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ERA Country Report 2023

Czechia

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Report

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Innovation

ERA Country Report 2023: Czechia

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ERA Country Report 2023

Czechia

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ERA COUNTRY REPORT 2023: CZECHIA

Key takeaways:

- Czechia is considered a 'moderate innovator' according to the European Innovation Scoreboard 2023. The gap between Czechia's performance and the EU average has been narrowing in the last decade.
- Czechia is committed to all actions of the European Research Area (ERA). The ERA Actions which are prioritised at national level include research infrastructures, research excellence, and industry and sectoral policies. Considerable attention was also paid to the open sharing of knowledge, reform of the R&I assessment system, knowledge valorisation, gender equality policies and making EU R&I missions and partnerships key contributors to the ERA.
- The 2023 European Semester Report for Czechia mentions some barriers for the development of research and innovation (R&I); (i) the lack of a highly skilled workforce in science & engineering, (ii) weak science-business linkages, (iii) a low intensity of venture capital, (iv) inadequate shares of excellent research outputs, and (v) limited participation in the Europe-wide transnational, as well as bilateral or multilateral, public R&I programmes. The report acknowledges that the Czech Recovery and Resilience Plan addresses key challenges related to green and digital transformation, education, labour market and R&I.

1. National context

1.1. Overview of the ERA policy agenda implementation

The 2023 **European Innovation Scoreboard (EIS)**¹ considers Czechia a **moderate innovator** with performance at 94.7% of the EU average. The scoreboard notes that performance is increasing at a rate higher than that of the EU average (8.5%-points). The report also acknowledges R&I-related policies envisaged by the Czech Recovery and Resilience Plan (RRP). Key Czech R&I policy initiatives prioritise research infrastructures, research excellence, and industry and sectoral policies.

As for the European Research Area, Czechia is committed to all ERA Actions. The **National Research, Development and Innovation Policy 2021+** (NRDIP 2021+)² is the key strategic document at national level. It covers policy measures relevant to the implementation of most ERA actions. Individual ERA Actions are also implemented on a case-by-case basis in line with the initiatives determined by the overarching NRDIP 2021+.

¹ European Innovation Scoreboard (2023). https://ec.europa.eu/assets/rtd/eis/2023/ec_rtd_eis-country-profile-cz.pdf

² <https://vyzkum.gov.cz/FrontClanek.aspx?idsekce=913172>

1.2. Policy context

The ERA Policy Agenda 2022–2024 is mainly addressed by central public authorities at the Governmental level, by relevant Ministries, Agencies and other stakeholders with the national scope of activities. The Czech **Ministry of Education, Youth and Sports (MEYS)**³ is the central government body responsible for the development and implementation of research and development (R&D) policies.⁴ The Czech **Ministry of Industry and Trade (MIT)**⁵ and the **Czechinvest**⁶ **Agency** are responsible for the design and implementation of Czech innovation policies. In addition, the MEYS is responsible for: (a) international co-operation in R&I (in the EU area in particular); (b) framework conditions to support large research infrastructures; (c) support for specific University research; (d) the governing of R&I systems; and keeping a register of R&I organisations.

The Czech Government **Council for the Research, Development and Innovations (CRDI)**⁷ is a professional and advisory body of the Czech Government. The CRDI co-operates with the MEYS and (i) drafts priorities for applied research and innovation policies, (ii) evaluates (public) research organisations and programmes, (iii) prepares **annual reports on the Czech R&D**,⁸ and (iv) drafts mid-range outlooks to support R&I. In addition, the **Grant Agency of the Czech Republic (GACR)**⁹ and the **Technology Agency of the Czech Republic (TACR)**¹⁰ are also key state bodies (grant agencies) for the R&I environment. Furthermore, regional authorities are usually consulted for policy-making issues with relevant regional dimension, such as the Smart Specialisation Strategy, the EU Cohesion Policy Funds, etc.

The GACR supports basic research while the TACR focuses on applied research. The **Czech Academy of Sciences (CAS)**¹¹ and higher education institutions (HEIs) are key research performers. The CAS has 54 public research institutions and employs over 8,000 employees, more than a half of whom are researchers with university degrees. There currently are 58 HEIs, of which two state and 30 private ones, in Czechia.

As mentioned before, the main initiative at the national level is the **National Research, Development and Innovation Policy 2021+** (NRDIP 2021+).¹² It sets strategic goals, policy measures, and priorities in applied research, and presents an indicative budget for State R&I policies until 2030. In this sense, it aims to encourage international excellence and citizens' engagement with research and innovation. Among its goals, NRDIP proposes a reform of the national R&I system, a reform of public research organisations (PROs), and cooperation across science and industry sectors, while increasing the role of research and innovation in the public and private sectors. In general, ERA has always been addressed as an integral part of the NRDIP 2021+.

³ Ministry of Education, Youth and Sports. Czechia. <https://www.msmt.cz/?lang=2>

⁴ The 130/2002 Law on Public Support to Research and Development defines system of institutions responsible for development and implementation of R&D policies in the Czech Republic.

⁵ <https://www.mpo.cz/en/>

⁶ <https://www.czechinvest.org/en?force>

⁷ <https://vyzkum.gov.cz/FrontClanek.aspx?idsekce=496>

⁸ <https://vyzkum.gov.cz/FrontClanek.aspx?idsekce=8304>

⁹ <https://gacr.cz/en/>

¹⁰ <https://www.tacr.cz/en/>

¹¹ <https://www.avcr.cz/en/>

¹² <https://vyzkum.gov.cz/FrontClanek.aspx?idsekce=913172>

Other key policies targeting ERA actions include the **Innovation Strategy for 2019-2030 (ISCR)**¹³ aimed at (i) increasing support to institutional finance for excellent research organisations, (ii) increasing project support to applied research (iii), improving research assessment systems and (iv) improving protection of intellectual property rights. **The Czech Recovery and Resilience Plan (RRP)**¹⁴ supports the post-pandemic recovery of the Czech economy, as well as the green and digital transitions, and covers measures aimed at knowledge valorisation and industrial ecosystems.

