Building back a better innovation ecosystem in Ukraine

04 November 2022

Key messages

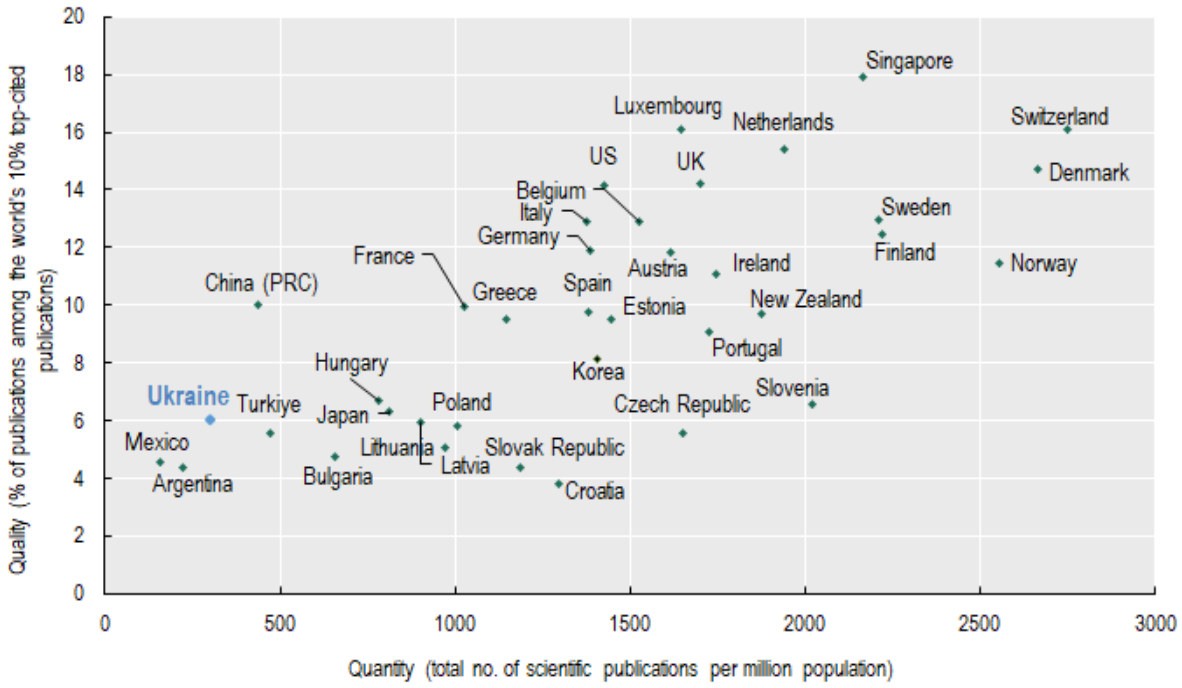
- Russia's large-scale aggression against Ukraine is aggravating the long-term trend of under-investment in research and development (R&D) in Ukraine through direct war-related destruction of physical infrastructure and human capital, as well as accelerated brain drain.
- About a quarter of the research workforce had left the country as of August 2022, and extensive destruction of scientific infrastructure has occurred, aggravating a legacy of outdated and insufficient research infrastructure.
- As of 2020, Ukraine's R&D spending had shrunk to less than half its 2003 level, and productivity had stagnated, while in the same period some Central European neighbours had nearly doubled R&D spending and experienced strong productivity growth. Understandably, since the outbreak of the war further drastic cuts have occurred.
- Despite recent improvements, Ukraine is weakly integrated into the European and global research space, partly due to the limited English language skills of researchers and insufficient support for international collaboration.
- Today's R&D challenges in Ukraine are the result of a lack of strategic approach to science and innovation, a low priority given to R&D spending, poor co-ordination of science and innovation policies across the government, human capital challenges, infrastructure deficits, insufficient development of applied research, weak business-academia linkages, and limited international co-operation.
- While defining its National Recovery and Development Plan, Ukraine could build on its competitive advantage in information and communication technology (ICT) services, which is based on pockets of scientific excellence, in such fields as computer science, engineering, mathematics and physics.

