
Conditions for Developing and Supporting Public Sector Innovation in the Face of Economic Turbulence in Europe

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Abstract:

Purpose: The aim of the article is to analyze and assess the impact of innovative processes in the public sector on socio-economic development in the face of economic instability in Europe, and to evaluate the government support for innovative activities in various conditions of the public finance sector in selected countries.

Design/Methodology/Approach: The study used the desk research method in the field of statistical resources and the method of comparative analysis. The analysis included the assessment of selected innovation indicators and measures defining commitment in the field of financial support for innovation, which included the scope of government expenditure on R&D in 2010-2019.

Findings: The research proves that the mechanisms of generating innovative solutions in the public sector have their own specificity. They are often the result of forced, planned and targeted activities, reflecting the necessity to create conditions for the development support of innovations by public entities. Mainly it takes place through financing R&D in various sectors of the economy. The results of the analysis indicate the significant differences in the scope and directions of government support for activities for the development of innovation in the EU countries.

Practical Implications: The proper functioning of the public sector economy requires maintaining mechanisms of constant support for scientific research and development of innovative solutions. The results of the study provide information to be used for activities aimed at improving the implementation of innovative solutions in various public entities and strengthening the diffusion of innovation in the intersectoral dimension.

Originality/value: The results contribute to the discussion on the determinants of the application of innovation in the public sector in the organizational, technical, financial and social dimensions. In this approach, innovations are subordinated not so much to the mechanisms of market competition but to the achievement of better results of public services.

Keywords: Innovation, public sector, research and development, economic development.

JEL classification: O47, O32, H54.

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1. Introduction

In the context of the next economic crisis, emerging after over a decade, the public sector on a global scale faces a difficult challenge to maintain economic and social stability. This task is all the more difficult and unusual as it concerns the planning of remedial measures in the economy in a situation of an unprecedented scale of the pandemic threat, having a destructive impact on communities and global economic connections, as well as on the condition of local economic entities (Ehnts and Paetz, 2021). Crisis phenomena have been observed since the beginning of the outbreak of the pandemic, and their intensity and differences in individual countries can be seen in the observed and forecasted values of available economic measures, for example, regarding the level and rate of changes in GDP, and in terms of the public sector in the level of budget revenues and expenditure (OECD, 2020).

It should be expected that in the coming years streams of budget revenues supplying the budgets of public sector units at the level of central and local government administration will be significantly limited, due to the worsening condition of some enterprises (especially SMEs) and the tax relief instruments used by public authorities aimed at a quick recovery of domestic economy. At the same time, there may be some pressure to undertake intensive public investment programs and to increase the financial and organizational involvement of public sector entities in stimulating economic processes.

Previous research has shown that when it comes to organizational units of the public sector, there are large disproportions in the socio-economic potential and, consequently, in the possibilities of undertaking and financing complex innovative investment projects (Jarosiński *et al.*, 2015; Opalka, 2020). It cannot even be concluded that the known mechanisms of analysis and evaluation of the feasibility of investment projects can be universally applied to significantly different entities of public administration. A special dimension, when it comes to supporting innovation in the public sector, is the persistent socio-economic inequality between such entities, especially at the local level (Baranowski, 2017; Derlukiewicz *et al.*, 2021).

In the modern world economy, innovation is of great importance in the context of maintaining and accelerating economic and social development. The aim of many enterprises, regions, and economies in the national dimension is to strive to increase the level of innovation (Kaur and Singh, 2016). In highly developed countries, innovations have long been the subject of research, also concerning the activities of public sector entities (Arundel *et al.*, 2019). The new situation caused by contemporary economic crisis phenomena affecting the condition of public finances contributes to an increase in the level of risk in public development projects. Innovations should support the economic dimension of public undertakings, in which they would increase the level of public safety, stability of financing activities in the public sector, and efficiency of public services.

Although the public sector is less susceptible to innovative processes and it is more difficult to implement complex and costly innovative solutions in it, public administration at various levels undertakes continuous research to create new technical and technological solutions in the field of public services and is gradually opening to new methods of financing investment projects. There are many possibilities, but they constitute a substantive challenge, which cannot always be effectively carried out in public authorities due to the rather low level of human capital and social competencies.

The premise for taking up the research subject is the need to identify the current changes and challenges arising in the context of the role and scope of innovation in the public sector. The essence of the functioning of the public sector at various levels of competence, from local to central government, is to meet the collective needs of residents as part of service activities. Although they also include production activities (e.g., water production, waste processing), the final stage, ending the process, is the provision of public services.

