DOI 10.31489/2022Ec4/85-94
JEL H25, O31
UDC 336.02

I. Lunina[1*], O. Bilousova [2], N. Frolova[3]

[1, 2, 3] State Organization "Institute for Economics and Forecasting of the National Academy of Sciences of Ukraine", Ukraine
E - mail: [1]ilunina@ukr.net , [2]bilousova.os@gmail.com , [3]nata.frolova99@gmail.com

ORCID ID: [1]http://orcid.org/0000-0003-3812-4802, [2]https://orcid.org/0000-0001-7434-3469, [3]https://orcid.org/0000-0002- 7979-950X
Web of Science Researcher ID: [1]AAP-2680-2020, [2]AAB-1694-2019, [3]AAD-5412-2022

The strategy of fiscal support for business research and innovation in the context of economic crisis

Abstract

Object: study of the problems of fiscal support for business research and innovation in the conditions of economic crises, analysis of the implied tax subsidy rate on R&D (Research and Development) expenditures, generalization of international experience of state support and stimulation of business innovative activities in crisis periods, substantiation of strategic directions of such support in crisis conditions. The subject of the study was fiscal support for business R&D, as well as the state's strategy for its implementation. The purpose of the article is to substantiate the strategic directions of fiscal support of business R&D in crisis conditions.

Methods: methods of systemic and historical-logical analysis, structural-functional analysis, and statistical comparisons were used.

Findings: the study determined certain peculiarities of fiscal R&D support and business innovations during the periods of economic crises in OECD (Organisation of Economic Cooperation and Development) countries; it is stated that such support, in particular, through tax allowances and direct budget support, as well as state funding of other R&D expenditures, should be an important component of economic recovery measures; strategic areas of fiscal support for business R&D have been developed to ensure the post-crisis reconstruction of the national economy on an innovative basis.

Conclusions: measures aimed at provision of high level of R&D investment (even in difficult conditions) should belong to the priority areas of economic policy, and state support for R&D investment should be counter-cyclical. The goals and measures of innovation policy in crisis conditions should spur the restoration of the national economic growth and improve its competitiveness, which requires, in particular, finding a balance between the creation of general conditions for innovation and state support for business R&D. The latter should be based on clearly articulated priorities of such support as well as areas of innovative activity that should be developed in the long term.

Having summarized the experience of applying various business support measures in crisis conditions, the following measures have been substantiated as foreground: to provide direct budget support for business R&D, as well as budget financing of high- risk long-term research of the creation of public goods and knowledge that have a high expansion potential; to improve the information base for fiscal decision-making, to broaden support for business R&D of small and medium-sized enterprises in order to create the potential for sustainable economic recovery.

Improving the effectiveness of the impact of R&D fiscal measures on the development of national economies requires ensuring a wide coverage of the components of the innovation system, in particular, by expanding state procurement of innovative goods and services; development of cooperation in the spheres of mutually complementary economic activities; expansion of public-private partnership projects and commercialization of public sector research.

Keywords: economic growth, economic crisis, fiscal support, tax allowances, direct budget support for scientific research and innovation, public finance, tax credit, R&D business expenses.

Introduction

In the conditions of an innovative economy, state support for business R&D investments should take into account new factors of economic growth and the provision of innovative structural shifts. Stimulation of business innovative activities is an important prerequisite for the successful development of national economies based on innovation. Different measures have been practiced for years in many countries of the world. However, the fiscal decisions of the different governments in crisis conditions aimed at the accelerating of getting over the crisis, show the capacity for improving measures of state support of innovative development of national economies in crisis conditions and of post-crisis recovery. It allows identify strategic directions for quicker adaptation to new conditions.

*Corresponding author's e-mail: *ilunina@ukr.net*

The set of stimulation measures launched by many countries of the world, among which is state support for business R&D in crisis conditions, needs to be improved with consideration of the good practices of countries that were able to successfully adapt to new conditions and priorities.

In Ukraine, nowadays there are no state support measures for business R&D (neither in the form of tax incentives nor direct budget R&D support). In addition, budget programs for funding research and innovation-investment projects have been curtailed or significantly reduced during periods of economic crisis. At the same time, about 44% of domestic enterprises spent less than 5% of their profits on R&D (Survey, 2020). Given that innovation is one of the most important driving force for economic growth, it is important to determine the strategic directions of fiscal support for business R&D in crisis conditions in order to create the innovative foundation for post-crisis recovery.

Literature Review

According to the results of many studies, starting with the fundamental works of Schumpeter and later Romer, who developed a model of equilibrium with endogenous technological changes, it has been proven that innovation is a key factor in increasing productivity, economic growth, and increasing well-being (Schumpeter, 2008; Romer, 1986; OECD et. al., 2018). The work reveals long-term causal relationships between innovations and economic growth per capita in 19 European countries in the period 1989–2014 (Maradana et. al., 2017).

The most vivid examples of such connections include the experience of China, where high rates of GDP (Gross Domestic Product) growth are observed against the background of steady growth in innovative activity, in particular, during crisis years. In 2009, R&D funding by business increased by 26%. For instance, in 2004 China's share in the world volume of R&D was 7%, in 2008 – 10.5%, but in 2009 it increased to 13% (Pellens et. al., 2018).