To ensure the efficient development of Czech R&I, relevant policies receive substantial assistance from the European and Structural Funds (ESIF) across the programming period of 2021-2027. The **Jan Amos Komensky Operational Programme (OPJAK)**¹⁵ allocates EUR 2,551 million to research and education. The **Operational Programme Technologies for Applications and Competences (OPTAC)**¹⁶ allocates EUR 3,136 million to research and innovations in firms, SME competitiveness, digital infrastructure, the low-carbon and circular economy, and sustainable mobility.

2. Assessment of the Implementation of the ERA Policy Agenda and ERA Priorities

The aim of this section is to provide an overview of the key policy initiatives adopted in Czechia to implement the ERA Policy Agenda and its associated actions, as well as provide an overview of the progress towards the ERA priorities. The key data sources used for this report include: (a) quantitative data from ERA indicators; (b) qualitative data provided in the OECD STIP survey; (c) policy reports, including the 2023 European Semester Report for Czechia, the 2023 National Reform Programme for the Czech Republic, the Czech 2022 Annual Report on R&D¹⁷; and (d) key Czech national documents on research, development and innovation policies.

The quantitative information presents the most recent data available for the ERA Scoreboard and ERA Dashboard indicators.¹⁸ However, in some cases, the data available pre-dates the ERA Policy Agenda. This report will serve as a baseline for reporting in the future. Therefore, the longer-term trends covering the last ten years are presented. The indicators falling under each ERA priority are presented below, and the general indicators are outlined in Table 1. More detailed information on the data and graphs can be found in Annex 1.

¹³Czech Innovation Strategy 2019-2030. <https://www.vlada.cz/cz/urad-vlady/vydavatelstvi/vydane-publikace/inovacni-strategie-ceske-republiky-2019-2030-204816/>

¹⁴ <https://www.planobnovycr.cz/ke-stazeni>

¹⁵ Jan Amos Komensky Operational Programme. <https://opjak.cz/dokumenty/>

¹⁶ <https://dotaceeu.cz/cs/evropske-fondy-v-cr/kohezni-politika-po-roce-2020/programy/list/op-technologie-a-aplikace-pro-konkurenceschopnost>

¹⁷ <https://www.vyzkum.cz/FrontClanek.aspx?idsekce=967605&ad=1&attid=970350>

¹⁸ See <https://european-research-area.ec.europa.eu/era-monitoring-reports>.

Table 1. General ERA Scoreboard and ERA Dashboard indicators¹⁹

Indicator	Most recent EU average	Most Recent Metric
Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP	2.26 (2021)	2.0 (2021)
Government Budget Allocations for R&D (GBARD) as a share of GDP	0.76 (2021)	0.63 (2021)
Researchers (in full-time equivalent) per million inhabitants	4,483.4 (2021)	4,581.3 (2021)
Business Enterprise expenditure on R&D (BERD) as a percentage of GDP	1.49 (2021)	1.3 (2021)

Source: compiled by research team based on the ERA Scoreboard and ERA Dashboard indicators

2.1. ERA Priority 1: Deepening a truly functional internal market for knowledge

2.1.1. State of play in the implementation of the ERA Actions

To implement **ERA Action 1: Enable the open sharing of knowledge, including the development of the open science cloud (EOSC)**, the **NRDIP 2021+²⁰** introduced a measure on ‘Open access to research, development data, and results. The measure aims for the implementation of the **EU Directive 2019/1024** of the European Parliament to strengthen digital infrastructure for open science, and its integration within the **European Open Science Cloud (EOSC)**. The measure envisages the implementation of the European Open Science Cloud, the creation of a national licence centre (**CzechELib**), and the negotiation of open access to scientific results with major science publishers.

To implement the **ERA Action 2: Propose an EU copyright and data legislative and regulatory framework fit for research**, the **NRDIP 2021+** foresees adopting a Framework for the protection of intellectual property rights.

ERA Action 3: Reform the Assessment System for research, researchers and institutions is also addressed by the **NRDIP 2021+**. The document sets a goal towards ‘long-term assessment-based investments in R&I’. The long-term research priority setting will be supported by technology foresight and technology assessment exercises. The strategy aims to increase the share of institutional funding for the best performing research organisations. The first assessment cycle (2020-2024) uses five sets of evaluation criteria: (i) quality of research results; (ii) research performance; (iii) social relevance of research; (iv) viability; and (v) strategic orientation. The 2019 **Innovation Strategy of the Czech Republic²¹** for 2019-2030 (ISCR) also stipulated the need for improving research assessment systems.

ERA Action 4: Promote attractive research careers, talent circulation and mobility is addressed by two policy measures in the **NRDIP 2021+ strategy**. The measures prioritise the introduction of personal development and career plans for researchers working in higher

¹⁹ Further information on the trends can be found in Annex 1

²⁰ <https://vyzkum.gov.cz/FrontClanek.aspx?idsekce=913172>

²¹ <https://www.vlada.cz/cz/urad-vlady/vydavatelstvi/vydane-publikace/inovacni-strategie-ceske-republiky-2019-2030-204816/>

education institutions. The career plans are also aimed at improving gender balance and work-life balance in the R&I sector. The quality of career plans and gender equality plans are important elements in research assessments and reward cases. The NRDIP 2021+ aims to address long-term problems with the availability of human resources in science and engineering. The document suggests that these issues would be addressed by the Czech Innovation strategy. Several **TACR and GACR projects** support the careers of excellent PhD students, post-docs and other early-career researchers.

To implement **ERA Action 5: *Promote gender equality and foster inclusiveness***, the policy measure 12 of the **NRDIP 2021+** document focuses on “conditions for the combination of research work and parenthood, and working arrangements for women after maternity leave”.²² It suggests several measures to improve gender equality and inclusiveness: (i) introduction of ‘return grants’ for female researchers returning from maternity leave, (ii) interruption of project activities during pregnancy and maternity leave; (iii) inclusion of pregnancy and parenthood-related items into grant budgeting; and (iv) acknowledging good working conditions for mothers in assessment exercises.