The paper aims to examine changes in the field of supporting innovation in entities and organizational units of the public sector in selected European Union countries, with different budget situations and different conditions for financing development. The analysis and evaluation focus on changes concerning an important dimension of innovation in the economy of Poland and selected European Union countries, i.e. financing R&D activities, with particular emphasis on the activity of the public sector. The study also included an assessment of barriers and opportunities of engaging the public sector in the effective implementation of innovation in the conditions of the observed economic crisis caused by the global pandemic.

2. Developing Innovation in the Public Sector – Theoretical Background

Innovation have been the subject of research for many years and there is a variety of approaches and definitions that define their essence and role in the economy. However, innovation is always understood as a completely new product or a new look at an old problem, which causes an unambiguous and identifiable discontinuity with the past (Brown and Osborne, 2012). Such a radical discontinuity can be seen as the main difference between innovation and improvement or other forms of transforming products and processes (Bekkers and Tummers, 2018). The use of the term “innovation” may appear in various contexts and refer to both the process and the outcome. For clearer specification, the term “innovation activities” is used in the context of processes, while the term “innovation” refers only to effects (Bał-Woźniak, 2012). A definition in the Oslo Manual indicates that “innovative activity includes all development, financial and commercial activities undertaken by an enterprise to bring about an innovation for the enterprise” (OECD/Eurostat, 2018). The definition in such an approach leaves some latitude as to the adopted form of management of the above-mentioned activity, be it in the form of separated projects or regular business activity, or *ad hoc* activity.

The definition of innovation is analyzed in the literature on the subject from many perspectives, mainly concerning the enterprise sector. A more practical approach, considering the experiences and challenges of research processes involving innovations and their effects, is also included in the Oslo Manual, pointing to innovation as a new or improved product or process (or a combination thereof) in which there are significant differences from the previous products or processes of a given entity and which has been made available to potential users (product) or put into use by an entity (process) (OECD/Eurostat, 2018). In this context, an innovative process is a sequence of activities necessary over time to implement a specific innovative concept and transform it into a new situation (Jasiński, 2014). The emerging new forms can be, for example, a new product, new production technology, or new service (Petkovšek and Setnikar-Cankar, 2013). A key condition to be recalled for a new idea, model, method, or prototype to be considered an innovation and considered as one of the basic characteristics of innovation is the necessity to implement it. Meeting this condition requires systematic actions to ensure that innovation is available to potential external or internal users.

On the basis of the conducted research, it was found that it is reasonable to define the significance of the phenomenon of public innovation in the economy and society, bearing in mind the instability of public finances and the need to generate development impulses to overcome the currently observed economic turbulences. This phenomenon is defined as the activity of public sphere entities in the use of the results of scientific research and other concepts or ideas that include methods and techniques in the organization, as well as lead to the improvement of infrastructure, i.e., in consequence, to improve the quality of public services provided or products made (Jasiński, 2014).

In the context of the activities of public sector entities, it is worth paying attention to another requirement, also considered crucial, that innovations should contain at least such features that have not been previously made available to users by a given organizational unit. These features may, but need not necessarily, be new to the economy, society, or a specific market. Innovation can take shape based on products and processes that have already been used previously in other contexts, for example in other geographic or product markets. In this way, the diffusion of innovation takes place, which may constitute a source of significant economic and social value and thus the subject of interest of the public sector in the context of the expected and measurable effects (Bugge *et al.*, 2010).

In the public sector, innovation is forced by social expectations regarding broadly understood changes in the standard of living, which are influenced by actions taken by public authorities. In the private sector, however, we have other types of mechanisms, where the innovative behavior of entrepreneurs is formed naturally through the market mechanism and the company's position on the market between the consumer and the behavior of other competing companies in a given industry.

Supporting innovation in the public sector and disseminating information about them should help to counteract stagnation in the management of the public sphere. This demonstrates the role of public sector innovation as a factor influencing the improvement of the range of services offered to society as well as their quality. In this sense, in the public sector, a broader promotion of innovative solutions that may appear in various spheres of activity should be expected. It may be one of the most effective mechanisms for creating entrepreneurial behavior and achieving innovative effects (Heichlinger and Bossen, 2017).

Innovations in the public sector are of interest to public administration entities, managers of public enterprises, social organizations and other groups. The current socio-economic challenges to a large extent force a departure from the established practice of the functioning of the economy and society and contribute to the constant verification of the role of the public sector (Bekkers and Tummers, 2018). Public authorities seek to tackle such problems by strengthening cooperation with other stakeholders such as research institutions, private sector companies, citizens, and community organizations (Łożykowski and Sarnowski, 2019; Holt, 2019). The correct course of socio-economic processes from the point of view of the public sector requires paying attention to innovative processes in many dimensions, including: organizational, technical, financial, as well as other relations depending on local, regional and national conditions (OECD, 2017).