However, there are no reliable arguments for such dependence for transitional economies, since countries with transitional economies (including Ukraine) do not have effective innovation systems with a high return on investments in R&D (Zveryakov et. al., 2020).

The transition to a knowledge-based service economy led to a growing role for investments in intangible assets, which became as important as investments in machinery, equipment and buildings. In the new conditions, state support of the national economy must take into account new factors of economic growth that ensure the acceleration of innovative structural shifts (Guellec, Wunsch-Vincent, 2009).

The issue of assessing the impact of innovations on the realization of socio-economic goals, approaches to determining the efficiency and effectiveness of innovation policy are presented in the works of the OECD (OECD, 2016).

Having systemized the key driving forces of business R&D, which affect their ability to engage in innovative activities, financial resources obtained by enterprises due to measures of state support for such activities were defined (OECD et. al., 2018).

In many countries the most prevalent is state support for business R&D in the form of tax allowances. In OECD countries, in 2018, it accounted for about 56% of total state support for business R&D, compared to 36% in 2006. In the European Union (EU-27), during this period, the share of tax support doubled – from 26% to 57% (OECD, 2021).

At the same time, attention should be paid to the fact that the state can stimulate the innovative development of the national economy both directly – by supporting innovations (by financing state research or encouraging private business entities to invest their own funds in R&D and innovation), and indirectly – by creating appropriate conditions for firms, who are ready to invest more and apply innovations (in particular, through the development of material and institutional facilities) (Maradana et. al., 2017).

The formation of the policy of state support for innovative processes should take into account the theoretically argued features of such processes. Thus, within the framework of the theory of innovation systems, it has been proven that innovation processes are not consistent and linear, but include many interactions (OECD et. al., 2018) and support economic and social changes that help solve internal and global problems. This requires coordination of systemic innovation transformations (OECD, 2016).

According to the results of a regression analysis of state R&D expenditures in 26 OECD countries in the period 1995-2015, it was found that in many countries, state funding of investments in R&D has a procyclical nature – an increase in GDP by 1% contributed to an increase in state expenditures on R&D by approximately 0.15–0.2% (Pellens et. al., 2018), and the reduction of the budget deficit by 1 percentage point of GDP was accompanied by an increase in spending on R&D in the short term by 0.6–0.8%.

Izsak et al. researching the government policy in the crisis conditions of 2008-2009, drew attention to the expansion of targeted support measures for R&D, in particular, high-tech entrepreneurship, as well as to the emergence of trends in the commercialization of research findings and strengthening of ties between state and private developments (Izsak et. al., 2013).

Veugelers also points to an increase in state support for the most priority R&D expenditures in conditions of economic crisis (Veugelers, 2016). Among the disadvantages of such support are its focus mainly on firms that already spent significant funds on R&D, and at the same time insufficient attention to firms that wish to engage in R&D, which causes a decrease in returns from private R&D and, accordingly, additional state funding of R&D support measures.

Post-crisis reconstruction of the economy on an innovative basis requires significant financial resources. This indicates the need to develop strategic directions for fiscal support of R&D and innovation in times of crisis.

Methods

In the article, the methods of systematic as well as historical and logical analysis were used in the investigation of state support provided by various OECD countries in 1990-2020, the methods of structural-functional analysis and statistical comparisons – for the analysis of indirect state incentives in different countries and the analysis of fiscal support in periods of crisis, the method of graphic representation in the construction of graphs and charts.

Results

The key role of the financial factor in the innovative development of national economies is evidently confirmed by the indicators of the total financing of scientific, technological and innovative activities of the leading countries (both from the budget and by tax allowances, as well as by business (GBARD+GTARD). For instance, in Israel, according to our calculations, such costs, based on OECD data, averaged at 5.01% GDP for 2016-2019 and 4.23% for 2004-2007, in Korea – 4.56% and 3.24% of GDP, respectively. In Finland, Sweden and Japan, they exceeded 3% GDP on average between 2004 and 2020. Across OECD countries, R&D funding increased on average from 1.67% GDP in 2004-2007 to 1.98% in 2016-2019. (Table 1), including the private sector – from 0.94% to 1.02% GDP, respectively.

Table 1. Government expenditures on business R&D and R&D tax allowances to the private sector in OECD countries: 2004-2019, % GDP

Items	On average for 2004-2007	On average for 2008-2009	On average for 2011-2014	On average for 2016-2019
Total financing of scientific, technological and innovative activities (GBARD+GTARD)				
unweighted average	1.666	1.762	1.865	1.979
Tax allowances				
unweighted average	0.038	0.049	0.062	0.076
min	0.000	0.000	0.000	0.000
max	0.204	0.241	0.275	0.297
Direct budget support for business				
unweighted average	0.058	0.065	0.072	0.063
min	0.000	0.003	0.001	0.002
max	0.183	0.260	0.237	0.164
All budget allocations plus tax allowances				
unweighted average	0.585	0.664	0.650	0.651
min	0.063	0.087	0.096	0.090
max	1.000	1.138	1.306	1.201
Private sector expenses				
unweighted average	0.937	0.933	0.952	1,018
min	0.044	0.051	0.071	0.060
max	2.523	2.558	2.897	3.325
Note - calculated by the authors based on data from the OECD Statistical Bureau (OECD, 2021)				

International experience of state support for R&D

R&D tax allowances serve as a tool of indirect state incentive for businesses in the field of research and development. Over the past 15 years, most OECD countries have observed a steady trend towards their growth (except for 7 countries where their volumes increased and decreased in different years – these are Australia, Spain, Canada, Korea, Mexico, New Zealand, Hungary). This form of R&D support was not applied in Estonia, Luxembourg, Germany and Switzerland during this period.

