

INVESTMENTS IN RESEARCH-DEVELOPMENT-INNOVATION - A WAY TO OVERCOME THE CRISIS GENERATED BY COVID-19

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ABSTRACT: *Research-development and innovation have played an important role in the Covid-19 pandemic. The world's economies have focused and are focusing on stimulating the investments in research-development-innovation in order, on the one hand, to solve the medical situation (drugs, vaccines, high-performance equipment) and, on the other hand, to boost the economic development, which is necessary to replenish depleted budgets by the measures taken to limit the effects of the Covid-19 pandemic. The present paper presents how the pandemic affected research-development and innovation (RDI). Also, the paper presents how RDI was mobilized to provide vaccines, treatments, and innovative solutions (often digital) and examines the RDI policies responses implemented in countries to stimulate research and innovation in order to find solutions to the pandemic. Many European countries prioritize the field of research and development by attracting European funds. In Romania, the phrase "research and development" is frequently mentioned in the National Plan for Investment and Economic Recovery recently published by the government, in different contexts, either related to GDP growth, improving digitalization in administration and economy, increasing competitiveness in fight SARS-CoV-2 virus and more. However, Romania hardly manages to popularize even the existing facilities in the field, so that they can be accessed by more beneficiaries.*

Keywords: *research, development, innovation, investments, pandemic.*

JEL Classification: *O30, O31, Q55*

1. INTRODUCTION

The Covid-19 pandemic represents a global threat to health and has led to the largest global economic crisis since World War II. In this context, attention has been focused on the research-development-innovation sector, which can provide quick solutions to the problems caused by the pandemic and are important levers in ensuring sustainable economic recovery, increasing resilience and competitiveness.

This pandemic has once again highlighted the importance of a stable research infrastructure and funding for preparedness, response and resilience for public health

emergencies. The stakes of this global pandemic have never been higher, because human lives have been lost and are still being lost, economies are being disrupted, and people's lives have changed. Stopping the Covid-19 pandemic and resolving the crisis caused by it depend to some extent on high-quality research, which provides clear, accurate, concrete and useful data. While the priority goals are the treatment and prevention of disease, research can provide key data for managing and restoring economic and social well-being.

OECD Science, Technology and Innovation Outlook 2021 launched in January 2021, highlights that the current pandemic could cause long-term damage to RDI systems, at a time when science and innovation are needed to meet sustainable development goals and accelerate the digital transformation [6]. The pandemic has also pushed research and innovation systems to their limits, revealing gaps that need to be filled. For this reason, the organization has highlighted the need for measures to improve overall preparedness and safeguard the RDI system for future crises, recalibrate RDI policies to provide tools and capabilities to guide research and innovation efforts towards long-term goals of sustainability, inclusion and resilience.

2. RDI SISTEM RESPONSE TO COVID-19

With the sudden shock of the coronavirus pandemic, the functioning of the RDI system was severely affected. Research and development organizations have seen their activities severely disrupted by measures taken to combat it. The impact on research conducted before the onset of the Covid-19 pandemic was rapid, dramatic, and no doubt will be long-term. The beginning of the pandemic restricted most scientific and clinical research or refocused it on the Covid-19 study. After the initial shock, several parts of the RDI system recovered quickly as governments lifted restrictions and eased distance measures after the first pandemic wave. Many companies in the ICT sector - already a major investor in research and development before the crisis- have recorded growth, as a number of ICT tools have proved essential in counterbalancing social distancing measures.

RDI policy responses to the crisis have focused heavily on ensuring funding for research and innovation related to Covid-19, billions of dollars being allocated to funding vaccines and therapies. Governments have also implemented funding schemes to support innovative enterprises and have helped researchers and research institutes to adapt to the new context [5]. Most countries have prepared and launched economic stimulus and recovery packages and, in particular, to protect jobs that directly or indirectly support RDI actors.