In the case of organizational innovations, the subject of changes are usually the methods of managing the organization, as well as internal systems, structures and hierarchical arrangement. In the public sector, however, organizational innovation is not straightforward, and the process of implementing it is often slow and complicated, and requires wider public support, including from the administration and the political community. The focus on services in the public sector reflects the mission of this sector, however, the implementation of organizational innovation is eminently internal, which will often not be seen as an innovation directly affecting the recipients of public services, which may be one of the barriers to this type of innovation (ARCS Foundation, 2013).

Creating and implementing innovations of an organizational nature is a continuous process and proceeds with varying intensity. The essence of this is the universal impact of this type of innovation. Changes in management, changes in work organization apply to all positions and most of the employees. The implementation of organizational innovations is related to the creation of technical and economic innovations, and also concerns changes in social awareness. Therefore, we are dealing here with a situation of mutual influence of various innovative tendencies, influencing the improvement of the general level of functioning of the organization.

Both in the private sector and in the public sector, the most important factor contributing to the creation of innovation is the rapid development of new technologies. Technologies can improve the performance of the public sector.

However, there should be specific conditions for management support from public authorities and heads of organizational units at the local or national level as a stimulus of change and innovation. This means that public entities must be open to new technologies and to give the necessary management support. Managers should be aware of the availability of new technological solutions, while employees should be convinced to change their previous ways of working. The users of services and products also need to be informed or even educated on how to use new technologies and solutions.

The pace of changes in the introduction of new technologies is slightly slower in the public sector, which should be related to the specificity of the public service provision process (Prawelska-Skrzypek and Jałocha, 2014). Nevertheless, the technological progress created by the private sector entities undoubtedly influences changes in the technical, technological, and organizational possibilities of providing public services with considerable force. In the public sector, we have a slightly different situation in terms of creating and implementing innovative solutions of a technical and technological nature. Slightly different mechanisms operate in public service enterprises (Wirick, 2009). The devices used in production processes are characterized by something referred to as longevity, which means that the applied technical solutions are used for a long period until the need for modernization investments or the implementation of new investments.

Financial resources appear among the key drivers of innovation. The source of financing of innovative processes are usually funds collected under the budgets of local government units, the state budget, and in the case of Member States - from the budget of the European Union. Under certain conditions, the source of financing may be external private funds.

The active role of the public sector in shaping outlays for innovation is shaped, among others, by the European Commission, which indicates the need for action by public institutions to stimulate innovation. In its Communication on a broadly designed innovation strategy for the EU, the European Commission emphasizes the importance of public procurement to strengthen the EU's innovation capacity while improving the quality and efficiency of public services (Commission of The European Communities, 2006). This is done through public procurement, including innovative solutions, which in turn leads to better use of funds through the combination of higher quality, faster delivery and cost reduction of public projects. This means that public procurement of innovation can serve the implementation of the objectives of public policies of the EU, while influencing the pace of economic development of the Member States (Wójtowicz-Dawid, 2020).

Strategic actions for the development of the EU emphasized the need to increase expenditure on the development of innovative products, services and construction works (European Commission, 2011). They include not only strategic goals, but also the need to respond to current, unexpected events that the public sector has to deal

with, including those resulting from the need for changes, e.g. in the field of healthcare, and the need to use the latest equipment, and to produce new drugs and vaccines (Mazzucato and Kattel, 2020). This entails the need to purchase innovative products and services.

The processes of supporting innovation in financial terms are most often assessed with the use of parameters that allow measuring R&D activity through the perspective of expenditure on this activity incurred by various participants of the economy (Diaconu, 2019). It is mainly through research and experiments that the creation of knowledge in the economy takes place, which contributes to the ability to create innovation (Turczak, 2016). It should be noted, however, that the very category of R&D expenditure is not sufficient for a complete and credible assessment in this regard, despite the fact that in the research on innovation it allows to identify certain trends in selected sectors of the economy. In addition to the amount of expenditure on R&D activities, the form of spending and the effectiveness of the funds involved in R&D are of particular importance (Ziętek-Kwaśniewska, 2020).

Based on the available literature on the subject, it should be stated that innovation in the public sector is one of the main factors, both for the development of public services at a high-quality level concerning local communities and societies, as well as an important factor in business development. However, innovations remain a big challenge due to the specificity of the functioning of the public sector, internal relations, and numerous links with the external environment in the economic and social sense, both domestically and internationally. Undoubtedly, an indispensable element of their functioning in the public sector remains the provision of appropriate financial support, which can be provided primarily from public resources.