Furthermore, the **Strategy for Equality between Men and Women** contains three Strategic Objectives under the chapter on knowledge: SO1 Ensuring maximum development of the potential of girls and boys / women and men; SO2 Expanding the content of education, science and research to include gender perspective; SO3 Applying a gender perspective in the running of educational and scientific research institutions with five specific objectives aimed at supporting institutional changes.²³ The **MEYS** funds the **National Contact Centre for Gender and Science**. It acts as the **National Contact Point for gender in R&I** and provides advice to bodies of the Czech public. This funding also supports the implementation of ERA Action 5 through funding the co-chair position in the ERA Forum subgroup on inclusive gender equality. The Centre also provides support to RPOs in relation to the Horizon Europe gender equality policies GEP eligibility criterion and the thematic areas of the GEP. In this respect, it provides consultations, training, an e-learning platform, and a Community of Practice of more than 450 RPO staff members. The gender dimension in research is also addressed through a training programme for researchers and the awareness campaign **One Size Does Not Fit All**. It has also published a methodology for integrating the gender dimension in curricula for students and staff of pedagogical faculties.

With regards to **ERA Action 6: *Deepening the ERA through protecting academic freedom in Europe***, the promotion of international cooperation in R&I and access to large research infrastructures are the most important initiatives. The European Commission has launched, under the Action and within the framework of the Horizon Europe Policy Support Facility (PSF), a **Mutual Learning Exercise (MLE) on Tackling Foreign Interference in Research and Innovation (R&I)**.²⁴ Czechia was one among 13 countries participating in this MLE activity under the ERA Action 6. In this sense, the country was the first host of an MLE on Tackling Foreign Interference in R&D in June 2023 in Prague.

To implement **ERA Action 7: *Upgrade EU guidance for a better knowledge valorisation***, the **NRDIP 2021+** document specifies that all new research programmes receiving public support must ensure co-operation between scientific research and practice. Scientific results must benefit not only the industry sector, but also the social sciences and humanities. For example, the **TACR** co-operates with the **Czech Ministry of Culture** and suggests themes for research grants. The TACR also implements a number of competitive grant programmes (e.g. SIGMA,

²² <https://vyzkum.gov.cz/FrontClanek.aspx?idsekce=913172>

²³ <https://www.vlada.cz/assets/ppov/gcfge/Gender-Equality-Strategy-2021-2030.pdf>

²⁴ Mutual Learning - PSF | Research and Innovation (europa.eu)

GAMA, TREND, TRIO) to support knowledge valorisation. The country took part in the **Awareness Raising Campaign on Knowledge Valorisation in April 2023** in the framework of a **Tour des Capitales** organised by DG RTD.²⁵ Additionally, the CRDI established a working group on knowledge transfer in March 2023, that aims to strengthen transfer of scientific results into practice, establishing spin-off companies, and linking the science sector with the public administration.

As for **ERA Action 8: Strengthen sustainability, accessibility, and resilience of research infrastructures in the ERA**, the **NRDIP 2021+** document defines a "complementary system of finance for research organisations with large infrastructures".²⁶ The measure argues for a 'bottom-up approach' to interconnect research infrastructures with grand social challenges and the needs of the Czech businesses. In 2010, Czechia established the **Council for Large Research Infrastructures**²⁷ which develops the **Roadmap of Large Research Infrastructures**. The latest edition of the Roadmap, updated in 2023,²⁸ introduces the strategy of large research infrastructures' funding in 2023-2026. Additionally, in 2019 the **ESFRI roadmap**²⁹ was passed.

Since 2014, the MEYS organises international periodical assessments of the infrastructures' performance. The last assessment was performed in 2021 and identified a tendency to create links to and provide support through ESIF or similar plans.³⁰ The **Jan Amos Komensky Operational Programme** (JAKOP, Priority 1), for example, allocates EUR 802.78 million to research infrastructures and capacities across the programming period of 2021-2027.

ERA Action 9: Promote a positive environment and level playing field for international cooperation based on reciprocity is also addressed by the **NRDIP 2021+** document. The document mentions support for young and talented scientists via the **EXPRO and JUNIOR STAR** programmes. Czechia wants to benefit from co-operation at the European level, to enhance global engagement through initiatives as the **Horizon Europe, ERC, EIC, COST and EUREKA** programmes. In addition, MEYS is actively engaging within the Multilateral Dialogue on values and principles in international cooperation.

Horizontal support to international co-operation is provided by the National Centre for Information Support to Research, and initiatives as the **TACR's Starfos** full-text search engine and the **CzechELib** among others. Progress towards achieving ERA objectives relevant to the ERA Priority Area 1

2.1.2. Progress towards achieving ERA Priorities

According to **Sub-priority 1.1. Open science**, the indicator shows that 34.08% of total Czech **scientific publications (with DOI) accounted for open access** in 2019 (EU-27: 39.17%). In addition, Czechia participated in 25 **European research infrastructures** in 2021 (Figure 6 in Annex 1), supporting **Sub-priority 1.2. Research infrastructures**.

²⁵ Join the European Union campaign to boost knowledge valorisation - European Commission (europa.eu)

²⁶ Ibid.

²⁷ https://www.vyzkumne-infrastruktury.cz/wp-content/uploads/2022/08/Rada-pro-velke-vyzkumne-infrastruktury_cz-7.pdf

²⁸ https://www.vyzkumne-infrastruktury.cz/wp-content/uploads/2023/11/Cestovni-mapa-VVI-2023-2026_elektronicka-verze.pdf

²⁹ https://www.vyzkumne-infrastruktury.cz/wp-content/uploads/2019/11/Aktualizace-Cestovni%C3%AD-mapy-2019_en.pdf

³⁰ <https://www.vyzkumne-infrastruktury.cz/2020/09/mezinarodni-hodnoceni-velkych-vyzkumnych-infrastruktur-cr-v-roce-2021/>

Sub-priority 1.3: Gender equality, equal opportunities for all and inclusiveness, Czechia showed limited progress towards ERA indicators related to gender equality in the R&I sector. The **proportion of female doctoral graduates in STEM** grew from 35.96% to 40.38% in 2013-2020 in Czechia (Figure 7 in Annex 1). The **proportion of women in authorships of the top 10% most cited publications** increased from 25.9% to 28.5% in Czechia, while from 28.0% to 32.6% in the EU-27 across 2010-2018 (Figure 9 in Annex 1). **The proportion of papers with mixed gender authorship** increased from 45% to 55.4% in Czechia, while this statistic increased from 52.2% to 62.7% in the EU-27 in the period 2010-2020 (Figure 8 in Annex 1). Finally, the **Women Digital index** in Figure 10 in Annex 1 showed that the Czech value was around the 50% and hence, below the EU average.

