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Financing the education and research sector in times of war

Financiación del sector de la educación y la investigación en tiempos de guerra

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Abstract

In the context of a full-scale war, new needs and issues arise in Ukraine's educational and scientific sectors. The article aims to study the characteristics of financing Ukraine's educational and scientific sphere. The study used general scientific methods of statistical analysis and systematisation of the results of studying the state, structure and features of financing Ukraine's educational and scientific sphere in the conditions of war. The article highlights the latest trends in changing the directions and approaches to financing Ukraine's educational and scientific sphere in the context of war. The study demonstrates the ability of the government and local authorities to provide financial support for this sector in the context of a full-scale war. In general, expenditures on education and science decreased only in 2022, both at the expense of the state and local budgets. Instead, in 2023-2025, the amount of planned state budget expenditures on education and science in Ukraine is growing. The work's practical value lies in highlighting the status and trends of financing the education sector at the expense of the state and local budgets and identifying the

peculiarities of the structure of expenditures on education of the state and local budgets by level of education.

Keywords: education, higher education institutions, state budget, research sector, war.

Resumen

En el contexto de una guerra a gran escala, surgen nuevas necesidades y problemas en los sectores educativo y científico de Ucrania. El artículo pretende estudiar las características de la financiación de la esfera educativa y científica de Ucrania. En el estudio se han utilizado métodos científicos generales de análisis estadístico y sistematización de los resultados del estudio del estado, la estructura y las características de la financiación de la esfera educativa y científica de Ucrania en condiciones de guerra. El artículo pone de relieve las últimas tendencias en el cambio de las direcciones y enfoques de la financiación de la esfera educativa y científica de Ucrania en el contexto de la guerra. El estudio demuestra la capacidad del gobierno y de las autoridades locales para prestar apoyo financiero a este sector en el contexto de una guerra a gran escala. En general, los gastos en educación y ciencia sólo disminuyeron en 2022, tanto a expensas del presupuesto estatal como de los locales. En cambio, en 2023-2025, el importe de los gastos previstos del presupuesto estatal en educación y ciencia en Ucrania está creciendo. El valor práctico del trabajo radica en poner de relieve la situación y las tendencias de la financiación del sector de la educación a cargo de los presupuestos estatales y locales y en identificar las peculiaridades de la estructura de los gastos en educación de los presupuestos estatales y locales por nivel educativo.

Palabras clave: educación, instituciones de enseñanza superior, presupuesto estatal, sector de la investigación, guerra.

Introduction

In the context of a full-scale war, new needs and issues arise in Ukraine's education and research sector that require additional funding. The risks of shelling social infrastructure necessitate the transfer of educational institutions to distance learning, which means spending on digitalising educational processes and constructing shelters in schools to ensure the safety of staff, pupils and students. The internal displacement of the population also required addressing the issues of adaptation of pupils and students to the new learning environment. At the same time, the need to finance the security and defence sector has reduced the potential for allocating funds to the education and research sector.

The factors that had a favourable impact on the financing of the education and research sector include fiscal decentralisation, which contributed to the transfer of authority in the management of educational institutions, the formation of educational budgets to local governments, and the provision of free and accessible educational services. Accordingly, during the war, local authorities were responsible for addressing issues related to the financing of education: infrastructure development, innovation, and logistics. At the same time, the central government allocates subsidies to the education sector (Law of Ukraine No. 280/97-VR, 2024).

As for the research, the sector has traditionally been characterised by low public and private funding levels for several reasons. The knowledge intensity of Ukraine's GDP has also remained low compared to EU countries over the past ten years (less than 1% of GDP, compared to the EU average of 2.2% in 2023) (Eurostat, 2024a). The reasons for this situation include the underdevelopment of state mechanisms for cooperation between the private and scientific sectors, which would allow scientists to sell their research and development to businesses directly. Limited public spending on the research sector is also a key reason for the low financial support. In addition, research centres at universities are relatively underdeveloped in Ukraine, and no local agencies support the scientific sector under local executive authorities.

Given the above, the issue of highlighting the specifics of financing Ukraine's educational and scientific

sphere in the context of war is becoming relevant. The article aims to study the specific features of financing Ukraine's educational and scientific sphere. The main objects of the study are 1) the state of financing of the educational sector at the expense of the State and local budgets; 2) the structure of expenditures on education of the State and local budgets by levels of education; 3) the state of financing of the scientific sphere in Ukraine by types of research work, sectors, and sources of financing.