3. Research Methodology

In this study, the analysis used selected indicators of innovation and commitment in terms of financial outlays supporting innovation, used in the European Union and OECD countries, including the concept and results of the European Innovation Scoreboard (EIS), as well as own statements using available data. The methodological assumptions of EIS distinguish four main areas and ten dimensions of innovation, to which more detailed criteria are assigned. The methodological structure of the ranking includes 27 partial indicators for which the values are obtained from the resources of statistical databases and the results of specialized research developed and published by international institutions and research and development entities as well as entities dealing with the protection of patent rights (Hollanders, 2020).

The structure of the European Innovation Scoreboard covers the framework conditions, investment, innovation activities and impacts. This method takes into account investments made in both the public and business sectors. The design of the indicator makes it possible to assess the availability of financing for innovative projects through venture capital expenditure and government support for research and

innovation, as well as support measured by R&D expenditure by universities and government (or mainly government-funded) research organizations.

The study analyzed the scope of support for activities stimulating innovation, considering the amount of expenditure on R&D. Empirical data for the EU Member States and selected countries of the world were compiled. For the study, the author used the desk research method in the field of statistical resources, the comparative analysis method, and the method of critical analysis of literature on the subject. The resources of the Eurostat, OECD, and AMECO database as well as studies and summaries of data available in the resources of statistical offices of the surveyed countries and the resources of the European Commission were queried.

This paper presents the results of a comparative analysis covering a set of European countries assessed according to the Innovation index, developed in the European Innovation Scoreboard 2020 methodology. A group of countries were selected for detailed empirical data analyses, including three countries classified as “strong innovators,” three countries included in the “moderate innovator” group, and one country among those classified as the “modest innovator,” in terms of the index mentioned above. The presented results of the analysis consider significant data characterizing the scope and directions of financial support for innovative processes coming from the public sector funds, primarily in the form of expenditure streams allocated to R&D activities.

4. Research Results

The results of research covering the Member States of the European Union in terms of expenditure financed from public funds (general government) allocated to supporting R&D activities in various sectors are presented below. The presented scope of detailed results concerns a group of countries characterized by a different level of socio-economic development and the level of innovation. The list of indicators characterizing economies in terms of innovation in selected countries is presented in Table 1.

The presented countries are ranked according to the value of the Innovation Index 2020, i.e. recorded for 2019. The table also presents data on the ranking position of individual countries recorded in the group of 28 EU Member States in each of the analyzed years, the indicator of general expenditure on R&D activities (GERD) in relation to the GDP value, in percentage terms, as well as government expenditure on R&D activities (GOVERD) in relation to the GDP value, also in percentage terms.

The strong innovators group includes Germany and Ireland, and since 2018 also Estonia, where the most dynamic increase in the index value is visible among the analyzed countries in the analyzed period. In the analyzed group of countries included in moderate innovators, Poland was characterized by significantly lower values of the Innovation Index compared to the Czech Republic and Italy, although it should be

noted that in the entire analyzed period, in the case of Poland, there was an increase in the value of the index of general expenditure on R&D in relation to GDP. It is worth noting, however, that in Poland the lowest values among the entire group of the examined countries were found in the ratio of public expenditure on R&D in relation to GDP.

Table 1. Innovation assessment indicators of selected countries in 2017-2019

Country	2017				2018				2019			
	Innovation index value	Innovation index rank	GERD/ GDP (%)	GOVERD/ GDP (%)	Innovation index value	Innovation index rank	GERD/ GDP (%)	GOVERD/ GDP (%)	Innovation index value	Innovation index rank	GERD/ GDP (%)	GOVERD/ GDP (%)
Germany	127.1	7	3.05	0.41	129.5	8	3.12	0.42	130.5	8	3.18	0.44
Ireland	121.1	10	1.22	0.05	121.3	10	1.14	0.05	121.9	10	0.78	0.05
Estonia	83.4	13	1.28	0.15	105.7	12	1.41	0.16	107.7	12	1.61	0.17
Czechia	87.2	17	1.77	0.30	90.9	15	1.90	0.31	91.7	17	1.94	0.32
Italy	80.0	19	1.37	0.17	86.2	19	1.42	0.18	90.1	19	1.45	0.18
Poland	54.9	26	1.03	0.02	60.2	26	1.21	0.02	64.1	25	1.32	0.02
Romania	33.1	28	0.50	0.16	32.9	28	0.50	0.15	34.4	28	0.48	0.15