In OECD member countries, tax incentives can take the form of enhanced deductions from taxable income (enhanced allowances) for research and development expenses (in an amount exceeding 100%). As part of the preferential R&D taxation regime, not all, but only operational R&D costs, which account for an average of about 90% of the total amount of R&D costs, are deductible. On average, across OECD countries, R&D expenses are distributed in the following proportion: 60/30/5/5, where 60% are labor costs, 30% are other opertional costs; 5% – capital expenditures on equipment, 5% – capital expenditures on buildings (OECD, 2019). Support which is based on indicators of operational costs stimulates investment in human resources and increases employment in the national economy, which is extremely important in crisis conditions.

If the taxable income turns out to be less than the amount of deductions, the unused amount of deductions may be carried over for future periods. The extension period varies from three years (as, for example, in the Czech Republic) to 8 years in Portugal and 18 years in Spain, and 20 years in the USA, or for an unlimited period (as, for example, in Great Britain and Lithuania) (OECD, 2020).

Another form of tax support is the compensation of business R&D expenses (in full or in part) against its tax liabilities (tax credit). If the amount of the credit exceeds the amount of a company's corporate income tax liability, or if a company is loss-making, some countries allow to deduct R&D tax credit from payroll tax liabilities, in particular from employers' social security contributions, or offset against future tax liabilities of a company, or receive compensation in the form of cash payments from the budget.

In a number of countries, the right to receive reimbursement for unused R&D tax credit is granted only to selected categories of companies, such as small and medium-sized enterprises or startups. Access to tax R&D allowances may also be bounded by capping the amount of reimbursements or establishing the minimum thresholds in terms of the amount of R&D expenses or number of employees involved in R&D, etc., which make an enterprise eligible (OECD, 2019, December). This is usually due to the intention of the governments to minimize their budget tax expenditures on R&D incentives and to encourage business entities (mainly medium and small businesses) to increase their funding for R&D.

In a number of countries, companies get the right to use tax R&D incentives, provided that their R&D spending shows an increase relative to the base level (either a certain fixed indicator or a moving average over several years). It is customary to call such a loan incremental, and a loan without a requirement regarding the dynamics of costs – volume-based R & D tax credits) (OECD, 2010, 4).

In 12 OECD member countries, and also in Brazil, China, Malta, Romania, accelerated depreciation is provided for capital expenditures on R&D, which allows companies to write off these costs as quickly as possible.

In 2019, Great Britain and France took the top positions with the highest ratios of R&D tax incentives as % of GDP with indicators of 0.33% and 0.28%, respectively. Moreover, Great Britain increased R&D tax incentives (as % of GDP) compared to 2007 by more than 6 times, and France – by almost 3 times.

In the OECD countries, the implied tax subsidy rate (ITSR) on R&D expenditures is used to measure the impact of R&D tax allowances on the investments of economic entities, which represents the percentage amount by which a company investing in R&D can reduce its cost of investments due to the application of such R&D tax allowances. The assessment of the implied tax subsidy rate on R&D expenditures is based on a methodical approach developed by an expert of the Canadian Tax Foundation, Yacek Warda in 1983 (Warda, 2001, 191). His analysis of the efficiency of R&D investments is based on the use of the $B\text{-}_{index}$, which reflects the reduced value of profit before taxation, sufficient to ensure the break-even of an additional unit of R&D expenses. The definition of indicator $B\text{-}_{index}$ has the following mathematical form:

$$B_{\text{-index}} = ATC /1- t, \quad (1)$$

where ATC is the cost of an additional unit of the company's R&D expenses after tax, t is the corporate income tax rate.

The implied tax subsidy rate on R&D expenditures is calculated according to the formula (Appelt et. al., 2019, 14-15):

$$ITSR = 1- B_{\text{-index}} . \quad (2)$$

The level of the implied tax subsidy rate on R&D expenditures depends on both the rates of R&D tax allowances (tax credit and deductions from taxable income) and the rates of reimbursement of unused tax credits. Therefore, the level of R&D tax support significantly varies not only across different OECD member countries,

but also across different kinds of companies within one country. Thus, the largest benefits from R&D tax incentives in 2021 in the EU countries were received by small and medium-sized profitable enterprises of Slovakia (their ITSR was 55%) and Iceland (42%). During 2007-2021, ITSR for SMEs were in many countries higher than for large companies, and therefore, it is reflected by the corresponding average implied tax subsidy rates on R&D expenditures in OECD countries (Table 2). In OECD countries, in 2021, the level of the implied tax subsidy rate on R&D expenditures was higher for profitable medium and small enterprises and amounted to an average of 21.3%, while for large enterprises it was an average of 17.5%. If in 2007 the difference between such rates was on average 1.2 percentage points, then in 2021 it achieved the level of 3.8 percentage points. In 2021, in some countries, the percentage points for small and large enterprises differed by more than twice (Colombia – 67 and 33%, the Netherlands – 39 and 15%, Great Britain – 27 and 12%).

