowledge. Direct application of such knowledge by enterprises can be made hard in the first period after getting the results of such research. Thus, financing such kind of research more often lies on public units. In a long-term perspective social benefits resulting from this kind of research can be very big, an example can be e.g. discovery of DNA code.

Applied research consists in knowledge development in order to accomplish certain needs resulting from economy development, or particular branches. An example of such research can be works on grafpen, thanks to which one will get, among others, further miniaturization of electronic devices. Applied research in a big extent, is interested in private sector. Direct engagement of public sector is often connected with the aims of health protection or defensive capability.

Development research consist of application of knowledge to create certain goods and services. They usually encompass project activities, constructing prototypes and implementing goods to production, which are to accomplish certain financial aims, set by enterprises.

In most of developed countries, within sources financing research-and-development works, one can notice a certain tendency. The biggest public support is directed to basic research sector, next one is support for applied research, the lowest one is for development research. In the USA in 2008 this division was 38% for basic research, 34% for development ones, and 28% for applied research (Tyson, Linden, 2012). One should notice that, structure is dynamic and in 1950 public expenditures on basic research constituted only 10% of all government expenditures R+D. Such a matter of concern used to have expenditures connected with military research, which were included in most applied and development research. Significance of military expenditures in the USA is still very big. In 2010 they constituted up to 58% of government expenditures on research and development. To compare on R+D connected with defensive capability, OECD countries spend on average 33% of expenditures, EU countries 13% and Japan 4,5% .

The issues associated with utilizing the tax system to induce changes in the innovation of enterprises in developing countries are the subject of analysis by many authors. Examples include the economies of Indonesia (E Sudarmanto, TZ Aulia, RL Putri, 2024), Iraq (SSQ Almosawi, BA Wahaib, 2024), and China (W Yang, X Wang, D Zhou, 2024). In all of these cases, the effectiveness of fiscal tools in achieving the designated goals related to economic modernization arises as a problem. An increasing amount of research also focuses on the effectiveness of supporting enterprise innovation in the context of environmental protection transformations (H Zhu, A Zhang, 2024), (C Li, Y Teng, Y Zhou, X Feng, 2024). However, these are actions that utilize a combination of various tools, including expenditure-related ones, within the scope of fiscal policy.

Construction tax benefits of R & D

Implementing tax preferences for enterprises spending some financial means on research and development, legislators can choose from several groups of solutions. They can be adjusted to recipients depending on the aims government would like to achieve. Among tax solutions, which can be applied, one can distinguish the following ones:

1. Stepped up amortization system of investment (machines, devices, buildings, intangible and legal values) used for research-and-development activity.
2. An increase of an indicator of costs' deductions, qualified from the tax base. Such solutions allow to assign costs of earning income more than 100% of incurred expenditures on R+D activity. In Great Britain for large enterprises, this indicator is 130%, and for enterprises coming from middle and small enterprises sector it comes to 175%.
3. Reliefs from tax burdens and tax free employees' remuneration, employed in R+D activity in an enterprise. There are also known different kinds of tax reliefs for employees from abroad, employed in R+D departments.
4. Tax reliefs allowing enterprises to deduct certain part of their expenditures on R+D, not from the tax base but from tax obligation itself.

Except from the above mentioned tools in legislation of some countries, different kind of synthetic tools are applied. One of the most interesting one is so called, box patent, which is to combine reliefs in research-and-development activity with reliefs in tax from incomes generated from registered patents in a certain country. Box patent was implemented firstly in Holland and Belgium in 2007 and then in Spain and Luxemburg in 2008.

In the case of reliefs from tax, there are two systems serving to calculate a deduction amount. The first way is to deduct all means spent on research and development. The second one is to deduct from tax only accrual of expenditures R+D, which took place in an enterprise in a certain year, in relation to the previous one. One can say that, the second way is more motivating. It rewards the activity of enterprises tending to widen research-and-development areas.