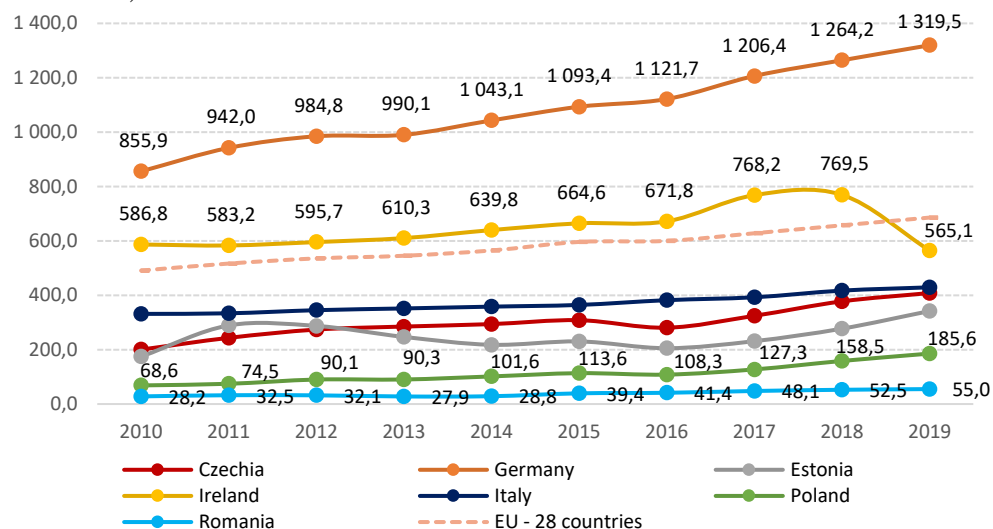
Source: Own compilation based on Eurostat data and European Innovation Scoreboard 2020, https://interactivetool.eu/EIS/EIS_2.html.

These differences were particularly noticeable in comparison to Germany and the Czech Republic, where the value of the analyzed indicator was several dozen times higher than in Poland. This indicates a low level of involvement of Polish public sector institutions in activities supporting innovation, although a detailed analysis of the public sector structures in the surveyed countries would be required to precisely assess the causes of these differences. In Romania, included in the modest innovators group, there was a stagnation in terms of the level of innovation, as well as the amount of expenditure on R&D (both in general and in the government sector) in relation to GDP.

In further analysis of the scope of public sector involvement in innovation, the indicator of public expenditure on R&D per capita was used, which allowed to notice very clear differences in the value of this indicator in the analyzed group of countries. Figure 1 shows the difference between the countries of Western Europe, including a particularly high level of the indicator in Germany and Ireland, and the countries of Central and Eastern Europe, which, despite sometimes high positions in the innovation ranking, recorded a clearly lower level of expenditure. In 2019, the value of the index in Germany was seven times higher than the value of the index in Poland, almost four times higher than in Estonia and almost 24 times higher than in Romania. In the analyzed period, the amount of public expenditure on R&D per capita increased on average in the entire European Union and in the analyzed countries, except for Ireland,

where already in 2019 a significant decrease in the value of the indicator by 26.6% was recorded.

Figure 1. Total government budget allocations for R&D in all sectors (Euro per inhabitant)



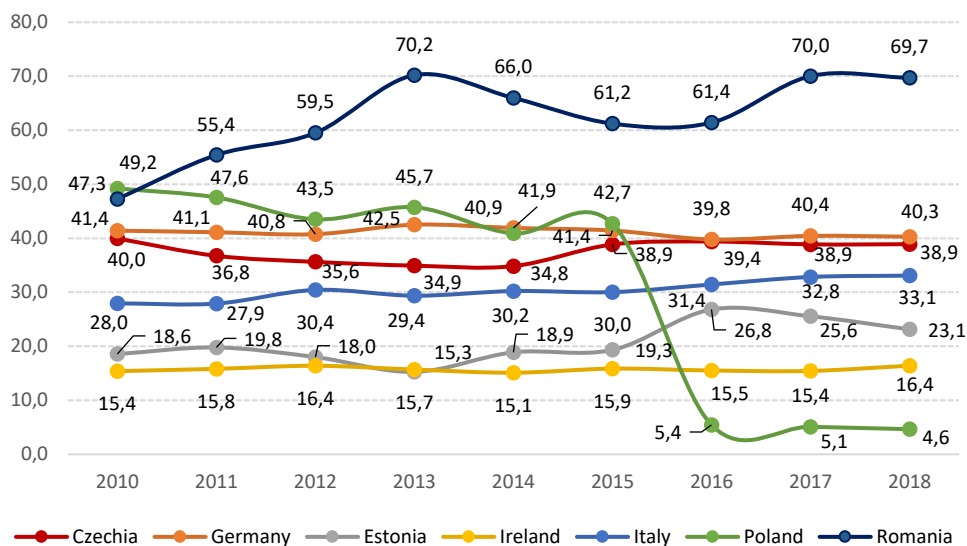
Source: Own study based on Eurostat data, <https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database>.