Table 2. Unweighted average implied tax subsidy rate on R&D expenditures in OECD countries in 2007-2021, %

Enterprises	2007	2009	2012	2019	2021
Small and medium -sized profitable enterprises	10.4	12.1	13.2	17.7	21.3
Large enterprises	9.2	10.5	11.5	15.3	17.5
Note - calculated by the authors based on data from the OECD Statistical Bureau (OECD, 2021)					

The indicator of the implied tax subsidy rate on R&D expenditures can serve as a tool for measuring and forecasting the effects of R&D tax allowances on the income tax burden of enterprises that invest in R&D, and therefore – to determine the country's rank in the competition for attracting investments (Warda, 2001, 191).

The situation in Ukraine

The implementation of innovative projects and the development of innovative activities in Ukraine is significantly hampered by the lack of own funds or private capital of enterprises, as well as the lack of appropriate state support. The legislation of Ukraine does not provide an R&D tax credit, nor enhanced deductions of operational R&D expenses from the taxable corporate income. For certain period of time, the stimulation of investment and innovation activities was carried out by providing tax preferences for certain kinds of economic activities, technological parks, as well as free trade zones and territories of priority development. In 2005, most of these benefits were abolished. From 2017 until 2025, a benefit in the form of a coprorate income tax exemption of the aircraft industry, as a priority sector of the Ukrainian economy, was temporarily restored. However, most of the funds exempted from taxation in 2018 were directed by aircraft industry to the re-equipment of its material and technical base, while R&D was not funded in 2017-2018. Therefore, the provision of R&D stimulation requires a clear definition of the purposes of providing tax allowances and should be accompanied by increased control over their use (monitoring of the use of funds exempted from taxation).

Peculiarities of R&D state support during periods of economic crises

Bearing in mind that R&D increases the knowledge capital and has a long-term positive impact on the productivity and economic growth, the reduction of such costs during economic crises, in particular, is treated negatively by ZEW experts. Even more, the provision of a high level of R&D investment (even in difficult conditions) is attributed to priority areas of economic policy (Pellens et. al., 2018).

During the economic crisis of 2008-2009, in many OECD countries, the business expenses on R&D decreased. For instance, in 2009 they fell (as % GDP) compared to 2007 in 14 out of 37 countries. Total business expenses as a whole in OECD countries decreased by 2.5% – from 1.378% of GDP in 2007 to 1.344% in 2009 and 1.312% in 2010.

As you know, in crisis conditions the government can take different actions according to various scenarios (OECD, 2012): to increase budget support to businesses in order to secure certaint level of R&D business expenses; to increase of R&D funding in the public sector (universities, public scientific-research institutes etc.) in order to offset possible reduction of R&D funding in the private sector; to redistribute public R&D expenditures on priority goals and measures (projects) that gain the greatest macroeconomic effect, taking into account the risks of reducing government tax revenues and the need to save budget funds; to reduce R&D budget funding (in response to a reduction of tax revenues).

Discussions

According to Makkonen's findings, based on the analysis of changes in R&D budget expenditures of the EU countries after the economic crisis of 2008-2009, countries that demonstrated a pro-cyclical reaction

which corresponded to the general trend of reducing public spending (Makkonen, 2013) are, as a rule, less oriented towards innovation and have worse financial indicators.

Table 3. Budget R&D expenditures in pre-crisis 2007 and crisis 2009, % GDP

Countries	Budget support for business R&D in 2007,% GDP	Budget support for business R&D in 2009,% GDP	The growth of budget support for business R&D in 2009/2007,%	Other R&D budget expenditures, 2007, % GDP	Other R&D budget expenditures, 2009, % GDP	The growth of other R&D budget expenditures, 2009/2007, %
Australia	0.036	0.026	71.3	0.428	0.478	111.6
Austria	0.090	0.077	85.1	0.533	0.670	125.6
Belgium	0.073	0.087	119.5	0.517	0.574	111.1
Canada	0.022	0.029	129.7	0.557	0.615	110.4
Colombia	0.001	0.016	2314. 3	0.065	0.074	112.9
Czech Republic	0.106	0.112	105. 3	0.424	0.470	110.8
Denmark	0.043	0.055	128.5	0.750	0.929	124.0
Estonia	0.047	0.069	147.7	0.426	0.613	143.9
Finland	0.083	0.066	79.0	0.847	0.995	117.6
France	0.125	0.122	98. 1	0.602	0.782	129.9
Germany	0.078	0.083	106.7	0.671	0.805	120.0
Hungary	0.046	0.100	216.2	0.335	0.351	104.7
Iceland	0.075	0.006	8, 2	0.732	0.997	136.2
Ireland	0.045	0.046	102.9	0.409	0.479	117.2
Israel	0.168	0.157	93.4	-0.168	-0.157	93.4
Italy	0.039	0.042	108.5	0.577	0.578	100.2
Japan	0.028	0.028	102.5	0.623	0.692	111.0
Korea	0.136	0.160	117.0	0.760	0.895	117.8
Latvia	0.005	0.006	113.2	0.270	0.195	72.2
Lithuania	0.006	0.007	120. 7	0.497	0.511	102.8
Luxembourg	0.053	0.039	73.8	0.310	0.467	150.5
Mexico	0.013	0.025	195. 4	0.196	0.230	116.9
Netherlands	0.020	0.029	145.0	0.683	0.747	109.4
New Zealand	0.043	0.044	101. 9	0.395	0.475	120.3
Norway	0.063	0.085	135. 6	0.677	0.764	113.0
Poland	0.020	0.023	116. 6	0.292	0.309	105.5
Portugal	0.020	0.041	208.0	0.409	0.483	118.1
Slovak Republic	0.018	0.014	75. 3	0.188	0.344	182.9
Slovenia	0.068	0.138	202.6	0.446	0.538	120.7
Spain	0.113	0.121	107. 2	0.629	0.692	110.0
Sweden	0.109	0.139	127.5	0.635	0.707	111.3
United Kingdom	0.069	0.079	115.6	0.533	0.526	98.7
United States	0.184	0.275	149.5	0.629	0.669	106.3
Unweighted average	0.058	0.069	119.3	0.549	0.632	115.2
Note - calculated by the authors based on data from the OECD Statistical Bureau (OECD, 2021)						