Even before Russia's full-scale invasion, Ukraine was not realising its full research and innovation potential

Despite recent improvements,[1] Ukraine's performance in science is relatively modest in global comparison, in both quantity and quality of scientific output. Overall scientific output per million population is very modest, and the percentage of publications among the top 10% cited is also below the world average, though broadly comparable to other Central and Eastern European countries (Figure 1).

Strong domains of specialisation exist, such as computer science, where Ukraine publishes almost twice as much as the average scientific output, and 11% of publications are among the top 10% cited, above the world average. Other areas of research specialisation include mathematics, physics and astronomy, engineering, materials science and energy (including nuclear energy, an area of particular strength), while medicine and biochemistry are lagging areas. Small but excellent research areas include environmental science and earth and planetary sciences, with more than 15% of publications among the top 10 cited (OECD, 2022[1]).

Figure 1. Ukraine's scientific output in global comparison



Source: OECD, Main Science and Technology Indicators (database), http://oe.cd/msti, July 2022.

Ukraine's information and communication technology (ICT) services exports have grown rapidly. From barely 100 million USD in 2004, they reached 7.1 billion USD in 2021, representing 38% of total services exports (World Bank, 2022[2]). This specialisation is often compared to the ICT sector in India, the world's leading ICT outsourcing destination. Measured on a per-capita basis, Ukraine's exports of ICT services are close to double those of India.[2] However, the bulk of the Ukrainian ICT sector focuses on low

[1] For a discussion of the recent evolution of scientific performance in Ukraine, see (OECD, 2022[1])
[2] Ukraine : 161 USD/inhabitant ; India 86 USD/inhabitant

value-added segments of the ICT value chain such as basic IT support by freelancers or small SME's providing software outsourcing, with only a few success stories proposing more advanced software engineering, design and build to specification solutions, such as Grammarly, Looksery, and Innovecs, which started in Ukraine and expanded globally. To move up the value chain, Ukrainian companies should strive to upgrade their managerial and technical capabilities in order to be able to compete in more advanced Western markets (Aridi, Hayter and Radosevic, 2021[3]).

Other knowledge-intensive service sectors do not show the same dynamism. For example, insurance and financial services exports are declining and represented less than 1% of services exports in 2021. Receipts of charges for the use of intellectual property represent a mere USD 69 million in 2021, down from USD 167 million in 2013, figures that are dwarfed by neighbouring Poland, which in 2021 registered a revenue of USD 1.48 billion for such charges, 21 times higher than Ukraine's (World Bank, 2022[4]).

Ukraine shows mixed performance as far as innovation policy is concerned. Ukraine's relative strengths lie in education, with relatively high funding allocated to the sector and 83% tertiary enrolment, strong patenting activity and a high number of intangible assets (ie. utility models, trademarks and industrial designs). Weaknesses relate to institutions, including the political environment, the business climate and the rule of law, outdated infrastructure (including ICT as well as general infrastructure), weak protection of investors, low credit to the private sector, innovation linkages, and creative goods and services (UNECE, 2020[5]).

Science, technology and innovation (STI) have yet to demonstrate support to sustainable development, a major challenge for Ukraine. Ukraine is one of the most carbon-intensive economies, with a carbon footprint of 0.31 kg CO2 per USD of GDP at PPP, compared to an OECD average of 0.18, and a lower-middle income country average of 0.23. This is partly due to Ukraine's industrial specialisation (metals, in particular), as well as underperformance on energy efficiency in housing and transports. Nearly 50% of the carbon emissions reductions necessary to achieve the Net Zero objective in 2050 rely on technologies that are currently at demonstration or prototype stage (IEA, 2021[6]). Such technologies include developments of renewable energies, sustainable mobility solutions, carbon capture and storage techniques, process innovation in industry and agriculture, insulation of housing, substitution of plastic and other environmentally-unfriendly materials, waste recycling. The small but excellent scientific production in environmental and planetary sciences[3] could significantly contribute in mitigating those challenges.