One of the main measures of public sector involvement in supporting innovation is the amount of funds that are spent on research and development activities. These expenditures, broken down statistically according to the source of funds, are marked as expenditures of the government sector for research and development, which can be directed to particular sectors of performance. This analysis focuses on the role of the public sector, hence the important information is the structure of the use of public funds for research and development, i.e. those at the disposal of government sector entities, with particular emphasis on the amount of funds used by the public sector itself. Figure 2 shows the share of funds directed to the government sector (in terms of execution) in the total amount of funds spent from the government sector (in terms of the origin of capital) in selected EU countries.

In the analyzed group of countries, since 2011, Romania had the highest share of financing research and development in the government sector with funds also from this sector, where this share was also the highest among all EU members. In 2010-2015, the discussed share in the case of Poland and Germany remained at a similar level, ranging between 40% and 50%, although in the case of Poland this share was subject to greater fluctuations and a clear downward trend. While Germany maintained the value of the above-mentioned index at a stable level throughout the analyzed period, in the case of Poland, a very large decrease in the value of the index was recorded to 5.4% in 2016. After 2017, this value decreased even more, reaching

the level of 4.6% in 2018 and only 2.8% in 2019. It should be noted that none of the other countries covered by the study recorded such a decrease, and in Estonia, the value of the indicator even increased significantly in 2016.

Figure 2. Government expenditures on R&D (GOVERD) to Government sector as % of total Government sector allocations for R&D in selected UE countries



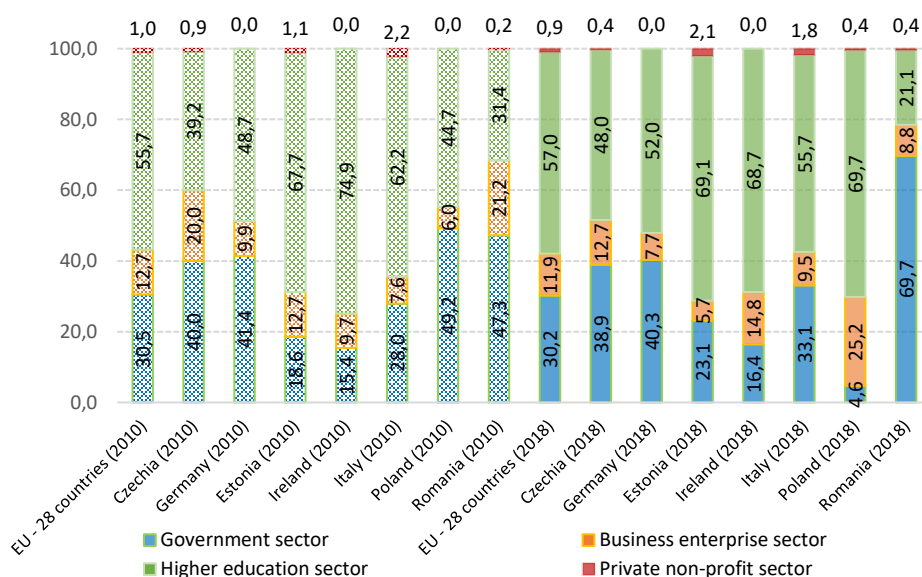
Source: Own study based on Eurostat data, <https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database>.

Government spending on research and development in the surveyed countries was directed to various sectors. As shown in Figure 3, on average among the 28 EU Member States, the largest share of the funds in question was transferred to the higher education sector, which accounted for 55.7% of total government funds in 2010. Values above the EU average were recorded for countries with a higher ranking innovation, i.e., in Ireland, Estonia and Italy, respectively: 74.9%, 67.7% and 62.2%.

In 2018, there was a noticeable change in the share of the higher education sector in the use of public funds spent on R&D activities compared to 2010. According to the presented data, it should be noted that this share increased both in terms of the 28 EU countries and in the case of with a higher level of innovation, especially in the Czech Republic (an increase by 8.8 pp) and Germany (3.3 pp). However, the most significant changes took place in Poland, where between 2010 and 2018 there was an increase in the discussed share ratio from 44.7% to 69.7% (25.0 pp). As indicated earlier, the share of the government sector in the use of government funds for R&D activities remained stable in most of the countries surveyed in the period 2010-2018, with the exception of Poland and Romania. Taking into account the years 2010 and 2018, the directions of changes in the structure of government expenditure can be indicated, mainly caused by changes in the value of expenditure in the government sector and in

the business enterprise sector. In Poland, there was a sharp decrease in the share of expenditure from the discussed source in the government sector from 49.2% in 2010 to only 4.6% in 2018. At the same time, the share of expenditure in the business enterprise sector increased more than 6 times, to the level of 25.2% in 2018. However, in the case of Romania, it should be noted that the share of the government sector in the implementation of public expenditure on R&D activities is clearly increasing, where the change between 2010 and 2018 was 22.4 pp, and at the same time the share of the business enterprise sector decreased by 12.4 pp.