According to our estimates in 2009 compared to 2007, 27 OECD countries increased their direct R&D budget support of economic entities (as % GDP), including Hungary, Slovenia, Portugal – by more than twice, and the Netherlands, Estonia, the USA, Turkey – by 45-77% (Table 3). On average across OECD countries, the amount of such support increased by 19.3% to 0.069% GDP. In 2009, the ratio of R&D tax allowances was increased in 13 OECD countries, including Belgium – by more than 3 times, in France – by 2.6 times. The average ratio of R&D tax allowances across OECD countries increased by 27.7% to 0.054%

GDP. Several countries (Portugal, Spain, Italy, Ireland, etc.) increased both direct budget and tax support for R&D, in response to the need to stabilize the economy during the crisis.

It should also be noted that in the crisis of 2009, not only direct budget support for private sector R&D expenditures increased, but also other budget expenditures on R&D (financing research organizations, material and institutional facilities). The average ration across OECD countries grew by 15.2% up to 0.632% GDP (Table 3). Therefore, broad support for innovation has become an important component of economic recovery measures.

So, as the OECD practice showed in the crisis of 2008-2009, the importance of state R&D support increased. Those measures gained the so-called "double dividend": stimulated the development of innovative activity and simultaneously encouraged the business to create new jobs (Sapirie, 2020). In addition, given the limited access to external sources of financing, such support allowed enterprises to reduce the investment cost.

According to the conclusions of OECD experts, the economic crisis of 2008-2009 affected the development of science, technology and innovation in general (OECD, 2012), as the aggravation of a number of problems, most of which arose before 2008, required a review of the policy in the field of research and development. Successful development was attained to countries that were able to adapt to new conditions.

Endogenous economic growth during the crisis years was facilitated, in particular, by applying better targeted state R&D support tools and measures, in particular, to the companies engaged in the production of in-demand innovations (Hud et. al., 2015).

A number of researchers have drawn attention to the advantages of direct budget support measures (Broughel et. al., 2019), to finance long-term, high-risk researces, as well as to target areas that either create public goods or have particularly high secondary effects. Therefore, the formation of a portfolio of policy measures should ensure a proper balance between direct and indirect measures (OECD, 2021).

It should also be noted that during the 2008-2009 crisis, the governments of many countries (OECD, 2016) inceased the efficiency and effectiveness of their innovation policy, in particular, due to the improvement of evaluation methods and evidence base. They also paid higher attention to supporting business R&D of small and medium-sized enterprises in order to support R&D in general and, consequently, to create the potential for sustainable economic recovery. In the following years, innovations received a high status in national programs of economic policy (OECD, 2012). For instance, Korea announced a new science and technology policy initiative "Post-corona, science and technology policy for a new future", which outlines 30 perspective technologies that will have a high priority for state R&D funding (González et. al., 2021).

The economic crisis caused by the COVID-19 pandemic and the following government restrictions on doing business, including long-term quarantines, showed the need for changes in the policy of state support for business R&D. The COVID-19 crisis helped to realize that innovations should not only ensure further recovery of the economy but also actively participate in restraining crisis. Thus, according to the conclusions of OECD experts, state R&D support measures should direct efforts to where innovation is most needed (OECD, 2021). Therefore, one of the key components of the national innovation policy during the economic crisis should be the determination of the priorities of state R&D support and business innovative activities, which should be ensured in the long term.

In recent decades, the share of support through tax allowances (compared to direct support measures) has increased in business R&D support. However, the main disadvantage of tax allowances is the lack of clear goals for their application. Summarizing the experience of using various measures in crisis conditions reveals the priority of applying measures of direct budget support for business R&D, as well as high-risk long-term research for the creation of public goods (for example, in the field of health care) or knowledge that has a high expansion potential.