Literature Review

Scholars discuss the issue of financing the education and research sector in the context of political, economic, and historical factors influencing the expenditures of these sectors of the economy. Political approaches to financing primary, secondary, and higher education, including ideological, historical, and institutional factors influencing such a system, are covered by Ansell & Lindvall (2015) and Rizvi & Lingard (2015). Pellegrini & Vivanet (2021) examine the implications of evidence-based policies for the EU's education and research sector. The role of public policy in ensuring access to educational services and reducing social inequality is studied by McGuinness (2016), Cantwell (2021), and Lee (2021).

Estermann & Pruvot (2015) and Sá & Sabzalieva (2018) have studied the degree of influence of higher education institutions' financial autonomy on the efficiency of their use of financial resources and the achievement of their development's strategic goals. Scott (2015) also examine the relationship between universities' financial independence and social responsibility.

Another area of research in education financing is the funding sources and the quality and accessibility of educational services (Chattopadhyay, 2007; Lung et al., 2012; Mintz, 2021). The findings on the structure of public and private funding of higher education and its impact on the quality of educational services are interesting. In particular, Teixeira & Dill (2000) study how privatisation and the ratio of public-private sources of education funding have affected the quality of education in different countries. Ziderman (2017) assesses the role of student loans in increasing access to higher education. Psacharopoulos & Patrinos (2018) estimate the economic return on investment in education at the individual and national levels. Mintz (2021) highlights the problem of financing education through public subsidies in the context of tax efficiency in OECD countries and notes their regressivity.

Vorontsova et al. (2020) studied the interrelationships between state regulation of education and economic growth and achieving sustainable development goals in CEE countries in 2006-2016. As a result, the most effective instrument of regulation was found to be public funding of education. Agasisti & Bertoletti (2022) found no significant impact on the economic growth of different funding sources (public, private) in European regions from 2000-2017. Busu et al. (2021) conduct an empirical analysis of the cost per student, the share of GDP allocated to higher education in the EU.

Another area of research concerns the accessibility of education and overcoming social inequality in access to educational services. Goldrick-Rab & Steinbaum (2014) and Marginson (2016) analyse the impact of financial mechanisms on social mobility and reduce inequality in access to quality education.

The specific issues of financing education and science are considered by Marginson (2016), Maringe (2023), & OECD (2022). Innovative funding models and the search for new mechanisms for financing the education and research sector, mainly to ensure efficiency and equity in resource allocation, are discussed by Jongbloed & Vossensteyn (2016) and Hedges & Rhoads (2016). Using regression analysis, Krstić et al. (2020) found a significant correlation between higher education and sustainable development.

Regarding expenditures on the research sector, most studies discuss the impact of R&D funding on innovation and economic growth in the EU. In particular, the article examines the convergence of EU countries in terms of R&D expenditures in 2004-2015, which revealed marked differences between countries in the level of expenditures due to the differentiation of the private sector, higher education, and

different public sector R&D expenditures (Blanco et al., 2020). Simionescu et al. (2021) empirically prove the impact of R&D expenditures on the GDP dynamics of EU countries in 2004-2018. Androniceanu et al. (2020) found higher GDP growth in EU countries with higher levels of R&D investment. Celli et al. (2024) discovered no significant impact of R&D expenditures on regional economic growth in the EU's lagging regions.

At the same time, few studies have examined the state and problems of financing the education and research sector in the context of a prolonged war, which causes the diversion of financial resources from human capital development to the security and defence sector.

Methodology

The study is based on general methods of scientific knowledge, statistical analysis of the state of financing the education sector at the expense of the state and local budgets, the structure of expenditures on education of the state and local budgets by levels of education, and the state of financing of the scientific sphere in Ukraine by types of research, sectors, and sources of funding. The data from the State Statistics Service of Ukraine and the Open Budget platform were used for the detailed analysis.