The war has exacerbated pre-existing innovation challenges and brought new ones to the fore

Russia's large-scale aggression against Ukraine has shed light on the longstanding barriers to achieving excellence in scientific research, diffusing knowledge across society, and fostering competitive research, development and innovation in the industrial sector in Ukraine. During exchanges with Ukrainian scientists in the context of the preparation of Ukraine's National Recovery and Development Plan in May-June 2022, the following challenges were identified:

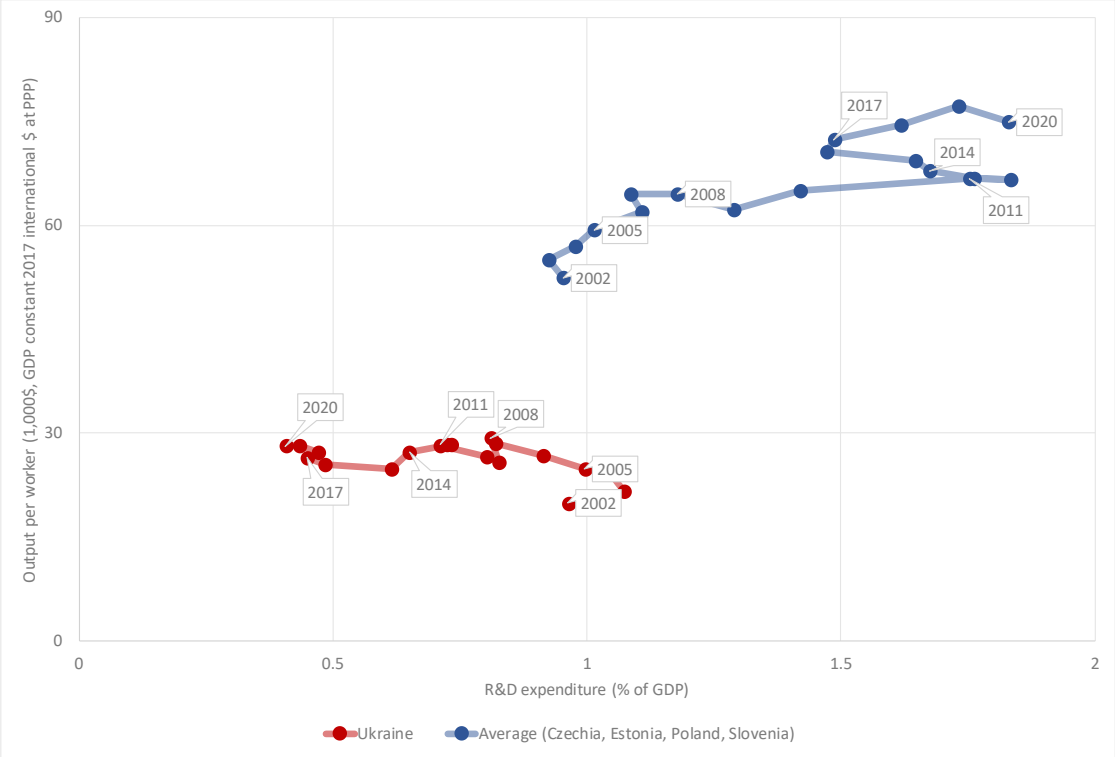
- **Lack of comprehensive implementation of a national strategy for innovation:** while Ukraine adopted in 2019 the National Innovation Strategy 2030, its action plan was poorly implemented for various reasons, including insufficient funding and the absence of a monitoring mechanism[4].