Increasing the efficiency and effectiveness of state support for R&D requires the balance between support measures (R&D tax allowance, direct budget R&D support in the private sector, other budget R&D expenditures), as well as improving the information basis for fiscal decision-making in support of innovative development.

Increasing the effectiveness of the application of financial measures of innovative development of national economies requires ensuring a wide coverage of the components of the innovation system, in particular, by:

- the expansion of public procurement of innovative goods and services (i.e. from the demand side), the introduction of new standards and regulations (in particular, safety standards, methods of quality control of products, processes, services), as well as the use of innovative user-oriented initiatives (for example, waste disposal, energy efficiency measures, etc.);
- development of cooperation in the spheres of mutually complementary economic activity (based on the formation of clusters uniting enterprises, higher educational institutions, research institutions, other state and private organizations, as well as the implementation of "smart specialization" strategies);
- expanding commercialization of public sector research and public-private partnership projects.

Conclusions

During economic crises the fiscal state of countries usually becomes more complicated (strict budgetary restrictions arise) and at the same time the issue of providing a budgetary policy aimed at ensuring economic growth becomes urgent. In such conditions, there is a need to mobilize all national resources – financial, human capital, innovative potential. Based on the experience of many countries, the solution of these tasks requires higher government involvement in innovation policy, which must be effective, responds to current challenges, and ensures the coherence of various measures.

Innovative business activities require state support, especially in crisis conditions, when market signals are distorted and coordination processes are complicated. However, given the limited financial resources of the state, such support should have clear goals and forward private innovative efforts to where they are most needed.

The goals and measures of innovation policy in crisis conditions should make higher impact on the growth of the national economy and improve their competitiveness, which requires, in particular, finding a balance between the creation of general conditions for innovation and state support for business R&D.

The introduction of R&D tax allowances should be accompanied by enhanced control over tax compliance and better business reporting on the accrual of tax allowances, as well as their intended use.

References

Appelt, S., Galindo-Rueda, F. & González Cabral, A. (2019). "Measuring R&D tax support: Findings from the new OECD R&D". Tax Incentives Database. *Working Papers OECD: Science, Technology and Industry, 2019/06*. Retrieved from https://www.oecd-ilibrary.org/docserver/d16e6072-en.pdf?expires=1589309691&id=id&accname=guest&checksum=6DCCF40A2E5E9832A470DFEF3C849B56

Broughel, J. & Thierer, A. (2019, February). "Technological Innovation and Economic Growth: A Brief Report on the Evidence". *Mercatus Research, Mercatus Center at George Mason University*. Retrieved from https://www.mercatus.org/system/files/broughel-technological-innovation-mercatus-research-v1.pdf

González Cabral, A., Appelt, S. & Hanappi, T. (2021). "Effective Corporate tax rates for R&D: The case of expenditure-based R&D tax incentives". *Taxation Working Papers OECD, 54*. Retrieved from https://doi.org/10.1787/ff9a104f-en

Guellec, D., & Wunsch-Vincent, S. (2009). "Policy Responses to the Economic Crisis: Investing in Innovation for Long-Term Growth". *OECD Digital Economy Papers. 159.* (quoted from the summary). Retrieved from https://doi.org/10.1787/222138024482.

Hud, M. & Rammer, C. (2015). "Innovation Budgeting Over the Business Cycle and Innovation". ZEW. *Discussion Paper. 15-030*. Retrieved from https://ftp.zew.de/pub/zew-docs/dp/dp15030.pdf

Izsak, K., Markianidou, P., Lukach, R. & Wastyn, A. (2013). "The Impact of the Crisis on Research and Innovation Policies". Technopolis Group Belgium and Idea Consult. Retrieved from https://www.zsi.at/object/publication/3115/attach/0_Impact_of_crisis_on_R_D_1897_FINALVERSION.pdf

Makkonen, T. (2013). "Government science and technology budgets in times of crisis". *Research Policy. 42*. 817–822.

Maradana, R. P., Pradhan, R. P. & Dash, S. et al. (2017). "Does innovation promote economic growth? Evidence from European countries". *J Innov Entrep. 6,* 1. Retrieved from https://doi.org/10.1186/s13731-016-0061-9

OECD, & Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting. The Measurement of Scientific, Technological and Innovation Activities. Reporting and Using Data on Innovation, 4th Edition.* Retrieved from https://dx.doi.org/10.1787/9789264304604-en

OECD (2010). R&D tax incentives: rationale, design, evaluation. Retrieved from https://www.oecd.org/sti/ind/46352862.pdf

OECD (2012). Innovation in the crisis and beyond, in: OECD (ed.). Science, Technology and Industry Outlook 2012, 21–57.

OECD (2012). Science, Technology and Industry. Outlook 2012 Highlights. Retrieved from http://www.oecd.org/sti/rd-tax-stats.htm

OECD (2016). Science, Technology and Innovation. Outlook 2016. System Innovation; The Innovation Imperative. OECD 2015. Contributing to Productivity, Growth and Well-Being. Retrieved from https://www.oecd.org/fr/sti/oecd-science-technology-and-innovation-outlook-25186167.htm

OECD (2019). R&D. Tax Incentive Database. General and country-specific notes. Retrieved from https://www.oecd.org/sti/rd-tax-stats-bindex-notes.pdf

OECD (2019, December). "R&D Tax Incentives: Spain, 2019". Directorate for Science, Technology and Innovation. Retrieved from http://www.oecd.org/sti/rd-tax-stats-spain.pdf

OECD (2020). R&D. Tax Incentives Database. Retrieved from http://www.oecd.org/sti/rd-tax-stats.htm

OECD (2021). Science, Technology and Innovation. Outlook 2021. *Times of Crisis and Opportunity*, 13-14.