The article presents a descriptive-analytical study of the impact of the war on the state and structure of financing for the education and research sector in Ukraine. The main objective is to summarise the trends in financing the education and research sphere before and after the beginning of the war. The data collection process involved summarising existing information and secondary data on financial provision for education and research, published on the official websites of the Ministry of Education and Science of Ukraine, as well as using databases from the State Statistics Service of Ukraine and the World Bank's "Open Budget platform." Secondary data from expert interviews published on the website of the Ministry of Education and Science were processed to understand approaches to financing in wartime conditions. Statistical analysis of education sector financing was conducted for the years 2018–2024, using data from the "Open Budget platform" and included the following variables: 1) Expenditure from the state budget for financing education by functions in Ukraine during 2018–2024; 2) Expenditure from local budgets of all regions of Ukraine and Kyiv for financing education by functions in Ukraine during 2018–2024. Statistical analysis of the research sector in Ukraine was conducted based on the following variables: 1) The volume of expenditures on research and development (R&D) in Ukraine by type of activity during 2010–2023, and their share in Ukraine's GDP during 2010–2023; 2) The volume of R&D expenditures in Ukraine by sectors during 2021–2023; 3) The structure of R&D expenditures in the business sector by sources of funding during 2022–2023; 4) The volume and structure of expenditures on research and development in Ukraine by fields of science during 2021–2023. Data for the analysis of the research sector's financing were obtained from the State Statistics Service of Ukraine. All calculations (tables and figures) were prepared using Excel. The criteria for verifying the data included assessing the reliability of data on education and research financing volumes as presented on the Open Budget platform, the Ministry of Education and Science, and the State Statistics Service. The main methodological limitations of the study are associated with the lack of complete data on education financing by function from local budget expenditures due to the decentralisation process in Ukraine, which began in 2015. The Open Budget platform only contains data on education expenditures from 2018 onwards.

Results and discussion

In total, UAH 143.4 billion was allocated to finance Ukraine's education and research sector in 2023, UAH 176.2 billion in 2024, and UAH 194.3 billion in expenditures are planned in the State Budget for 2025. In 2024-2025, the budget for education and science increased by 35%. In particular, the growth was driven by increased allocations for school shelters to ensure the continuity of education and the purchase of buses. Funding for the New Ukrainian School reform increased by almost 50% in 2024-2025, bringing the planned budget to UAH 2.15 billion in 2025 (UAH 1.5 billion in 2024). It should be noted that the reform involves purchasing new equipment, developing teachers' professional skills, and updating teaching aids. In 2025, it is also planned to spend UAH 540 million on training and practical centres of vocational education

institutions, laboratories, and workshops of vocational colleges. A positive trend is the provision of funding for vocational pre-university and higher education, which is planned to be funded at UAH 55.6 billion. Only UAH 3.3 billion will be provided for science in 2025 (Ministry of Education and Science of Ukraine, 2024).

During 2018-2021, education spending in Ukraine increased from UAH 44.31 billion to UAH 63.84 billion, but in 2022 it decreased to UAH 58.5 billion, with an increase to UAH 60.45 billion in 2023. In 2018-2023, spending increased by UAH 16.15 billion, and its share in state budget expenditures decreased by 2.99% (4.5% in 2018, only 1.51% in 2023) (Table 1).

Table 1.
Dynamics of state budget expenditures on education in Ukraine in 2018-2024, billion UAH

Features	2018	2019	2020	2021	2022	2023	2024	Deviation (2018-2023), +/-
State budget, total expenditures, UAH billion	985,37	1072,89	1288,02	1490,26	2705,42	4014,42	2977,71	3029,05
Expenditures on education, UAH billion	44,31	54,49	61,7	63,84	58,5	60,45	44,4	16,15
Share of expenditures on education, %	4,5	5,08	4,79	4,28	2,16	1,51	1,49	-2,99
Preschool education	-	-	4,26	-	-	-	-	-
General secondary education	0,4	0,39	0,37	0,49	0,48	0,48	0,46	0,08
Professional (vocational) education	0,28	0,36	0,39	0,46	0,48	0,44	0,32	0,15
Vocational pre-university and higher education	36,69	43,04	48,36	53,8	49,88	50,2	35,98	13,5
Postgraduate education	1,0	1,11	1,1	0,98	0,31	0,31	0,23	-0,69
Extracurricular education and out-of-school activities for children	0,33	0,43	0,34	0,64	0,38	0,42	0,46	0,1
Programmes for the material support of educational institutions	0,8	1,06	0,52	0,68	0,09	1,41	1,2	0,61
Basic and applied research and development in education	1,23	1,29	1,32	1,75	1,22	1,64	1,23	0,41
Other institutions and activities in the field of education	3,57	6,82	5,04	5,04	5,66	5,55	4,53	1,98

Source: calculated by the author of Open Budget (2024)

The most significant amounts of state budget expenditures were allocated to vocational pre-university and higher education (UAH 36.69 billion in 2018, UAH 50.2 billion in 2023), while other educational levels lag far behind in funding. Thus, in 2023, UAH 0.48 billion was allocated for general secondary education, only UAH 0.44 billion for vocational education, UAH 0.31 billion for postgraduate education, and UAH 0.42 billion

for out-of-school education and related activities. In 2018, UAH 0.8 billion was allocated for material support programmes for educational institutions, and UAH 1.41 billion in 2023. Budget allocations for basic applied research and development in education increased slightly: UAH 1.23 billion in 2018 and UAH 1.64 billion in 2023.