Next choice made by legislator is to define activities qualifying to tax deductions. Definition R+D differs between countries (OECD, 2010) primarily with an expenditure catalogue, which is qualified to benefit from selected preferences. Relatively narrow definition is in force in Holland. It allows to include into expenditures qualified different kind of remunerations connected with R+D. More generous systems include also current costs and capital amortization. Although, there were few attempts to standardise expenditure catalogue qualified to R+D, still every country, according to its own needs, creates its catalogue.

Next element which helps to construct tax reliefs constitute deduction limits. They can concern a percentage volume of all expenditures on research and development, which can be deducted from accrued tax. This percentage varies in particular countries: from 10% in Italy, 18% in Holland, 20% in Canada and Korea, up to 30% in Spain and France. Another different solution is tax deduction from its base, which in e.g. Great Britain comes to 175% (OECD, 2019)

The second limit can concern a maximal amount of tax relief, which can be used within a tax year.

Limits can also have digressive character. It happens so e.g. in France where one can deduct from tax 30% of expenditure R+D, but after exceeding threshold of 100 million Euros expenditure, only 5% (OECD, 2009).

Next construction element in research-and-development reliefs is an object range. Many tax systems distinguish particular groups of enterprises, relatively increasing or decreasing the range of applied preferences. In Canada, Japan, Norway, Holland and Great Britain enterprises from small and medium groups are preferred. Increased range of preferences can also concern newly-created enterprises, as it is in France.

Often met tax preferences concern enterprises cooperating in activities R+D with higher education posts. It can also concern reliefs connected with payments for university, as well as with the reduction of tax reliefs while employing science representatives in relation to projects, which are being accomplished. Subject preferences are more seldom met, from the view of certain sectors. Such solutions most often concern kinds of technology, which is going to be taken into research, as e.g. alternative energy sources application. There can also be defined an area of research and development as e.g. biotechnology or nanotechnology. Problems with the application of such elements in tax reliefs construction result from complications connected with the interpretation of tax regulations, for the enterprise itself, as well as for fiscal institutions.

Object diversification can also have geographical character. It most often concerns state or province. In Italy, southern regions have a bigger level of preferences than in northern regions. In the USA, particular states can define the range of tax credit in accordance with R+D activity.

Next element of tax reliefs construction can be defined by legislator, as a period through which, one can deduct from tax, or tax base, expenditures connected with R+D activity. Costs deduction from a particular year can be possible only in a this year or in further years. Several years settlement is beneficial for companies bringing a loss in a particular tax year.

Last recommendation concerning tax relief, connected with expenditures on research and development is stability of assumed solutions. Although, this recommendation results from the catalogue of tax rules, it is still actual. Effectiveness of applied tools will be closely connected with stability of tax system and clearness of assumed solutions.

The functioning of the tax benefits of R & D in Poland

Tax preferences role is to stimulate enterprises to increase inputs on research and development. In a consequence it will bring benefits for themselves, through the rise of competitiveness, as well as for the whole economy, through external effects.

Enterprises' expenditure on R+D have a complementary character in relations to public expenditures. Enterprises and government's rules in the vast majority decide about expenditure level on research and development of particular country.

Table 1. The level of expenditure of the country for research and development in relation to GDP

	2018	2019	2020	2021	2022
EU 27	2,18	2,22	2,3	2,27	2,24
Czech	1,9	1,93	1,99	2,0	1,96
Germany	3,05	3,11	3,17	3,13	3,13
Estonia	1,41	1,62	1,75	1,77	1,78
France	2,2	2,19	2,27	2,22	2,18
Hungary	1,51	1,47	1,59	1,64	1,41
Poland	1,21	1,32	1,39	1,43	1,46
Slowenia	1,95	2,04	2,14	2,13	2,11
Finland	2,96	2,8	2,91	2,99	2,95
USA	2,96	3,17	3,42	3,46	3,39
South Korea	4,52	4,63	4,8	4,93	4,78
Japan	3,22	3,22	3,27	3,34	3,37

Source: Eurostat, http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/main_tables, date of collection 15.02.2024.

Expenditure level on research and development in relation to GDP in Poland is the lowest one in a group of analysed economies. At the average EU-27 being in an interval from 2,18 to 2,27, in Poland this indicator was from 1,21 to 1,46. Simultaneously, expenditures R+D in 2018 were the lowest ones among all gained indicators. The highest expenditures in relation to GDP were noted in South Korea, where in 2021 the indicator came to 4,93.