[3] In 2020, Ukraine published 416 papers in Environmental Science, and 14.7% of those were among the top 10% cited. In Earth and Planetary Sciences, there were 348 publications, and 16.8% of them were among the top 10% cited (OECD, 2022[1])

[4] Based on interviews with Ukrainian academics and policy makers

- **Low priority given to R&D spending, which is considered a cost, rather than an investment**: A large body of literature shows that the knowledge created through R&D performed by businesses, the public sector and foreign firms is a determinant of long-term productivity growth (Guellec and van Pottelsberghe de la Potterie, 2004[7]). Ukraine has experienced steadily declining expenditure for R&D, while productivity growth has been below potential (Figure 2). R&D spending has drastically declined – from 1.07% of GDP in 2003 to 0.41% in 2020, despite the target of 1.7% specified in Article 48 of the 2015 Law "On Scientific and Scientific-Technical Activities". This decline is further compounded by war-related budget cuts that lead to disruption of work in progress, reduction of scientific staff in research institutions and free economic zones, and outflows of personnel from the sector and the country more generally. Decision makers (in particular the Ministry of Finance which is responsible for preparing the budget) do not prioritise the scientific and innovative sphere for government spending and adopt a residual funding approach to science from the state budget, resulting in insufficient funding for both basic needs and development expenditures. A comparison to the evolution of neighbouring Central European OECD countries shows that Czech Republic, Estonia, Poland and Slovenia chose to increase R&D spending over the past two decades, converging towards the European and OECD average, and at the same time labour productivity has significantly increased (Figure 2)[5] .

Figure 2. Comparative evolution of R&D spending and productivity of Ukraine vs. benchmark Central European countries



Note: The benchmark was constructed as a simple average of four Central European OECD member countries: Czech Republic, Estonia, Poland and Slovenia.
Source: R&D expenditure from World Bank Databank, output per worker from International Labour Organisation

[5] Raising R&D spending is not enough to deliver innovation and productivity growth without addressing the other bottlenecks addressed in this paper.

- Business expenditure for R&D typically accounts for 60% or more of total R&D spending in OECD countries, but in Ukraine it only amounts to 20% of R&D spending, or 0.08% of GDP in 2020[6], in contrast to 0.88% in neighbouring Poland, 1.21% in Czech Republic, and an EU average of 1.53%[7]. Even such modest expenditures are largely self-financed by enterprises (85% on own funds, and less than 2% from the state budget[8]), as even basic policy instruments such as innovation vouchers[9] and matching grants[10] have not been introduced. In addition, this low rate of business R&D spending is probably due to issues with the framework conditions, further discussed below. Management and funding tools need to be reviewed and upgraded, in particular concerning setting scientific and technological priorities. Insufficient funding for defence-related research has caught the STI sector unprepared to support the war effort; reorientation of priorities is occurring in emergency conditions.
- **Governance challenges:** The body responsible for STI policy co-ordination, the National Council for Science and Technology Development, meets very rarely and does not ensure effective interdepartmental coordination between the Ministry of Education and Science, the National and branch Academies of Sciences, the National Research Fund, and central executive bodies. The division of roles is unclear among multiple hierarchical and collegial bodies, and the regulatory framework is partly outdated and sometimes contradictory. The evaluation and quality assurance system also needs to be upgraded according to international good practice, using a balance of quantitative and qualitative indicators. In addition, coordination is weak with the Ministry of Economy of Ukraine, which is in charge of business innovation.
- **Human capital challenges:** As of 19 October 2022, 7.7 million Ukrainians had fled the conflict according to the UNHCR[11], corresponding to 19% of the pre-war total population[12]; around 6.2 million were displaced within the country.[13] The effect of the war comes in addition to having lost 4.2% of its population between 2011 and 2021, compared to population growth of 5.9% in OECD countries and 15.4% in lower-middle income countries in the same period. The decline in population is caused both by strong outward migration and a deficit of births [(World Bank, 2022[8])]). Concerning the population of researchers, the loss is even more severe, as an estimated one-quarter of the research workforce has left the country by August 2022, compared to 13.5% in the overall population (Nature, 2022[9]). Even prior to the war, there was a skills gap for scientific research, in particular at PhD level. Scientific careers are insufficiently attractive, in terms of salary, social prestige, as well as advancement, which is predominantly seniority-driven, with insufficient focus on meritocracy and scientific integrity. This leads to brain drain, which has been aggravated by the war, despite the efforts of the international scientific community to not only host refugee scientist, but also to provide support to Ukrainian

[6] According to the Statistical Yearbook of Ukraine 2020, 'Expenses for innovations of industrial enterprises for R&D, performed on their own, and R&D performed by other enterprises, amounted to 3.486 billion UAH, while the nominal GDP was 4192 billion UAH.