For comparison, local budget expenditures on preschool education in 2018-2023 increased by UAH 13.49 billion, on secondary education by UAH 48.48 billion, on vocational education by UAH 6.06 billion, and professional pre-university and higher education by UAH 3.69 billion (Table 2). A slight decrease in spending on preschool, secondary, vocational, and postgraduate education was recorded in 2022, while in 2023, there was an increase in spending on education at the local level.

Table 2.
Dynamics of local budget expenditures in all regions and Kyiv to finance the education sector in Ukraine in 2018-2024, billion UAH

Features	2018	2019	2020	2021	2022	2023	2024	Deviation, +/-
Preschool education	31,79	36,04	37,56	48,54	40,67	45,28	34,42	13,49
General secondary education	101,29	114,89	122,08	149,56	144,86	149,77	113,95	48,48
Professional (vocational) education	9,72	10,46	11,12	13,72	15,02	15,78	11,30	6,06
Vocational pre-university and higher education	7,55	8,32	8,91	11,05	10,85	11,25	8,33	3,69
Postgraduate education	0,68	0,75	0,73	0,90	0,89	0,98	0,74	0,30
Extracurricular education and out-of-school activities for children	8,94	10,03	11,01	13,43	12,58	13,17	10,22	4,23
Other institutions and activities in the field of education	5,73	6,61	8,03	11,88	7,39	11,95	8,18	6,22
Total	165,71	187,10	199,43	249,08	232,25	248,19	187,13	82,48

Source: calculated by the author according to Open Budget (2024)

Until 2013, Ukraine showed an upward trend in R&D expenditures, which dropped due to the economic downturn in 2014-2015, followed by a recovery in expenditure dynamics until 2021. In 2022, due to the war, R&D expenditures, in general, decreased to UAH 17117.8 million, with the most significant decrease in funding for basic research and scientific and technical developments, the volume of expenditures for which was generally the highest in 2010-2023 (the share of expenditures was 20.7% and 49.6% in 2023, respectively). In 2023, the funding of R&D in Ukraine was restored to UAH 21348.1 million, while the knowledge intensity of Ukraine's GDP decreased from 0.75% in 2010 to 0.33% in 2023 (Table 3).

Table 3.
Dynamics of research and development expenditures in Ukraine by type of work in 2010-2023, UAH million

Indicator	2010	2019	2020	2021	2022	2023	Deviation, +/-
Expenditure on research and development - total, UAH million	8107,1	17254,6	17022,4	20973,8	17117,8	21348,1	13241
fundamental scientific research	2175,0	3740,4	4259,0	5163,7	4081,3	4424,4	2249,4
in %	26,8	21,7	25,0	24,6	23,8	20,7	-6,1
applied scientific research	1589,4	3635,7	3971,4	4821,3	4827,6	6348,4	4759
in %	19,6	21,1	23,3	23,0	28,2	29,7	10,1
scientific and technical (experimental) developments	4342,7	9878,5	8792,1	10988,8	8208,9	10575,3	6232,6
in %	53,6	57,2	51,7	52,4	48,0	49,6	-4
Share of research and development expenditure in GDP, %	0,75	0,43	0,41	0,38	0,33	0,33	-0,42

Source: State Statistics Service (2024a)

At the same time, in 2022, the amount of R&D funding in all sectors decreased: business, public, and higher education. In 2023, compared to 2022, the share of R&D funding from the business sector increased from 54.1% to 59.1%. At the same time, the share of public sector R&D expenditures decreased from 37.5% to 33.5% (Figure 1).