Figure 3. Government expenditures on R&D (GOVERD) by sector of performance, in %, in 2010 and in 2018



Source: Own study based on Eurostat data, <https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database>.

The EU Member States have a great deal of discretion in the manner of researching R&D activities. The method of classification of units in individual countries may differ due to the specificity of a given country, but according to international standards, it should be based on the institutional classification of units in the System of National Accounts. The explanation of the changes observed in the case of Poland requires a consideration of the corrections that have occurred in the method of classification of entities involved in R&D activity according to the executive sectors. Since 2016, following the guidelines developed by Eurostat and OECD, contained in the Frascati Manual 2015, there has been a change in the classification of units involved in R&D by sectors of performance (OECD, 2015). Due to the change in the methodological guidelines, the data for Poland for 2016 are not fully comparable with the previous years. The biggest differences concern the grouping of research-active entities into institutional sectors and the method of measuring R&D personnel.

Currently, the classification method has been closely related to the list of units conducting doctoral (PhD) studies and the classification of units used in the System of National Accounts. Previously, all research institutes and scientific institutes of the Polish Academy of Sciences were previously classified as government sector institutions, but now they are classified, depending on the characteristics of their activities, into three different sectors: government, business enterprises or higher education (Statistical Office in Szczecin, 2020).

Although, in terms of indicators, innovation processes in the public sector can be brought to comparability, the specificity of individual countries imposes the obligation of an individual approach to this issue in each case. The conducted research on innovation processes in the public sector and on the phenomena of diffusion of innovation unequivocally prove that eliminating development differences and disproportions through the wider use of innovative solutions is a process and cannot take place in the short or medium term. Expenditure on innovation in the public sector may accelerate the pace of changes and shorten the process of reaching the minimum conditions of economic and social cohesion. Therefore, more attention should be paid to outlays related to creating innovations in the public sector and leading to a wider implementation of solutions into practice. This applies not only to autonomous solutions created within enterprises and other public sector entities, but also the private sector and mutual cooperation between these sectors. Such cooperation may bring additional innovative multiplier effects in the public sector.

5. Discussion

The financing of innovative processes in the public sector is conditioned by many objective factors that are relatively easy to identify. This problem looks different in the situation of the public sector in developing countries with a low level of development, a poorly shaped public sphere and unstable sources of financing tasks, and it is different in highly developed countries, where the process of developing the social and economic infrastructure has been consistently implemented for many decades and already brings stable well-established economic and social effects. The position of the public sector and the scope of innovations generated by this sector is therefore a derivative of the possessed development potential and real needs in the sphere of public services.

In contrast to the mechanisms taking place in the open market in the conditions of a free-competition economy and market-driven innovation processes, in the public sector, we are dealing with a slightly different mechanism, where innovations are forced by service users, local communities, or society as a whole and created by leaders of public administration who recognize the usefulness of implementing innovative solutions and can manage innovative public investments.

It seems that in the field of innovative solutions, a better understanding and a more inquisitive approach to this issue are necessary. Institutions responsible for

development planning, therefore, need a better understanding of the conditions necessary for the emergence of innovation in the public sector, identifying the drivers and barriers, as well as the organizational and economic links through which a more innovative public sector generates benefits throughout the economy. After the financial and economic crisis that emerged in 2008, the economic situation in the EU imposed enormous pressure on the public sector, and a similar situation, perhaps with greater intensity, is emerging as a consequence of the global pandemic from 2020.

In response to previous crisis phenomena, the European Commission focused on innovation in the public sector by formulating the “Europe 2020 Flagship Initiative Innovation Europe” communication (European Commission, 2011). It emphasized that in the context of financial conditions and constraints on public resources, the public sector must innovate more than ever to meet the changing needs and expectations of public service users. The Communication also recognizes the need to better understand the innovation, highlight successful initiatives, and support instruments to test the benefits of implementing public sector innovation.

Noteworthy are the specific features of innovation in the public sector, which distinguish them from the most common innovation implemented in the economy. Entities operating in the public sector recognize the possibility of reducing public expenditure related to their statutory activity as an important factor motivating to undertake innovation. In the conditions of disturbance of budget revenue streams related to economic turbulence and the ensuing necessity to reduce public spending, one of the key ways of pro-savings activities is innovation in the public sector. To avoid limiting the scope of services and withdrawing from public programs, public authorities should generate new streams of innovation and thus look for opportunities to introduce a different approach and apply changes to their programs that are less costly and at the same time ensure an appropriate level of efficiency.