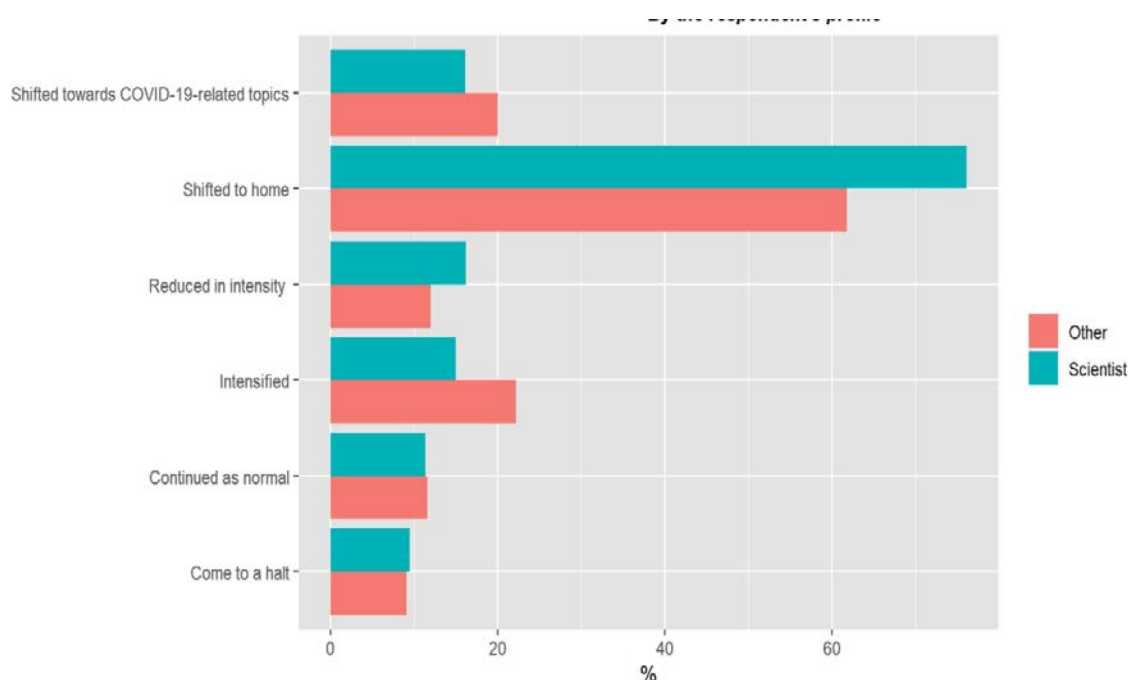
Both private and public actors from the CDI system have been actively involved in providing solutions to the Covid-19 crisis. This has led to massive investments in vaccines and treatments research, but has also produced innovations to cope with the impact of social distancing measures, such as improving digital tools for remote work. In the first months of the pandemic, a rapid increase in Covid-19 medical and health research was observed. This increase has been followed by the constant addition of research papers that have fueled the scientific debate.

In the 2021 edition of the UNESCO Scientific Report, entitled " The Race Against Time for Smarter Development", the authors note that the Covid-19 pandemic has led to a sharp increase in scientific research, as the management of the Covid-19 crisis required scientific support and cooperation government agencies, agencies and communities. The report cites open science and innovation as the main driving forces behind the international scientific collaboration that has produced innovative discoveries about Covid-19 [3].

Where traffic restrictions have been applied, many researchers have switched to remote work research [9]. A ResearchGate survey using data from 3,000 international researchers from various fields found that during the first wave of the pandemic, almost half of them focused on

writing, analyzing, publishing, and planning future research. Also, in the absence of new research data, some researchers spent more time analyzing older data sets that had not been previously explored [8]. Others have donated their time and experience to the fight against coronavirus, reusing its facilities and equipment to serve the needs of Covid-19. The results of the OECD Science Flash Survey 2020 show that almost three-quarters of scientists indicated that they have switched to working from home (Figure 1), more than half have registered or expect a decrease in the use of materials and facilities and about 40% a decrease in the time available for research. More than half of the researchers have experienced or expect a decrease in research funding [7].