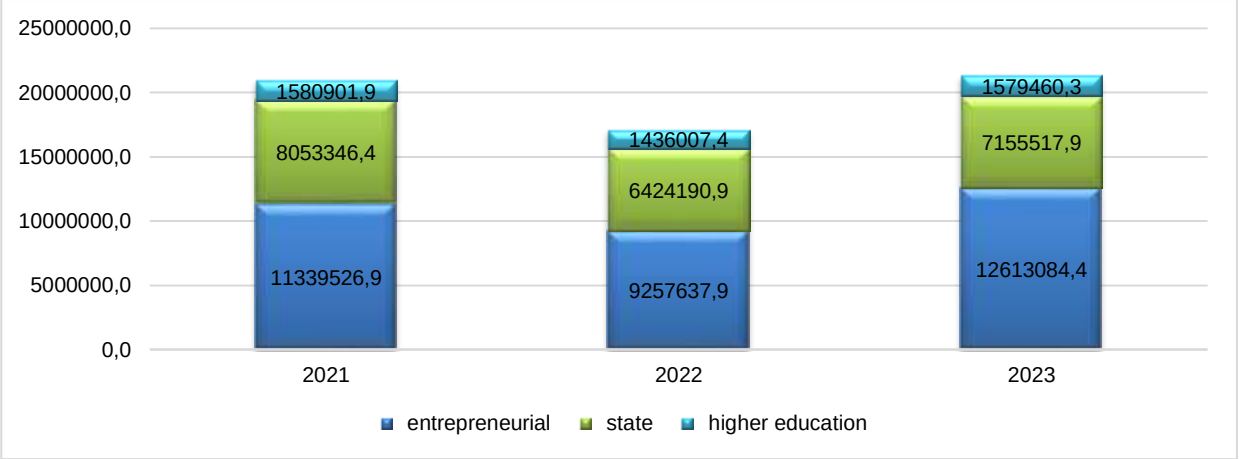

Figure 1. Ukraine's R&D expenditures by sector in 2021-2023, UAH million/%
Source: State Statistics Service (2024a)

In 2022, the predominant sources of funding for R&D expenditures in the business sector were public sector organisations (UAH 4,580.3 billion), business sector organisations (UAH 1,684.5 billion), foreign sources of R&D funding (UAH 1,597.1 billion), and own funds (UAH 1,289.1 billion).

For comparison, in EU countries, the share of R&D expenditure by funding source in 2021 was 57.7% from the business sector, 30.3% from the public sector, and 9.7% from foreign funds (Eurostat, 2024b).

An analysis of R&D expenditure by source of funding shows that more than half (57.7%) of total expenditure in the EU in 2021 was funded by enterprises, while almost a third (30.3%) was funded by the government, and another 9.7% from the rest of the world (foreign funds). Funding from the higher education sector was relatively small in 2021, at 1.2% of the total. The main change between 2011 and 2021 was a drop in the share of government funding from 33.6% in 2011 to 29.3% in 2019, with a slight increase in 2020 and then to 30.3% in 2021.

In 2023, the volume and share of such sources of financing R&D expenditures as enterprises' funds (UAH 5493.9 billion) and funds from foreign sources (UAH 3066.3 billion) increased significantly. At the same time, funding from public sector organisations decreased to UAH 2044.0 billion, while funding from the business sector increased to UAH 1981.4 billion (Figure 2).

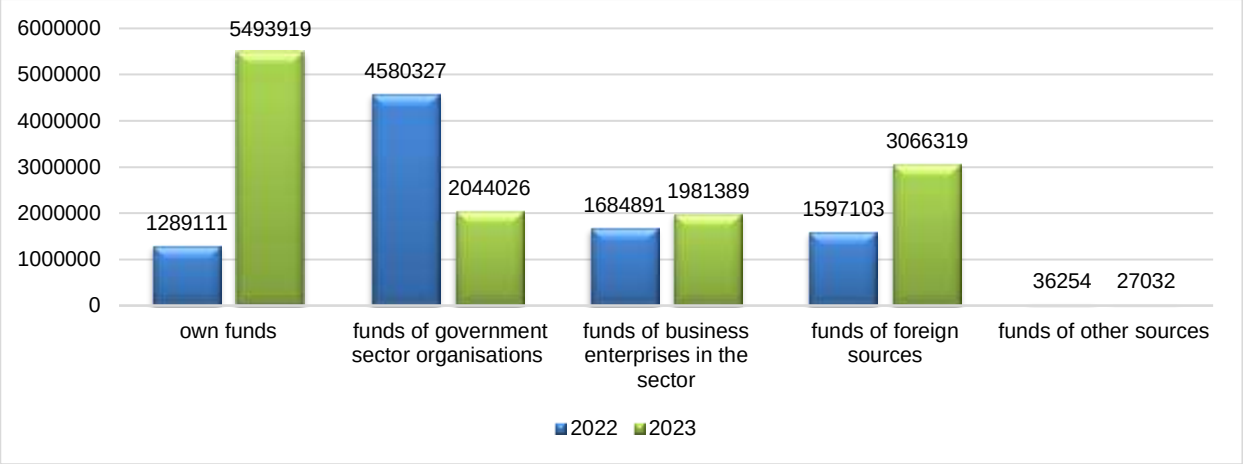

Figure 2. R&D expenditures of Ukraine's business sector by funding sources in 2022-2023, UAH million. Source: State Statistics Service (2024b)