[7] According to Eurostat https://ec.europa.eu/eurostat/databrowser/view/tsc00001/default/table?lang=en

[8] According to the Statistical Yearbook of Ukraine 2020

[9] Innovation voucher schemes are introduced to initiate collaboration between SMEs, and knowledge institutions, who can provide the relevant know-how. They usually have a relatively small face value (up to 10,000€) and a simple administrative set-up to facilitate broad diffusion among SMEs. The attribution of vouchers usually doesn't imply a selection process, and all requests fulfilling simple criteria such as size and a clean record with the tax authorities are granted.

[10] Matching grants are subsidies with higher face value than innovation vouchers, subject to comprehensive technical and market evaluation of the proposals. As their name suggests, they typically match the private company's R&D investment in a ratio of 1:1.

[11] https://data.unhcr.org/en/situations/ukraine

[12] Total population 41.2 million according to ukrstat.org

[13] https://www.iom.int/sites/g/files/tmzbdl486/files/situation_reports/file/iom-regional-ukraine-response-external-sitrep-27102022.pdf

scientists who remain in the country[14]. There is also a lack of skills within the public administration in charge of STI policies. Insufficient links between research and education at secondary and tertiary levels tend to perpetuate the skills gaps.

- **Infrastructure challenges:** Extensive destruction of scientific infrastructure has occurred, such as the shelling of the Kharkiv Institute of Physics and Technology neutron source, in March and June 2022. Such destruction aggravates a legacy of outdated and insufficient research infrastructure, a result of long-standing under-investment. This concerns buildings, scientific equipment and digital infrastructure. The situation is aggravated by the loss of scientific archives and data, as well as difficulties in relocating research activities. Difficulties are compounded by the lack of effective mechanisms for sharing research infrastructure and lack of flexibility for procuring equipment. The insufficient financial flexibility makes it difficult or impossible to make changes in pre-planned equipment purchases, use extra-budgetary funds or accept used scientific equipment as part of international assistance.
- **Weak business-academia linkages:** High-tech exports represent only 5.9% of Ukraine's manufactured exports, compared to 12.9% for the lower-middle income countries, and 18.2% of OECD members' exports in 2020 (World Bank, 2022[8]). The low-tech structure of the economy has limited the extent of innovation activities in industry and consequently the demand for domestic science and technology, as enterprises prefer to purchase standard ready-made solutions, further limiting incentives for business-academia partnerships. The war has aggravated this through corporate shutdowns and cuts in investments by corporations, even though some companies are proving resilient, relocating within Ukraine or abroad to avoid shutting down. Numerous initiatives were in place prior to the conflict, including science parks, technology parks, industrial parks, technology transfer centres, innovation centres, centres for intellectual property commercialisation and innovative incubators. However, the overall impact of these structures on the overall innovation performance remains below expectations, and some are not operational due to a lack of funding or insufficient innovative projects (UNECE, 2020[5]).
- **Insufficient development of applied research:** Government research institutes are strongly oriented towards basic research, and Ukraine lacks applied research institutes and research and technology organisations (such as Germany's Fraunhofer Society[15]).
- **International co-operation remains insufficient:** Despite recent improvements, Ukraine is weakly integrated into the European and global research space. Historical links with Russia have declined since 2014, but student and scholarly exchanges remained strong until Russia's large-scale war against Ukraine. Strong links have been developed particularly with Poland, and by 2020 co-publications with Polish institutions have surpassed those with Russia[16]. Nevertheless, the low level of English language proficiency among researchers is a strong barrier to integration with the global research community. The incompatibility of regulatory frameworks, as well as bureaucratic and financial constraints are barriers to participation in international projects. Overall, Ukraine lacks a strategic approach for supporting participation in foreign financial instruments – for instance there is a low uptake and success rate of Ukrainian entrepreneurs and scientists in Eureka and Horizon Europe programmes. There are also no systematic links with the scientific diaspora.