Sub-priority 1.4: Researchers' careers and mobility and research assessment and reward systems. There were some positive trends in research careers in Czechia in the last decade. The **share of foreign doctorate students** increased from 16.3% to 23.3% in the EU-27, compared with 12.8% to 22.3% in Czechia in the period 2015-2020 (Figure 11 in Annex 1). The **number of new doctoral graduates (aged 25-34) per 1,000 inhabitants** have been declining in the EU. The respective numbers dropped from 0.9 to 0.7 in the EU-27, while from 0.8 to 0.7 in Czechia in the period 2013-2020 (Figure 12 in Annex 1). Decreases in the numbers of doctorate graduates were only partly offset by immigration from abroad. Czechia reported some increases in numbers of foreign doctorate students (from Slovakia and Eastern Europe in particular). In addition, 4.3% of people **employed in science and technology changed their jobs in 2020**, compared with 6.8% in the EU-27 area (Figure 13 in Annex 1).

Regarding **Sub-priority 1.5: Knowledge valorisation**, the indicators suggest mostly positive developments in fostering knowledge valorisation in Czechia. The **share of public-private co-publications per million population** has been on rise both in Czechia and the EU. The respective shares in Czechia (EU-27) increased from 78.29 (86.38 in EU-27) in 2010 to 177.23 (133.89 in EU-27) in the period 2011-2021 (Figure 14 in Annex 1). Similar trends were observed in the **number of PTC patent applications** (Figure 15 in Annex 1). The **business enterprise researchers as % of national total** (Figure 16 in Annex 1) is similar both in the EU-27 average and Czechia. However, the Czech value is slightly below and drops in 2020 with a value of 50.96%.

The **numbers of business enterprise researchers in full-time employment (FTE) per thousand** increased from 3.04 to 5.34 in Czechia, compared with 4.38 to 6.89 in the EU-27 in the period 2010-2020. The gap between Czechia and EU-27 has narrowed in the last decade (Figure 17 in Annex 1). The **share of innovating firms collaborating with HEI/PRO** (out of all innovative firms) changed from 11.3% to 11.75% in period 2010-2020 in Czechia. The respective EU-27 shares increased from 10.9% to 13.27% in the same period (Figure 18 in Annex 1). There are some best practice examples and methodologies for knowledge valorisation that emerged from Czechia. For example, there is the '**KABADA** (Knowledge Alliance of Business idea Assessment: Digital Approach) Erasmus+ project. Additionally, the '**GAMA 2** programme supports the verification of outputs/results of applied research. Furthermore, the '**Supporting valorisation of social sciences and humanities research**' project interconnects science with the social sciences and humanities.

In relation to **Sub-priority 1.6: Scientific leadership**, the **number of Czech scientific publications among the top-10% most cited publications** worldwide (as a percentage of all publications) increased from 4.8% in 2010 to 5.2% in 2020. The respective EU-27 shares were 10.1% and 9.8% (Figure 19 in Annex 1). The absolute gap in excellence research, however, remained substantial. In addition, the **Academic Freedom Index** (Figure 20 in Annex 1) shows a similar performance of both regions, with a slightly higher value for Czechia.

Czechia made some progress in relation to **Sub-priority 1.7: Global engagement. International co-publications with non-EU partners** (per 1,000 researchers in FTE in the public sector) increased from 548 to 1317 in the period 2010-2022, compared with 217 to 359 in the EU-27 in the same period (Figure 21 in Annex 1). Figure 22 in Annex 1 shows the **European and international co-patenting in EPO applications at national and EU level**. The Czech value is noticeable lower than the European one and stagnated along time.

2.2. ERA Priority 2: Taking up together the challenges posed by the twin green and digital transition and increasing society's participation in the ERA

2.2.1. State of play in the implementation of the Actions

ERA Action 10: Make EU R&I missions and partnerships key contributors to the ERA is addressed by the **NRDIP 2021+** strategy.³¹ The strategy accentuates the need for improved participation of Czech research bodies and enterprises in the ERA programmes. The participation in EU partnerships is supported by the **MEYS and TACR grant programmes** in co-operation with Ministry of Industry and Trade, Ministry of Transport and Ministry of Environment. Czechia also established its national **R&I Liaison Office for Education and Research (CZELO)** in Brussels.³² The **MEYS and CRDI** are the key policy bodies for allocating national budget to implementing EU R&I missions and partnerships on national level thereby enabling the participation of Czech institutions. MEYS is also actively engaging in the MLE on R&I missions, as well as organising a MLE on mission portfolio in November 2023 in Prague.

As for **ERA Action 11: An ERA for green energy transformation**, the country is projected to reach its new 2030 climate target for effort sharing sectors, if it implements the additional measures as planned.³³ The report recognises that the Czech RRP allocated 41.6% of its **Recovery and Resilience Facility** grants to key reforms and investments to attain climate objectives. The Action is also addressed by the **NRDIP 2021+** document.³⁴ The document contains a separate measure on research focussed on adaptation to climate change. The **Czech State Energy Policy** sets state objectives in energy management. The **TACR** grant programmes also aim at addressing adaption to climate change.