One of the ways to rise a level of inputs on R+D were supposed to be in Poland, tax preferences. Application of tax system to support enterprises in their research-and-development activities, takes place through a tax relief on purchasing new technologies. This relief has a character of deducting expenditures from a tax base in income tax from natural person or legal person, depending on the forms of running business activity (Journal of Law, 2016), (Journal of Law, 2017).

Technological knowledge is perceived as the foundation of new technologies, manifesting in intangible and legal forms, particularly in the results of research and development (R&D) activities that facilitate the creation or enhancement of new products or services. A prerequisite for recognizing expenditures on the acquisition of new technologies is the evaluation by an independent scientific entity, determining its innovativeness and novelty, not having been applied globally for a period exceeding 5 years.

The basis for determining the deductible amount is the total expenditure incurred to acquire new technologies in the year when the technology is first recorded in the fixed asset account, with intangible and legal values recorded in the subsequent year. In situations where a taxpayer incurs a loss for a tax year or if the income from non-agricultural activities falls below the owed deductions, the deductions are spread out over three subsequent tax years, starting from the end of the year when the new technology was accounted for.

A key aspect of the framework for acquiring new technologies is the limitation set at 50% of the total expenditure. However, the taxpayer forfeits the right to tax relief if, within three tax years of purchasing the new technology, it is made available to other entities, bankruptcy is declared, or any expenditures for the purchase of new technology are refunded in any form.

Comparing the design of tax relief associated with R&D expenditures to similar solutions worldwide reveals distinctive characteristics. Notably, tax relief is delineated by a narrow scope, excluding fixed assets or current expenses related to research activities. Current expenses, such as employee salaries, foreign service costs, and material or energy consumption, constitute 69% of total R&D expenditures, with the remaining 31% attributed to capital expenditures, including tangible assets, intangible assets, or legal values (GUS 2021).

Another challenge in applying tax relief is obtaining the scientific unit's opinion regarding the innovativeness of the purchased technology. Enterprises, particularly those in the small and medium-sized enterprise sector, face constraints in obtaining such opinions and the associated responsibilities, which the scientific unit assumes when issuing a certificate. These certificates must adhere to specific formal requirements closely monitored by Treasury authorities (Pit.pl, 2021). However, the potential to utilize this tax relief should be evaluated positively over the subsequent three years if the taxpayer incurs a loss.

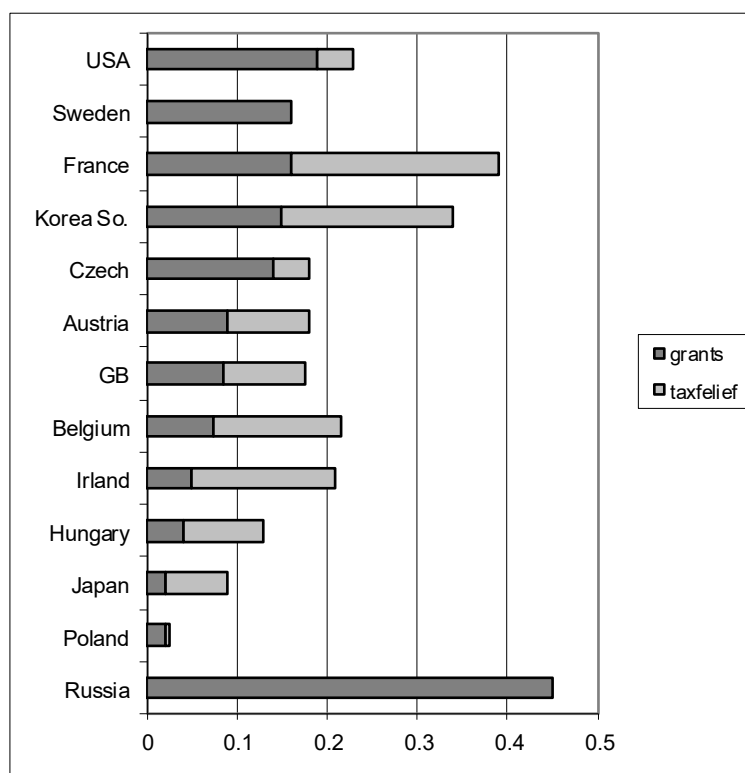


Figure 1. Government financial support for R & D spending in enterprises in 2020 as% of GDP

source: OECD Science, OECD R&D Tax Incentives Database, <http://oe.cd/rdtax> date of collection 15.05.2023