Figure 1. The impact of the pandemic on the work of researchers



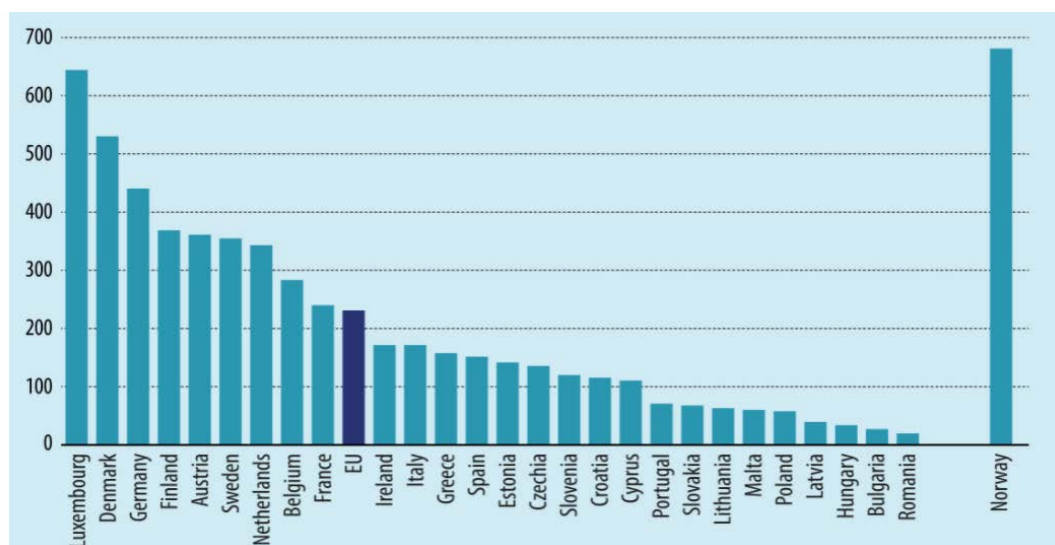
Source: OECD Science Flash Survey 2020, <https://oecdsciencesurveys.github.io/2020flashsciencecovid/>

3. INVESTMENTS IN RDI DURING THE CORONAVIRUS PANDEMIC

In the EU coordinated response to the Covid 19 pandemic research and development play an important role, EU wanting to support economic recovery by channeling public or private investment in research. EU countries' budget allocations for research and development in 2020 accounted for 0.8% of their gross domestic product (GDP) or EUR 100.8 billion EUR.

The average budget allocations of the 27 Member States for research and development per person were 225 EUR per person, up from 184 EUR per person in 2010. The highest allocations were in Luxembourg (648 EUR per person), followed by distance from Denmark (519 EUR) and Germany (443 EUR). Meanwhile, Romania, Bulgaria and Hungary were the countries that allocated the lowest research and development budget per person, with 15 EUR, 21 and respectively 39 EUR [2].