ERA Action 12: Accelerate the green/digital transition of Europe's key industrial ecosystems is addressed via the **'Digital Czechia 2018+' strategy**.³⁵ The strategy (last updated in 2022) states a mission "to provide user-friendly and efficient services for citizens and firms".³⁶ The Czech Government also passed the **National Strategy for Artificial Intelligence 2019** (NSAI, last updated in 2023).³⁷ The **2023 European Semester Report** describes progress towards digital transformation in Czechia. The report finds that Czech SMEs are almost in line with the EU average on digital transformation and that Czechia continues to make progress on the digitalisation of public services. It also identifies some weaknesses, such as challenges in digital infrastructure/connectivity, and a below average use of artificial

³¹ https://www.mpo.cz/assets/en/business/ris3-strategy/2022/1/National-RIS3-Strategy_2.pdf

³² <https://www.dzs.cz/en/czelo>

³³ 2023 European Semester Report for Czechia (p32). https://economy-finance.ec.europa.eu/publications/2023-country-report-czechia_en

³⁴ https://www.mpo.cz/assets/en/business/ris3-strategy/2022/1/National-RIS3-Strategy_2.pdf

³⁵ The Czech Government passed the 'Digital Czechia 2018+' strategy via the Government resolution no. 629 of 3rd October 2018.

³⁶ https://www.dataplan.info/img_upload/7bdb1584e3b8a53d337518d988763f8d/informacni-koncepc-cr_2022.pdf

³⁷ https://www.vlada.cz/assets/evropske-zalezitosti/umela-inteligence/NAIS_kveten_2019.pdf

intelligence (AI) and big data. The **NRDIP 2021+** document contains a policy measure on the digital transformation of businesses.³⁸ The measure supports the introduction of digital and AI-based innovations in SMEs via networks of Digital Information Hubs. Another policy measure aims at the implementation of the **NSAI**. The MEYS and CRDI are key policy making bodies for ERA Action 12.

As for **ERA Action 13: Empower Higher Education Institutions to develop in line with the ERA, and in synergy with the European Education Area**, the **EU's Education and Training Monitor** from 2022 found that Czechia performs poorly in early learning and tertiary education. The **2023 European Semester Report** finds that Czechia is facing significant labour and skills shortages, particularly of highly skilled workers, but some population groups face difficulties in access to training and employment. The report also points to Czechia's below-average participation rates in life-long learning. Measures supporting Action 13 are funded by the **Jan Amos Komensky Operational Programme**,³⁹ TACR grant programmes, as well as programmes on large research infrastructures.

ERA Action 14: Bring Science closer to Citizens is implemented by the **NRDIP 2021+** document.⁴⁰ It supports the applications of research results in social science and the humanities. The measure acknowledges that public bodies, including the state administration, are beneficiaries of research results, rather than firms. The measure aims to support societal engagement via special programmes by the **TACR** and the **Czech Ministry of Culture**. ERA Action 14 is also supported by prizes and awards for excellent scientists and innovators (e.g. 'The Czech Head', 'Innovation of the Year', MEYS awards), and shows and promotions ('Science Fair', Researchers' Night).

2.2.2. Progress towards achieving ERA Priorities

Sub-priority 2.1: Challenge-based ERA actions is analysed by a broad number of indicators. The ERA indicators suggest that the **Government Budget Allocations for R&D (GBARD) by NABS** in environment; transport, and telecommunications and other infrastructure were rather low (EUR 46.8 million and EUR 46.3 million respectively but increasing in the period 2010-2021). The GBARD in *environment*, however, decreased significantly in the same period (Figure 23 in Annex 1). The **environmentally related government R&D budget as a% of total government R&D** illustrates stagnation over the period 2010-2021 (Figure 25 in Annex 1).

Moreover, **R&I investments (transnational cooperation) GBARD (EUR) allocated to Europe-wide transnational bilateral or multilateral public R&D programmes per FTE researcher** (Figure 24 in Annex 1) decreased for both regions in the period 2010-2020, with Czechia remaining below the EU-27 average.

As for the **national public and private investments as suggested in the SET Plan progress report 2021** (Figure 26 in Annex 1), Czechia remains noticeably below the EU average, but the country experiences a significant improvement in the period 2010-2019. Still, in 2020 the value is reduced and stays around a 171. Czechia's performance in the **'OECD Patents on environment technologies'** indicator has undergone fluctuations over the period 2010-2019, with a slight decline (Figure 27 in Annex 1).

³⁸ https://www.mpo.cz/assets/en/business/ris3-strategy/2022/1/National-RIS3-Strategy_2.pdf

³⁹ <https://opjak.cz/en/>

⁴⁰ https://www.mpo.cz/assets/en/business/ris3-strategy/2022/1/National-RIS3-Strategy_2.pdf

Sub-priority 2.2: Synergies with education and the European Skills Agenda. Czech researchers received less training and were less mobile than those in the EU-27. 42.7% of **researchers received transferable skills training** in Czechia, compared with 46.3% in the EU-27 in 2019 (Figure 28 in Annex 1).

Sub-priority 2.3: Synergies with sectorial policies and industrial policy in order to boost innovation ecosystems. Direct **government support and indirect government support through R&I tax incentives** decreased from 0.1423 to 0.1193 in Czechia, compared to an increase from 0.1503 to 0.1815 in the EU-27 in the period 2010-2020 (Figure 29 in Annex 1).

For **Sub-priority 2.4: An active citizen and societal engagement in R&I in all its dimensions**, the ERA dashboard mentions that 43.2% of citizens had **trust in science** in the EU-27, compared with 44.0% in Czechia in 2021 (Figure 30 in Annex 1). **Research on social innovation** (measured via publications on 'social innovation' or 'social entrepreneurship' per million population) accounted for steady increases in the EU-27, while the Czech performance in the indicator was rather volatile in period 2011-2021 (Figure 31 in Annex 1).

2.3. ERA Priority 3: Amplifying access to research and innovation excellence across the Union

2.3.1. State of play in the implementation of the ERA Actions

ERA Action 16: Improve EU-wide access to excellence is addressed by the **NRDIP 2021+ strategy**.⁴¹ The document mentions **GACR and TACR** schemes supporting increased participation of Czech scientists and institutions in the EU-wide programmes, as well as support for the **EUREKA and COST schemes**. Action 16 is also supported by programmes on large research infrastructures (funded by **JAKOP**) and activities envisaged by the Czech Innovation and RIS3 strategies. Czechia is actively taking part in the ERA Forum sub-group on Access to Excellence – 'R&I and Cohesion Managing Authorities' Network (RIMA) that is co-chaired by a Czech representative.⁴²

As to implement **ERA Action 17: Enhance the strategic capacity of Europe's public research performing organisations** the **NRDIP 2021+** envisages increasing institutional finance for top performing institutions. Most activities under Action 17 are funded from the **GACR and TACR programmes**.