Constraints included in a tax relief construction in Poland translate to low level of their use.

According to the presented data, Poland belongs to the group of countries that mainly focused on direct incentives until 2020, while tax incentives did not play a significant role in this regard. This contrasts with the actions taken by countries such as France, Belgium, the United Kingdom, or Austria, which primarily based their innovation policies on tax instruments. However, it is worth noting that countries considered to be the most innovative in the European Economic Area (including Switzerland, Denmark, and Finland) also focused on direct subsidies, which may indicate that the success of innovation policy depends on other tools as well, not just those mentioned in the study.

One of the goals that Poland has set for itself as part of the implementation of the "Europe 2020" strategy is to increase investment in R&D to 1.7% of GDP by 2020. Meanwhile, in 2016, this share amounted to 0.97% of GDP, in 2017 it increased to 1.03%, 2018 it reached 1.21%, and 1.46% in 2022. These data indicate a gradual increase in R&D investment, although its level still significantly lags behind the EU average, which was 2.24% in 2022. According to Eurostat data from 2022, Poland allocated 127.30 euros per capita for research and development, which is less than 1/10 of the amount spent on these purposes in countries such as Denmark, Austria, Germany, or the USA.

The results of the European Innovation Scoreboard, published in the latest report by the European Commission in 2020, clearly indicate the significant challenges facing Poland in increasing the innovation of its economy. Ranking fourth from the bottom out of 27 EU countries, Poland was classified as a moderate innovator. Sweden took first place, followed by Finland, Denmark, and the Netherlands. These countries were recognized as innovation leaders.

Poland has one of the lowest indicators of research-and-development support for enterprises by government, among OECD countries and Russia. Support forms, in a significant majority are based on government subsidies, given for particular projects. While an indicator of subsidy level for enterprises in relation to GDP, does not

diverge from the support level in Japan, then a support level through tax reliefs is lower than in economies benefiting from such a form. From data, which were made available by Direct Tax Department of Ministry of Finance¹ results that in 2021, 3606 entrepreneurs paying income tax PIT and CIT benefited from reliefs for purchasing technologies.

Ineffectiveness of a tax relief to purchase new technologies, as a tool stimulating an enterprise to the growth of inputs on R+D, is noticed not only in an extremely low level of applying this relief, but also in the level of enterprises' engagement in development activity against background of institutions running activity R+D

Table 2. The share of corporate spending in total spending on research and development in%

	2017	2018	2019	2020	2021
EU 27	59,9	59,8	58,1	57,7	57,9
Czech	39,2	39,2	38,8	45,8	36,7
Germany	65,1	66,3	66,1	62,6	62,6
Estonia	43,6	48,8	49,5	50,6	50,2
France	56,3	56,8	56,3	56,5	55,4
Hungary	52,9	52,3	52,4	50,4	50,5
Poland	36,3	45,5	50,1	50,4	50,1
Slowenia	63,3	51,8	51	49,4	48,2
Finland	58,2	55,3	55,1	54,1	58,5
USA	64,9	65,7	65,7	67,1	67,2
South Korea	75,4	76,7	76	76,7	76,9
Japan	78,7	79,2	79,1	78,9	78

Source: Eurostat, http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/main_tables, date of collection 12.01.2024.

Enterprises functioning in Poland spend the least number of means on R+D activity among the introduced economies. At the EU average, exceeding 50% of engaged means in a particular country on R+D, Polish enterprises reached the highest level of 50,4% in 2020. At the same time in 2017 this level was the lowest one from all economies and came to 36,3%. The highest indicator of enterprises' engagement in R+D works of a certain country, showed in Europe some enterprises from Germany, in the world Japanese enterprises reached an indicator of 79,2% in 2018.