[14] For a more detailed discussion of brain drain and brain circulation, please refer to (OECD, 2022[1])

[15] For other examples of policy initiatives to enhance the impact of public research promoting excellence, transfer and co-creation see (OECD, 2019[17])

[16] 1504 co-publications with Poland, compared to 1296 with Russia in 2020, according to OECD calculations based on Scopus Custom Data, Elsevier, Version 5.2021, September 2021. For a more detailed discussion of international co-operation by Ukrainian scientists, see (OECD, 2022[1])

The outlook: Rebuilding a better innovation ecosystem in Ukraine

Several international initiatives have proposed emergency support for the Ukrainian STI system. In May 2022, the European Commission launched the MSCA4Ukraine scheme to support displaced scientists, as well as dedicated funding and tenders under Horizon4Ukraine. In June 2022, the academies of science of Poland, Ukraine, United States, Germany, Denmark, United Kingdom and the ALLEA European Federation published a statement with a 10-point action plan in support of Ukrainian research (OECD, 2022[1]).

Beyond these emergency measures, as the government finalises the National Recovery and Development Plan, this moment could be used as an opportunity to redesign Ukraine's science, technology and innovation system in order to better contribute to the post-war reconstruction of its economy and society. OECD experience points to the strong role of science, technology and innovation in the post-war reconstruction (Box 1).

Box 1. The role of science, technology and innovation in the post-war development of OECD economies

Studying the post-WWII development of 39 European countries and Japan, Comin and Hobijn find that technology can explain part of the difference in economic recovery, helping them not only to recover, but to move to a higher growth path than prior to the conflict (Comin and Hobijn, 2010[10]).

Drawing on the experience of the OECD, the origins of scientific activity in the Organisation can be traced to early Marshall Plan days in 1949, when the Council of the then Organisation for European Economic Co-operation (OEEC) set up its Working Party No. 3 on scientific and technical information. The Working Party realised that science could be most useful to the postwar economy as a driver of productivity at a moment when European industry was being re-equipped mainly with traditional plant and machinery. In order to support the reconstruction and development effort, the Working Party initiated a number of productivity studies, to launch specialized discussions on productivity measurement in particular sectors, and sent the first international productivity teams to visit the United States in the quest of good practices. National productivity centres were created and sustained with the aid of the US counterpart funds, which soon became available, and the European Productivity Agency was established as an organ of the OEEC. It initiated specific programmes to study, for instance, the use of oxygen in the steel industry, the generation of electricity by wind power and desalting of brackish waters.

Source: (King, 1965[11])

OECD experience suggests that Ukraine must address the following structural issues if it is to strengthen its innovation ecosystem as it rebuilds and recovers from the war:

- Develop a **consensual whole-of government STI strategy**[17] and create a national consensus about the role of STI in the overall economic and societal development, its expected contribution to economic growth and the resolution of societal challenges, including carbon emissions reduction, an ageing society, and biodiversity loss (Paic and Viros, 2019[12]). Such a strategy should be drafted in a

[17] For example the High-Tech Strategy in Germany, the Long Term Plan for research and development in Norway, the Cross-ministerial Strategic Innovation Promotion Programme in Japan, the Innovation and Skills Plan in Canada, the National Innovation and Science agenda in Australia, the Research, Innovation and Enterprise Plan in Singapore, the Basic Plan for Science, Technology and Innovation in Korea, or the Israel Innovation Authority Strategy (OECD, 2019[16])

collaborative manner, with the participation of all relevant stakeholders, including all government bodies concerned, with adequate funding, as well as institutional and regulatory support.