By field of science, the largest amounts of funding in Ukraine are allocated to R&D in engineering and technology (almost 54% in 2021, 51% in 2023) and natural sciences (29% in 2021, 34% in 2023). Instead, insignificant amounts of funding are allocated to R&D in the fields of medical sciences (4.3% in 2021, 3% in 2023), agricultural sciences (almost 6% in 2021, 5.4% in 2023), social sciences, and humanities (Table 4).

Table 4.
Expenditures on research and development in Ukraine by field of science in 2021-2023, UAH million/%

In total	Volumes, UAH million			Specific gravity, %		
	2021	2022	2023	2021	2022	2023
Expenditures on research and development, total UAH million	20973775,2	17117836,2	21348062,6	100,00	100,00	100,00
Natural sciences, UAH million	6128799,1	4568181,2	7264362,5	29,22	26,69	34,03
Engineering and technology, UAH million	11293004,0	9477893,1	10866168,8	53,84	55,37	50,90
Medical and health sciences, UAH million	905458,1	668495,9	657679,9	4,32	3,91	3,08
Agricultural and veterinary sciences, UAH million	1213509,9	1057423,3	1160269,5	5,79	6,18	5,44
Social sciences, UAH million	946370,6	862488,6	919399,0	4,51	5,04	4,31
Humanities and arts, UAH million	486633,5	483354,1	480182,9	2,32	2,82	2,25

Source: State Statistics Service (2024c)

Despite the challenging conditions of wartime in Ukraine, since the beginning of the war in 2022, the actual volumes of funding for education from the state budget and throughout 2023–2025 have slightly decreased. A similar trend is observed with expenditures from local budgets directed towards financing the education sector. It should be noted that the planned volumes of expenditures on education and science are significantly lower than the actual ones. Additionally, there is a decline in the volumes of funding for the education and research sector relative to GDP.

Conclusions

Despite expectations of a reduction in funding for the education and research sector in the context of a full-scale war, the study demonstrates the ability of the government and local authorities to provide financial support for this sector. At the same time, expenditures on education and science in general decreased only in 2022. Instead, in 2023-2025, according to the State Statistics Service, the planned amount of state budget expenditures will increase in education and science funding in Ukraine. Educational services are generally funded from local budgets as a result of the decentralisation reform. The largest share of funds from the state budget is allocated to higher education institutions. Instead, preschool and secondary education are mainly financed by local budgets. In general, there is a decrease in the share of state budget expenditures on education, although their volumes are growing. In the structure of educational funding, the primary expenditures are allocated to preschool, general secondary, vocational pre-tertiary, and higher education. The government and local authorities in Ukraine should reconsider the distribution of expenditures, particularly to increase funding for the material and technical base of vocational education institutions and expand state-funded places for students in vocational institutions. This is linked to Ukraine's future post-war needs for skilled workers in vocational professions. The knowledge intensity of Ukraine's GDP is also declining with the growth of funding for the research sector. At the same time, funding for the scientific sector mainly depends on the business sector. Funds are mostly allocated to natural sciences, engineering, and technology.

During the war, the financial stability of the educational sector in Ukraine has been evident. However, the scientific sector, traditionally receiving the lowest funding in Ukraine compared to European countries, was forced to cease its activities in conducting fundamental and applied research in 2022, with slight recovery observed in 2023. Considering the ongoing conflict and significant wartime risks for Ukraine, state policy during the post-war recovery period should focus on stimulating the educational and scientific sector, particularly through increased funding for research and development (R&D) in higher education institutions from the state budget.

The primary limitations of this study are related to the lack of complete data on the financing of education by function through local budget expenditures, considering the decentralization process in Ukraine that began in 2015. The "Open Budget" platform, however, contains data on educational expenditures only since 2018.

Future research should focus on studying the efficiency of educational and scientific expenditures during conflict and the correlation of these expenditures with the quality of educational services during crises in Ukraine. Currently, similar studies are hindered by the absence of data on the performance indicators of educational institutions. For example, data on expenditures per student under state contracts are available only for 2020.

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