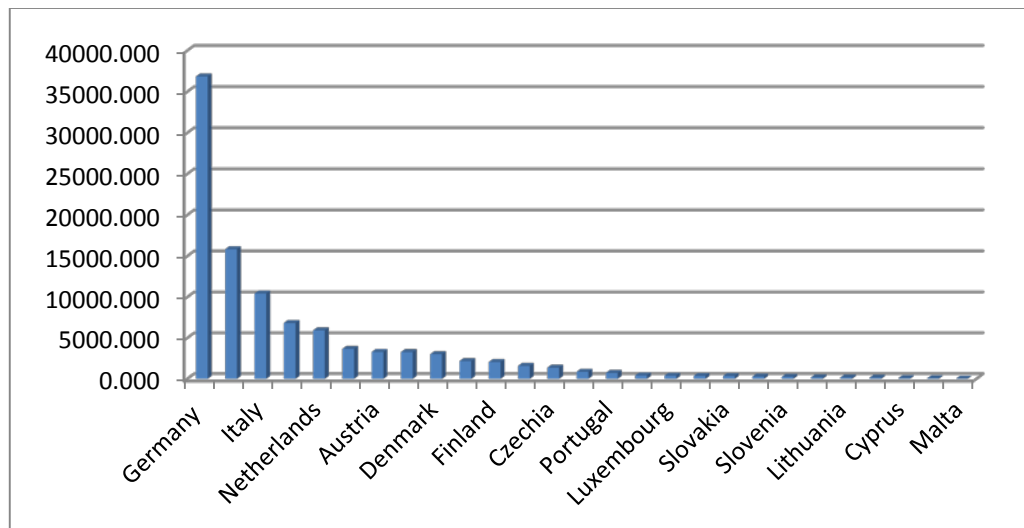
Figure 2. Budget allocations for research and development in 2020 (euro/person)



Source: Eurostat

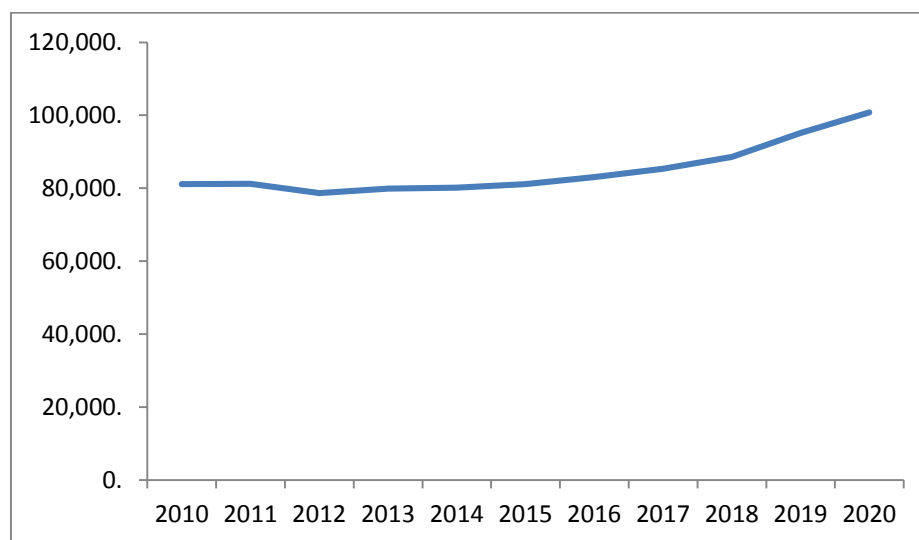
Over the last decade, the largest increases in government budget allocations per person for research and development have been in Latvia (from 14 EUR in 2010 to 42 EUR in 2020), Greece (from 62 EUR to 148 EUR), and Estonia (from 77 EUR to 141 EUR).

Figure 3. Total budget allocations for research and development in the EU, 2020



Source: Authors own processing based on Eurostat data

Regarding the evolution of budget allocations for research and development at EU level, as can be seen in Figure 4, they have increased since 2012, but the growth trend has been higher in 2019-2020.

Figure 4. Evolution of budget allocations for research and development in the EU

Source: Authors own processing based on Eurostat data

The latest official Eurostat data show the situation for 2020. According to them, the EU countries that have allocated the most funds as a percentage of GDP in 2020 are Germany, Denmark, Sweden and Austria, and those that invest the least in RDI are Romania, Malta; Cyprus, Estonia and Bulgaria. The table below shows the complete situation at EU level - in the period 2018-2020.