2.3.2. Progress towards achieving ERA Priorities

There is only one indicator measuring performance on **Sub-priority 3.1: More investments and reforms in countries and regions with lower R&I performance**. The **increase (in percentage points) of total R&D expenditure expressed as a percentage of GDP** is overall positive, except for 2016 when the R&D expenditure decreased. Overall, the increase has diminished from 0.21 in 2011 to 0.01 in 2021 (Figure 32 in Annex 1).

⁴¹ https://www.mpo.cz/assets/en/business/ris3-strategy/2022/1/National-RIS3-Strategy_2.pdf

⁴² <https://errin.eu/news/new-era-forum-sub-group-access-excellence-and-funding-synergies-kicked>

2.4. ERA Priority 4: Advancing concerted research and innovation investments and reforms

2.4.1. State of play in the implementation of the ERA Actions

As for the implementation of **ERA Action 19: Establish an efficient and effective ERA monitoring mechanism**, the **NRDIP 2021+** document implements policy measures on a single legislative framework for the R&I system and long-term and evidence-based support to R&I.⁴³ The **NRDIP 2021+** envisages several analytical and evaluation methods, including technology foresight and technology assessment. The '**Strategic Intelligence for Research and Innovation**' (**STRATIN+**) project provides analytical capacity and data-driven strategic information to public administrations and research organisations.⁴⁴

2.4.2. Progress towards achieving ERA Priorities

Sub-priority 4.1: Coordination of R&I investments. The **share of public R&I expenditures financed by the private sector** stagnated both in the EU-27, and in Czechia over the last decade (Figure 32 in Annex 1). The higher education institutions, however, became more capable to procure business income than public research institutions.

3. Country-specific drivers and barriers

Key drivers of the Czech R&I system include decent levels of financial support to R&I (including foreign resources), high shares of innovating firms and increasing numbers of private-public co-publications. The EIS report acknowledges that **foreign direct investment** was an important driver of business research in the last decade. As for the public support to R&I, business research and large research infrastructures receive the highest financial support. The 2023 European Semester Report for the Czech Republic refers to findings by the EIS and acknowledges “the below the EU average, but steadily increasing R&D intensity”.⁴⁵

Czechia has not sufficiently addressed some major barriers to R&I development, such as the **lack of a highly skilled workforce**, and **weak science-business linkages** so far. The 2023 European Semester Report observes labour shortages in sectors related to the green transition and emphasises the need for upskilling and reskilling in Czechia. The report also finds that R&I performance is hampered by persistent difficulties in developing a highly skilled workforce in science & engineering. Labour force shortages and skills mismatches are often identified as one of the biggest hurdles for innovation diffusion.⁴⁶ For this reason, Czechia has partially offset the lack of domestic highly skilled labour via immigration.

The European Semester Report also finds “**insufficient incentives for creating spin-offs and regulatory barriers**” to development of venture capital market.⁴⁷ These barriers also are noted in the OECD STIP survey, the Czech National Reform Programme, the NRDIP 2021+ document and annual analyses of the CRDI. The MEYS presented draft of a new law on research, development and innovation, and knowledge transfer in Autumn 2023. The new

⁴³ https://www.mpo.cz/assets/en/business/ris3-strategy/2022/1/National-RIS3-Strategy_2.pdf

⁴⁴ <https://www.tc.cz/en/projects/18/stratin-plus->

⁴⁵ https://economy-finance.ec.europa.eu/system/files/2023-05/CZ_SWD_2023_603_en.pdf

⁴⁶ Ibid.

⁴⁷ Ibid

law should support R&D in some key technologies (e.g., artificial intelligence, quantum technologies, and semiconductors).

4. Final remarks

Czechia is committed to all ERA actions under the ERA Policy Agenda. The agenda is mainly implemented by the main document for R&I in the country, the NRDIP 2021+, as its objectives partly overlap with the ERA Priorities. In addition, initiatives at the national level as the Innovation Strategy for 2019-2030 (ISCR) are also key for strengthening the research, development and innovation systems in the country.

Czechia has experienced a general improvement in relation to ERA Priority 1, being above or at least close to the EU-27 average in most of the indicators. However, the data registered on the indicators under ERA Priority 2 has been decreasing in the last years and remain below the European average. In regard to ERA Priority 3, the country has suffered constant fluctuations over the analysed period but recently it has been more stable and remains around the European value. Lastly, the indicator under ERA Priority 4 has remained stagnant. Still, the data is below the EU-27 and therefore, further efforts would be beneficial.

The main strength of the country in terms of R&I, is the high level of foreign direct investment that it receives from international partners. This allows the country to develop new initiatives and improve the current strategies in the areas related to research, innovation and development. However, the lack of skilled workers and the weak links between science and the private entities, hinders the country's growth in R&I.

Overall, the country has demonstrated its commitment towards ERA through the implementation of a variety of initiatives and through engaging in the European community. Although some incentives and further motivation will be needed to address the current challenges, Czechia's involvement with the ERA Policy Agenda is expected to continue increasing.

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6. Annexes

6.1. Annex 1: Graphs

The 2023 ERA Scoreboard and ERA Dashboard indicators used in the country report are presented in this annex. Detailed information on the data sources, description of the indicators, time period for which the data is available, and the necessary calculations can be found in the ERA Scoreboard and ERA Dashboard Methodology Report. The most recent available data for each indicator has been used.