OECD (2021). Statistical Bureau. Retrieved from https://stats.oecd.org/Index.aspx?DataSetCode= RDSUB

Pellens, M., Peters, B., Hud, M., Rammer, C. & Licht, G. (2018, January). "Public Investment in R&D in Reaction to Economic Crises – A Longitudinal Study for OECD Countries". ZEW. *Discussion Paper*. *18-005.*

Romer, P. M. (1986). "Increasing returns and long-run growth". *Journal of Political Economy. 94.* 1002–1037.

Sapirie, M. (2020, May 15). "Recession And The Research Tax Credit, Tax Notes". Retrieved from https://www.taxnotes.com/opinions/recession-and-research-credit/2020/05/15/2cjkq

Schumpeter, J. A. (2008). The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle, translated from the German by Redvers Opie, New Brunswick (USA) and London (UK): Transaction Publishers.

Survey of business representatives regarding innovative activities and current needs in R&D (2020). Ministry of Digital Information of Ukraine. Final report. 56. Retrieved from https://mon.gov.ua/storage/app/media/innovatsii- transfer-tehnologiy/2020/08/28.08/opituvannya-28-08-2020.pdf

Veugelers, R. (2016). "Getting the Most from Public R&D Spending in Times of Austerity: Some Insights from SIMPATIC Analysis". *Breugel Working Paper* 2016/1, Brussels.

Warda, J. (2001). "Measuring the Value of R&D Tax Treatment in OECD Countries". *STI Review. 27*: Special Issue on New Science and Technology Indicators, OECD. 185-210. Retrieved from http://www.oecd.org/sti/37124998.pdf

Zveryakov, M. I., & Patlatoi, O. Ye. (2020). "Innovation development of transition countries in the context of their participation in global value chains". *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*. *2*. 172-178.

И. Лунина, О. Белоусова, Н. Фролова

Экономикалық дағдарыс жағдайында бизнес-зерттеулер мен инновацияларды бюджеттік қолдау стратегиясы

Аңдатпа:

Мақсаты: Экономикалық дағдарыстар жағдайында бизнесті зерттеу мен инновацияларды фискалдық қолдау проблемаларын зерделеу, ҒЗТКЖ шығындарына салық субсидияларының болжамды мөлшерлемесін талдау, дағдарыс кезеңдерінде бизнестің инновациялық қызметін мемлекеттік қолдау мен ынталандырудың халықаралық тәжірибесін жинақтау және дағдарыс жағдайында осындай қолдаудың стратегиялық бағыттарын негіздеу. Зерттеу тақырыбы бизнестің ҒЗТКЖ-ны қаржылық қолдауы, сондай-ақ оны жүзеге асыру жөніндегі мемлекеттің стратегиясы. Мақаланың мақсаты — дағдарыс жағдайында бизнестің ҒЗТКЖ-ны бюджеттік қолдаудың стратегиялық бағыттарын негіздеу.

Әдістер: Жүйелік және тарихи-логикалық талдау, құрылымдық-функционалдық талдау және статистикалық салыстыру әдістері қолданылды.

Қорытынды: Зерттеуде ЭЫДҰ елдеріндегі экономикалық дағдарыстар кезеңдерінде ҒЗТКЖ мен бизнес-инновацияларды бюджеттік қолдаудың кейбір ерекшеліктері айқындалды; мұндай қолдау, атап айтқанда, салықтық жеңілдіктер мен тікелей бюджеттік қолдау, сондай-ақ ҒЗТКЖ-ға жұмсалатын басқа да шығыстарды мемлекеттік қаржыландыру арқылы экономиканы қалпына келтіру жөніндегі шаралардың құрамдас бөлігі маңызды болуы тиіс деп бекітіледі; Ұлттық экономиканы инновациялық негізде дағдарыстан кейінгі қайта құруды қамтамасыз ету үшін бизнесті ғылыми-зерттеу және тәжірибелік-конструкторлық жұмыстарға бюджеттік қолдау көрсетудің стратегиялық бағыттары әзірленді.

Тұжырымдама: ҒЗТКЖ-ға инвестициялардың жоғары деңгейін қамтамасыз етуге бағытталған шаралар (тіпті қиын жағдайларда да) экономикалық саясаттың басым бағыттарына жатқызылуы тиіс, ал ҒЗТКЖ-ға инвестицияларды мемлекеттік қолдау антициклді сипатта болуы тиіс. Дағдарыс жағдайындағы инновациялық саясаттың мақсаттары мен шаралары ұлттық экономиканың өсуін қалпына келтіруді және оның бәсекеге қабілеттілігін арттыруды ынталандыруы тиіс, бұл, атап айтқанда, инновациялар үшін ортақ жағдайлар жасау мен ҒЗТКЖ саласындағы бизнесті мемлекеттік қолдау арасындағы тепе-теңдікті табуды талап етеді. Соңғысы осындай қолдаудың нақты тұжырымдалған басымдықтарына, сондай-ақ ұзақ мерзімді перспективада дамытылуы тиіс инновациялық қызмет бағыттарына негізделуі керек.