On the contrary to enterprises, contribution of government expenditures, expenditures on R+D of all subjects from a certain country, in Poland it is very high.

Table 3. The share of government spending in total spending on research and development in%

	2017	2018	2019	2020	2021
EU 27	29,3	29,8	29,9	30,8	30,4
Czech	34,7	34,8	33,8	34,7	32,7
German	27,5	27,4	27,8	29,3	29,8
Estonia	40,1	39,1	37,8	36,1	36,8
France	32,1	31,9	31,7	31,1	32,4
Hungary	31,4	31,8	32	32,3	35,1
Poland	44,6	42,8	38,4	39,9	38,8
Slowenia	22,6	23,3	27,7	25,3	24,5
Finland	22,1	26,8	27	27,7	25,1
USA	22,1	22,2	21	21,5	19,4
South Korea	21,6	20,6	20,5	22,1	22,7

¹ www.gov.pl/web/rozwoj-technologie/ulga-na-badania-i-rozwoj dated 8.03.2022.

Japan	15,1	15,6	14,9	15,2	15,1
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Source: Eurostat, http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/main_tables, date of collection 12.01.2024.

At the EU average – 27 which amounted in a researched period below 30%, in Poland this indicator exceeded 41%, reaching in 2017 maximum in a surveyed group, it is 44,6%. Simultaneously, a high indicator of Japanese enterprises' engagement in R+D was connected with a low level of country's expenditures in this area. Expenditure of government sector in relation to inputs on research and development in Japan in 2019, were the lowest ones in a surveyed group, and came to only 14,9%.

Summary

The Polish economy is undergoing a significant transformation, shifting from a production-based model to one centered on modern services, with research and development (R&D) playing a pivotal role. Given the scale of these changes, this transition holds immense importance for sustained economic growth. Consequently, in planning future actions, it is imperative to consider the necessity of creating regulations that incentivize enterprises to increase their R&D expenditures, which currently rank among the lowest in the European Union compared to government expenditures.

Presently, the regulations governing tax preferences in income tax for individuals and legal entities have failed to meet expectations. Among the various potential components of tax relief designed to support enterprise R&D expenditures, lawmakers have implemented only a limited number. The restricted application of tax relief for the acquisition of new technologies stems from its narrow scope. According to the "Research and Development in Poland: Report 2020," 32% of surveyed enterprises do not benefit from tax relief due to limitations within the expenditure catalogue permitted for preference (Deloitte, 2022). Moreover, the narrow scope also contributes to apprehensions regarding potential divergent interpretations of tax regulations by Treasury authorities.

As a consequence, subsidies have become the most widely utilized tool for supporting R&D expenditures in Poland. According to the "Research and Development Activity of Enterprises in Poland" report, 85% of surveyed enterprises benefited from subsidies, whereas only 8% utilized tax relief for technology acquisition (KPMG, 2022). This trend persists despite evident constraints associated with subsidy application, such as the requirement for research alignment with subsidy criteria and the complex process of subsidy allocation and utilization.

Relying predominantly on subsidies for financial support, coupled with limitations in the application of tax relief for technology acquisition, is a contributing factor to low enterprise engagement in R&D activities. Without increased enterprise involvement in this domain, Poland will continue to lag behind other EU and OECD countries in R&D investments. Justification for such support extends beyond individual enterprise benefits, encompassing broader external benefits accrued by other enterprises and society at large. Neglecting this aspect risks a sustained decline in international competitiveness and could serve as a significant deterrent to long-term economic development.

The development of R&D activities is a crucial driver of Poland's economic innovativeness. To this end, the introduction of a new tax relief within enterprise income tax structures is imperative, one that expands the eligible expenditure catalogue for R&D. Without such an extension and simplification of regulations, coupled with a reduction in the interpretation scope of Treasury institutions, integrating enterprises into the process of increasing R&D expenditures in Poland, and consequently, the economic rebuilding process, will prove challenging.

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