General Indicators

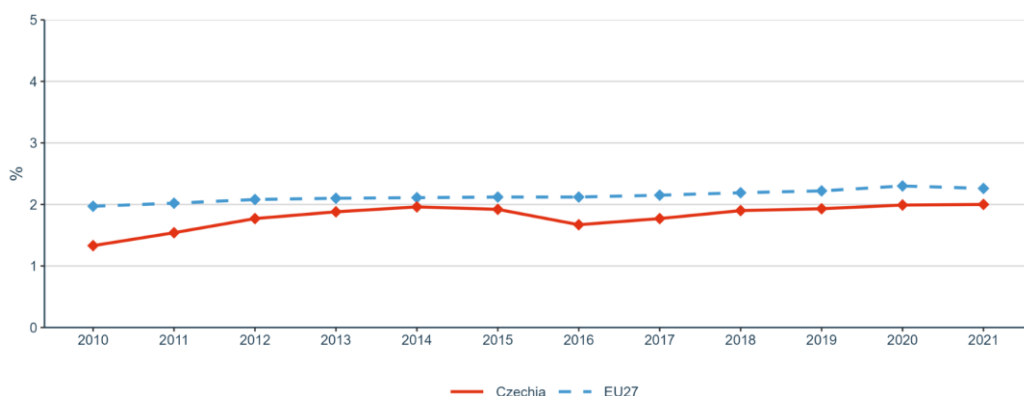


Figure 1: Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP

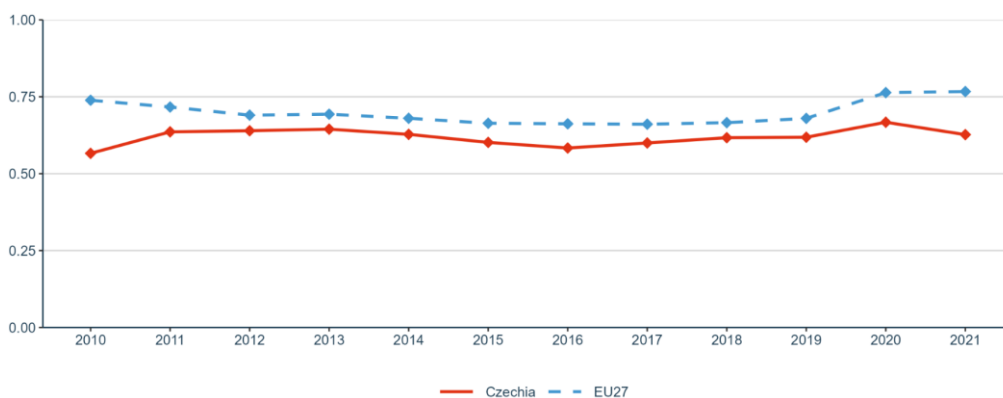


Figure 2: Government Budget Allocations for R&D (GBARD) as share of GDP

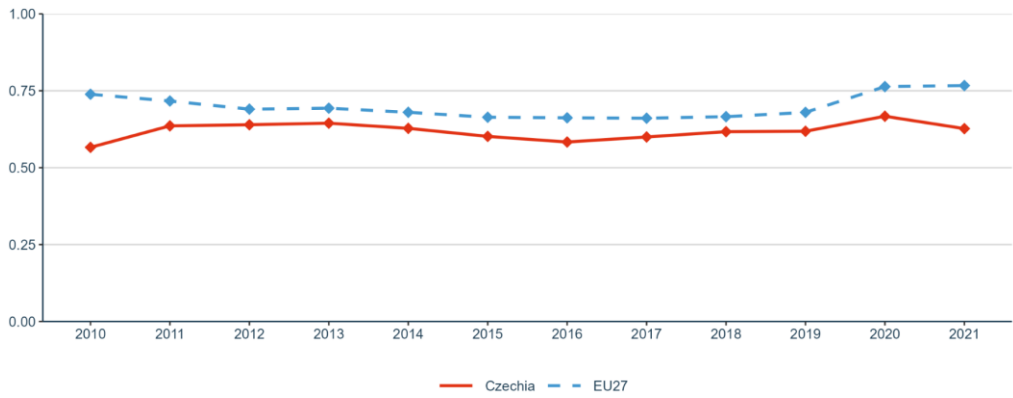


Figure 3: Researchers (in full-time equivalent) per million inhabitants

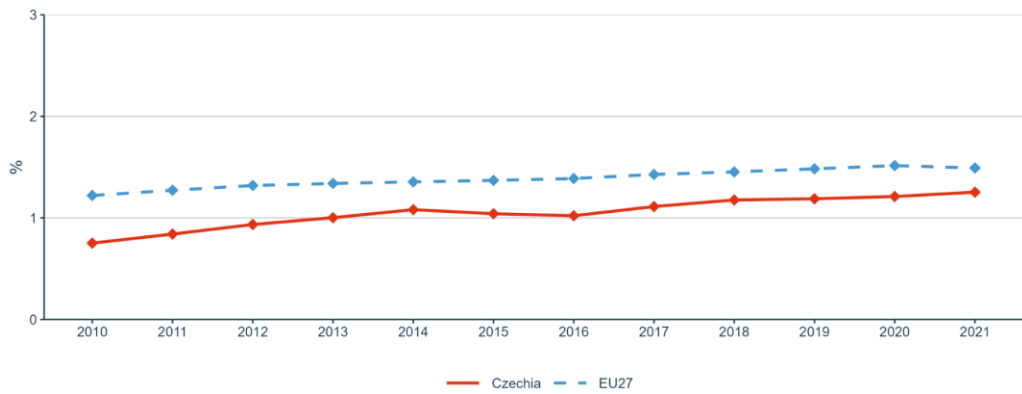


Figure 4: Business Enterprise expenditure on R&D (BERD) as a percentage of GDP

Priority 1: Deepening a truly functioning internal market for knowledge

Sub-priority 1.1: Open Science

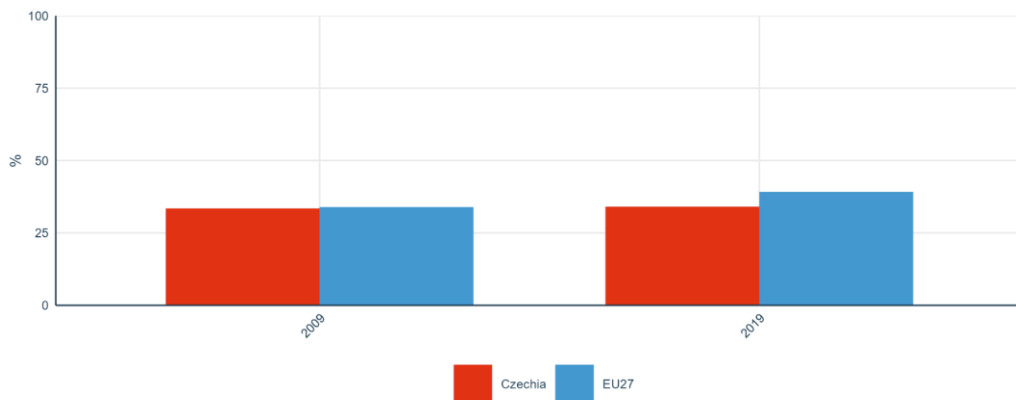


Figure 5: Share of publications available in open access

Sub-priority 1.2: Research infrastructures