The research results indicate that innovative processes in the economy and in the public sector are a direct result of research expenditure and development investments. These processes take place with different intensity and scope of impact, broken down into the private sector and the public sector. The dynamics of innovation processes in the public sector is relatively low because changes in manufacturing techniques take place relatively slowly. However, the public sector has a great power to absorb innovative solutions that arise as part of internal research, and are also the result of the aforementioned diffusion of innovation to the public sector (Jarosiński, 2015). Therefore, it can be concluded that innovative processes in the public sector proceed in parallel to similar phenomena in the economy, although their dimension is slightly different and they have their own specific specificity, however, these processes are always related to the financing of scientific research and investment outlays.

The development of the European innovation model, including solutions introduced in Poland, is largely based on public funds. This requires a particularly efficient and open administration with the capacity to monitor and coordinate the development of

the public sector. The necessary condition for the effective stimulation of the development of innovation should be the provision of budgetary funds, which in turn requires determination and strategic action on the part of general government institutions. Expenditure on R&D in the European Union financed from public funds is directed mainly to institutions included in the higher education sector. As indicated by the results of the analysis, in the analyzed countries, this share ranged from 30% to even 75% and remained quite stable in the 2010-2018 period. Slightly lower amounts of support in the above-mentioned scope were directed to the government sector, and in individual countries, its share of total public expenditure on R&D showed increasing values with the decline in the position of a given country in the innovation ranking according to the Innovation Index.

From the analytical point of view, a very important problem is the correct measurement of both expenditure on innovation and the achieved results. There are significant difficulties in this sphere, as has already been pointed out in this paper. Despite the constantly ongoing process of modifying and improving the methods of researching innovation, mainly in the private sector, but also in the public sector, attempts to assess the situation in individual countries and comparative comparisons encounter difficulties in terms of comparability of the obtained data in time series and between the surveyed territorial units.

In a situation of financial difficulties and deepening limitation of public spending, also concerning innovative activities, there is pressure to reduce expenditure, reflecting the tendency to optimize costs, common in crisis conditions. At the same time, it is in this situation that, driven by the need to reduce costs, the potential benefits of introducing innovative thinking into the overall way the public sector works are emphasized. The natural direction of changes is to depart from the existing, well-established approach to the offered products and services, to undertake reforms in the field of management methods to increase their flexibility, openness to newly developed solutions, which will allow for focus on cooperation, on optimizing the allocation of competencies and risks, and on building new communication channels. As a result, it will contribute to increased activity and ability of public sector organizations to react to economic fluctuations, despite the possible temporary difficult budget situation.

6. Conclusions

The conducted study confirms that the growing importance of the role of innovation in the global economy is accompanied by an increased interest in assessing and strengthening innovation processes in the public sector. This is a way to improve the competitive position, and often a source of success not only in the strictly business sense, characteristic of the private sector, but also in terms of the objectives assigned to the public sector. However, achieving a high level of innovation is not easy as it is dependent on many different factors. On the one hand, it is shaped by human factors, on the other, by the economic environment. Financial resources, in particular directed to financing research and development activities, are an indispensable factor in

achieving technological progress and organizational improvements. A noteworthy factor shaping the possibilities of assessing the allocation of public funds for the researched activities turns out to be the method of classifying organizational units to executive sectors, which may significantly affect the results of the observations and statistical research conducted.

The issues of innovation in the public sector, especially in the countries of Central and Eastern Europe, have not yet become an area of great interest on the part of economic analysis, which is related to the specific features of the public economy and historical conditions. Along with social changes and economic development, however, there is an increase in social pressure and citizens' expectations regarding the level of meeting the collective public needs of residents of territorial units, which in turn means the need for continuous activity of public authorities. At the same time, changes aimed at improving the quality of public services also require incurring appropriate expenditure on R&D, creating new knowledge and implementing new solutions. Despite the expected maintenance of support for innovation as an investment and pro-savings activity in the field of public resources, there is also a real risk that under the conditions of disruptions or reduced efficiency of public revenue streams, the actions of public entities to strengthen the factors stimulating innovation will be limited, and public funds will be directed to current tasks recognized as a priority from the point of view of maintaining the continuity of public service provision.

The importance and need to actively support innovation in the public sector is increasingly recognized in the context of delivering public services and pursuing development policy. However, there are still significant differences within the EU and, especially in the countries joining the EU in 2004 and later, where the systemic support for innovation in financial, organizational and social terms remains weak at various levels of the public sector. In some of these countries, the operating regulations and administrative procedures should be perceived in terms of barriers, as they are rarely oriented and structured in such a way as to bring innovative results.

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