- **Progressively increase budget support over time** and set a long-term objective of convergence towards investment levels in the European Union, similarly to the trends observed in some Central European countries over the past two decades (Figure 2). In the short term, increases in spending should be sought through international co-operation and donations. In this respect, a legal framework that allows for decentralised fundraising for research infrastructure by individual higher education institutions and public research institutes would be helpful.
- Review the **cross-ministerial co-ordination mechanisms**, especially across the four Ministries directly concerned with science, technology and innovation[18], as well as the National Academy of Sciences. It would also be useful to review and audit the functioning of the National Council for Science and Technology Development and adapt its activities in accordance with OECD good practice of Councils for research and innovation which provide policy advice in 90% of surveyed OECD member states, develop national strategic priorities in 74% of them, and evaluate policy reforms in 48% the cases (Borowiecki and Paunov, 2018[13]).
- Draw up a **comprehensive map of Ukraine's research infrastructure** in accordance with European Strategy Forum on Research Infrastructures (ESFRI) standards (ESFRI, 2021[14]), based on a comprehensive audit of existing infrastructure, accounting for obsolescence and war-related destruction, as well as needs according to the Smart Specialisation strategy[19], as required by ESFRI. Such a map should include information about the existing infrastructure, as well as infrastructure that was damaged or destroyed because of the war. This will help prepare the negotiations on membership of the European Union (Chapter 25 of the *Acquis Communautaire*), as well as discussion with donors as to the most urgent investments for research and innovation related reconstruction.
- Craft a **pragmatic approach to brain drain** [20]. In the short term, it will be impossible to stop or reverse the phenomenon; policies should be oriented towards keeping in touch with the diaspora and facilitating contacts between Ukrainian institutions and enterprises with the members of diaspora who can provide precious assistance in the establishment of scientific and business contacts globally. These arrangements could include the participation in scientific conferences, co-operation on collaborative projects such as the Polish-Ukrainian projects awarded by the Foundation for Polish Science[21], hosting of Ukrainian scientists on sabbatical leave and others. Over time, specific policies can try to gradually reverse the brain drain and create "brain circulation" by creating favourable conditions for returnees, including reforms of general HR policies as well as specific support such as housing and assistance in the search for employment for spouses.
- Upgrade policies and measures in favour of **business innovation and industry-academia co-creation**. OECD countries' experience shows a trend evolving beyond the linear technology transfer model towards partnerships between academia and industry to jointly fund, manage and implement

[18] Including the Ministry of Education and Science, the Ministry of Economic Development, Trade and Agriculture, Ministry of Digital Transformation and the Ministry of Strategic Industries of Ukraine

[19] The European Joint Research Centre's Smart Specialisation Framework for EU Enlargement and Neighbourhood Region is adopted on a voluntary basis. Between 2014, and 2020 five Ukrainian regions piloted the concept, which is slated to scale up to all 25 regions. Since 2021, Smart Specialisation is a mandatory part of regional development strategies. (European Commission, 2021[15])

[20] Please also refer to (OECD, 2022[1])

[21] See First Polish-Ukrainian Research Projects Awarded by the FNP - Fundacja na rzecz Nauki PolskiejFundacja na rzecz Nauki Polskiej

research activities leading to impactful innovation, involving shared facilities and mixed teams[22]. A reinforcement of intellectual property protection overall (in terms of coverage, duration, and enforcement) could be assorted with appropriate incentives for researchers in the case of intellectual property commercialisation. Specific policies such as innovation vouchers[23] and matching grants[24] to subsidise specific industry-academia R&D projects could also be considered as these have proven to have positive effects in OECD countries. Another useful measure would be the inclusion of technology transfer and entrepreneurship as the "third mission"[25] of higher education and public research institutions. An audit of existing infrastructures for academia-industry collaboration would be helpful to pinpoint areas for improvement.