Дағдарыс жағдайында бизнесті қолдаудың әртүрлі шараларын қолдану тәжірибесін жинақтай отырып, келесі шаралар бірінші кезектегі шаралар ретінде негізделді: Бизнестің ҒЗТКЖ-на тікелей бюджеттік қолдауды,

сондай-ақ әлеуеті жоғары кеңеюі бар қоғамдық игіліктер мен білімді құру бойынша жоғары тәуекелді ұзақ мерзімді зерттеулерді бюджеттік қаржыландыруды қамтамасыз ету; қаржылық шешімдер қабылдау үшін ақпараттық базаны жақсарту, экономиканы тұрақты қалпына келтіру әлеуетін арттыру мақсатында бизнесті зерттеу мен шағын және орта кәсіпкерлікті дамытуды қолдауды кеңейту.

ҒЗТКЖ саласындағы фискалдық шаралардың ұлттық экономиканы дамытуға әсер ету тиімділігін арттыру инновациялық жүйенің компоненттерін, атап айтқанда, инновациялық тауарлар мен қызметтерді мемлекеттік сатып алуды кеңейту жолымен кең қамтуды қамтамасыз етуді; өзара толықтырушы экономикалық қызмет салаларындағы ынтымақтастықты дамытуды; мемлекеттік-жекешелік әріптестік жобаларын кеңейтуді және мемлекеттік секторды зерттеуді коммерцияландыруды талап етеді.

Кілт сөздер: экономикалық өсу, экономикалық дағдарыс, фискалдық қолдау, салықтық жеңілдіктер, ғылыми зерттеулер мен инновацияларға тікелей бюджеттік қолдау, мемлекеттік қаржы, салық несиесі, ҒЗТКЖ бизнесінің шығындары.

И. Лунина, О. Белоусова, Н. Фролова

Стратегия бюджетной поддержки бизнес-исследований и инноваций в условиях экономического кризиса

Аннотация:

Цель: Изучение проблем фискальной поддержки исследований и инноваций бизнеса в условиях экономических кризисов, анализ предполагаемой ставки налоговых субсидий на расходы на НИОКР, обобщение международного опыта государственной поддержки и стимулирования инновационной деятельности бизнеса в кризисные периоды, обоснование стратегических направлений такой поддержки в условиях кризиса условия. Предметом исследования была финансовая поддержка НИОКР бизнеса, а также стратегия государства по ее реализации. Целью статьи является обоснование стратегических направлений бюджетной поддержки НИОКР бизнеса в условиях кризиса.

Методы: Использовались методы системного и историко-логического анализа, структурно-функционального анализа и статистических сравнений.

Результаты: В исследовании определены некоторые особенности бюджетной поддержки НИОКР и бизнес-инноваций в периоды экономических кризисов в странах ОЭСР; утверждается, что такая поддержка, в частности, посредством налоговых льгот и прямой бюджетной поддержки, а также государственного финансирования других расходов на НИОКР, должна быть важным компонентом мер по восстановлению экономики; разработаны стратегические направления бюджетной поддержки НИОКР бизнеса для обеспечения посткризисной реконструкции национальной экономики на инновационной основе.

Выводы: Меры, направленные на обеспечение высокого уровня инвестиций в НИОКР (даже в сложных условиях), должны относиться к приоритетным направлениям экономической политики, а государственная поддержка инвестиций в НИОКР должна носить антициклический характер. Цели и меры инновационной политики в условиях кризиса должны стимулировать восстановление роста национальной экономики и повышение ее конкурентоспособности, что требует, в частности, нахождения баланса между созданием общих условий для инноваций и государственной поддержкой бизнеса в области НИОКР. Последнее должно основываться на четко сформулированных приоритетах такой поддержки, а также на направлениях инновационной деятельности, которые следует развивать в долгосрочной перспективе.

Обобщив опыт применения различных мер поддержки бизнеса в условиях кризиса, в качестве первоочередных были обоснованы следующие меры: обеспечить прямую бюджетную поддержку НИОКР бизнеса, а также бюджетное финансирование высокорисковых долгосрочных исследований по созданию общественных благ и знаний, обладающих высокой экспансией потенциал; улучшить информационную базу для принятия финансовых решений, расширить поддержку бизнес-исследований и разработок малых и средних предприятий с целью создания потенциала для устойчивого восстановления экономики.

Повышение эффективности воздействия фискальных мер в области НИОКР на развитие национальных экономик требует обеспечения широкого охвата компонентов инновационной системы, в частности, путем расширения государственных закупок инновационных товаров и услуг; развития сотрудничества в сферах взаимодополняющей экономической деятельности; расширения государственных проектов частного партнерства и коммерциализация исследований государственного сектора.

Ключевые слова: экономический рост, экономический кризис, фискальная поддержка, налоговые льготы, прямая бюджетная поддержка научных исследований и инноваций, государственные финансы, налоговый кредит, расходы бизнеса на НИОКР.