Table 1. Budget allocations for RDI 2018-2020 (percentage of GDP)

Country	2018	2019	2020
European Union	2.19	2.23	2.32
Belgium	2.86	3.17	3.52
Bulgaria	0.76	0.84	0.86
Czechia	1.9	1.93	1.99
Denmark	2.97	2.93	3.03
Germany	3.11	3.17	3.14
Estonia	1.42	1.63	1.79
Ireland	1.17	1.23	1.23
Greece	1.21	1.27	1.49
Spain	1.24	1.25	1.41
France	2.2	2.19	2.35
Croatia	0.97	1.11	1.27
Italy	1.42	1.47	1.54
Cyprus	0.62	0.74	0.85
Latvia	0.64	0.64	0.7
Lithuania	0.94	1	1.17
Luxembourg	1.17	1.16	1.13
Hungary	1.51	1.48	1.62
Malta	0.57	0.57	0.66
Netherlands	2.14	2.18	2.29
Austria	3.09	3.13	3.22
Poland	1.21	1.32	1.39

Country	2018	2019	2020
Portugal	1.35	1.4	1.58
Romania	0.5	0.48	0.47
Slovenia	1.95	2.05	2.15
Slovakia	0.84	0.83	0.92
Finland	2.76	2.8	2.94
Sweden	3.32	3.39	3.51

Source: Authors own processing based on Eurostat data

As far as Romania is concerned, unfortunately it has been the EU's red light for years on budget allocations as a percentage of GDP, number of researchers per thousand inhabitants, global innovation index, international patents, etc. Romania was, in 2020, the European country with the lowest budget allocations for research and development, with only 15 euros per capita, according to statistics published on Wednesday by Eurostat. These place Romania among the countries that have reduced their budget allocation for research and development in the last decade [2].

4. CONCLUSIONS

The COVID-19 pandemic has generated significant uncertainty in all aspects of the global economy and society, and also the long-term impact on RDI is difficult to predict.

Statistics from previous crises indicate different challenges for future spending on RDI, which could have lasting effects on countries' innovative performance. However, the distinctive characteristics of the Covid-19 crisis suggest that the dynamics are likely to be different from those following the 2008-2009 global financial crisis and vary significantly from country to country.

Public funding for RDI could be put under pressure in the coming years due to increased levels of public debt, which could reduce funding for public universities and research institutes. The size of the funding reduction will also depend on the evolution of the number of students, sponsorships and research contracts in the institutions for which these revenues have been an important source of income. In countries that will be affected by budget cuts for RDI, there will be a risk of brain drain. The migration of highly qualified staff could increase, as did the 2008-2009 global financial crisis in countries such as Greece, Italy, Portugal and Spain.

On the other hand, the central role of the RDI in addressing the Covid-19 pandemic and the resulting economic crisis could provide a new impetus for increased political support for the RDI. This could lead to increases in public investment in RDI, including for universities and public research institutions. Health-related RDI, in particular, can benefit from such investments, especially those intended to prepare for future pandemics. Other technology sectors or areas (eg industry 4.0, artificial intelligence) could also receive more funding if they are identified as strategic for improving preparedness for future shocks and challenges, including climate change.

The Covid-19 crisis may change the role of RDI policy in recovery, as countries are trying to "rebuild better. If resilience, environmental sustainability and inclusion are key targets on the political agenda, RDI policy could play a significantly different role than it has in previous decades, when it was assessed primarily in terms of its contributions to productivity and competitiveness. long-term growth. The recent expansion of mission-oriented research and innovation (MOIP) policies already indicates a policy shift towards more directionality of RDI policies - a trend that can be strengthened after the COVID-19 crisis [4].

RDI can play a greater role in building a more environmentally sustainable, inclusive and resilient future. Environmental principles have been integrated as part of the massive

recovery packages implemented to support economic recovery. In November 2020, for example, the UK government announced a ten-point greenback plan of GBP 12 billion (\$ 17 billion) that includes investment in innovative green technologies and support for decarbonisation (including the transport, energy and construction sectors). Similarly, recovery programs can support IDUs that lead to greater resilience and inclusion. Previous RDI policies implemented to support green and inclusive growth can provide key information for the development of recovery policies [1].

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