- Strengthen specific support and incentives for **researchers to participate in European and international co-operation.** Such policies may include institutional and personal objectives for international co-operation, support to writing proposals for European and international projects, English language training, bilateral and multilateral scientific grants, scholarships for international researcher mobility and diaspora linkages, encouraging participation in regular online and hybrid seminars with foreign colleagues, and contribution to publications in foreign scientific journals. It would also be useful to further develop Ukraine's participation in international infrastructures such as CERN (where Ukraine is an Associate member), ITER[26], the European Molecular Biology Laboratory, the International Space Station and others.
- Improve the **evaluation system and process for research and innovation,** so that it is based on qualitative and quantitative metrics, following international good practice.[27] This will require the recruitment of highly-qualified evaluators, with adequate selection criteria and remuneration. Whenever possible, Ukraine should involve international experts in the evaluation process – it might be helpful to involve Ukrainian diaspora scientists who can work in the national language.

[22] Such as the Austrian Christian Doppler Research Association (CDG), the German Research Campus, the Swedish Strategic Innovation Programmes and the United States' Industry-University Cooperative Research Centres Programme (Guimon, 2019[18]), (OECD, 2019[19])

[23] Innovation voucher schemes are introduced to foster collaboration between SMEs (who lack the in-house expertise to successfully convert innovative ideas into new products) and knowledge institutions, who provide the relevant know-how. For a proposed implementation of voucher schemes in a country of similar income level, see (OECD, 2013[20])

[24] Matching grants are subsidies with higher face value than innovation vouchers, subject to comprehensive technical and market evaluation of the proposals. As their name suggests, they typically match the private company's R&D investment in a ratio of 1:1.

[25] The first two missions of higher education are teaching and research

[26] ITER is the world's largest tokamak, a magnetic fusion device that has been designed to prove the feasibility of fusion as a large-scale and carbon-free source of energy based on the same principle that powers our Sun and stars. www.iter.org

[27] Consider the practices contained within the San Francisco Declaration on Research Assessment and design specific evaluation criteria adapted to the Ukrainian situation

Key considerations for policy makers

- While looking ahead to the recovery and reconstruction, Ukraine has an opportunity to "build back better" addressing the longstanding under-investment in research and development (R&D) and the need for a more strategic approach to science, technology and innovation (STI).
- Science, technology and innovation have the potential to contribute to societal transformation of Ukraine in the post-war period, if a strengthened academic sector links to the entrepreneurs and feeds into an innovation-centric industrial strategy.
- Science, technology and innovation can also significantly contribute to Ukraine's green transition, through stimulation of grassroots entrepreneurship in co-creation with academia, in particular on the basis of Ukraine's small but excellent scientific production in the areas of environmental and planetary sciences.
- The information and communication technology (ICT) service sector provides opportunities for Ukraine to move up the value chain. It can benefit from its strong scientific competence in computer science and mathematics, as well as existing technical and managerial expertise.
- Skills need to be further upgraded through a public-private partnership approach, and ICT services should also be better connected to other legacy sectors such as agriculture, aerospace, and heavy machinery where they could help develop productivity and competitiveness.
- Experience from OECD member countries points to the following main priorities for Ukraine's further development of the R&D sector:
  - Develop and implement a **consensual whole-of government STI strategy**
  - Progressively increase **budgetary support** for R&D, taking into consideration constraints, but also the fact that R&D is a key driver of growth in the 21st century
  - Review and enhance the **cross-ministerial co-ordination mechanisms**
  - Draw up a **comprehensive map of Ukraine's research infrastructure** and develop fundraising efforts for post-war reconstruction
  - Develop links and co-operation with the **Ukrainian scientific and entrepreneurial diaspora**, while aiming to gradually reverse the brain drain and create "brain circulation" by creating favourable conditions for returnees
  - Develop policies in favour of **business innovation and industry-academia co-creation**
  - Support increased involvement of Ukrainian scientist and entrepreneurs in **European and international co-operation**
  - Improve the **research and innovation evaluation system and process**

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