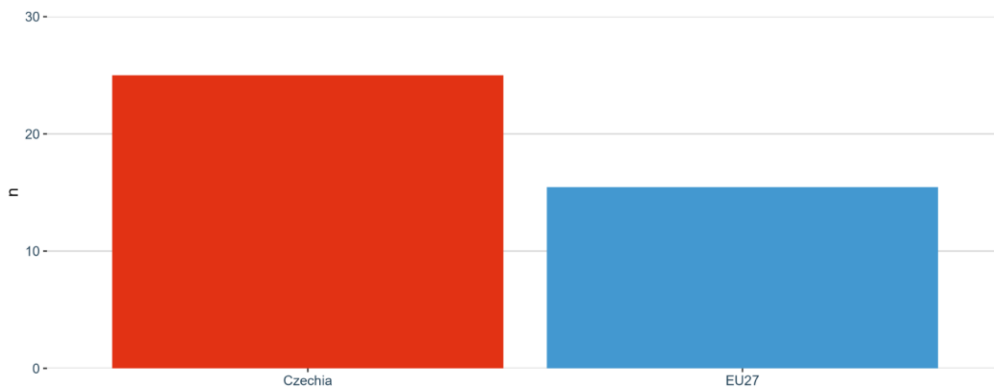


Figure 6: Number of European research infrastructures in which a Member State or an Associated Country participated (financially contributes to operations) in 2021

Sub-priority 1.3: Gender equality, equal opportunities for all and inclusiveness

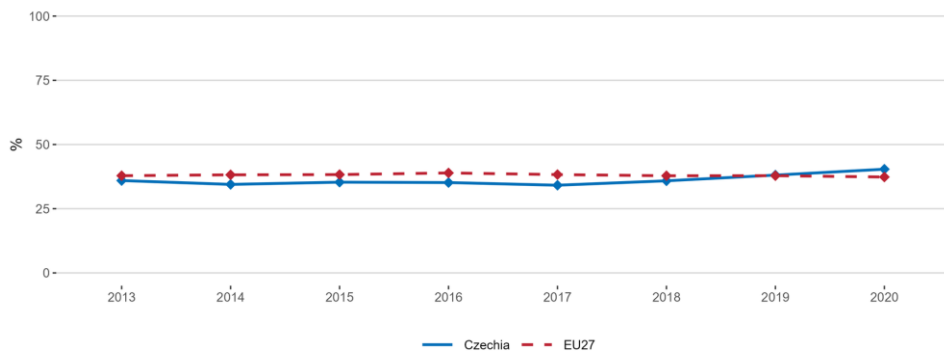


Figure 7: Proportion (%) of women among doctoral graduates by narrow fields of Science, Technology, Engineering and Mathematics (STEM)

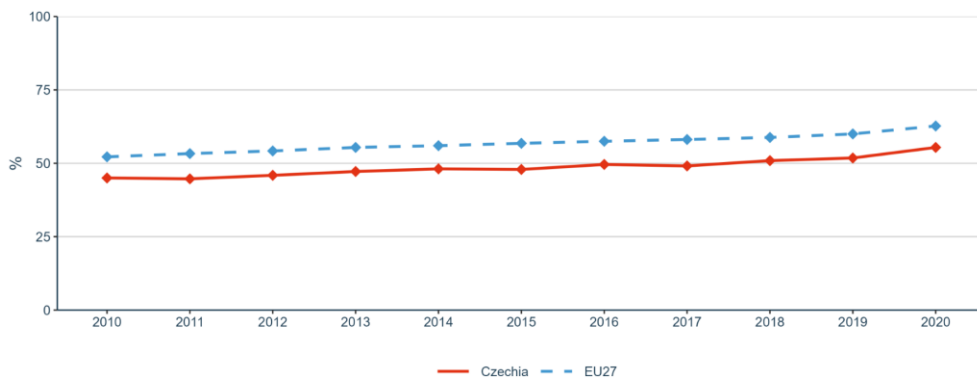


Figure 8: Proportion of papers with mixed gender authorship, 2000–2020

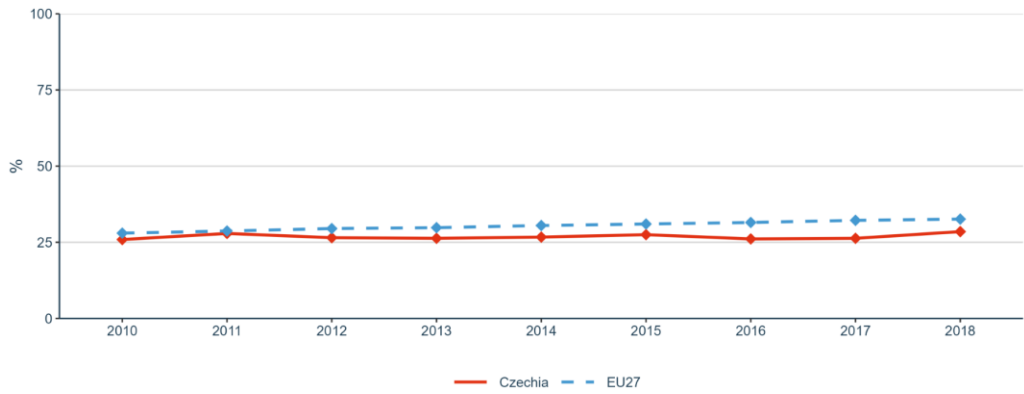


Figure 9: Proportion of women in authorships of the top 10% most cited publications, 2000–2018

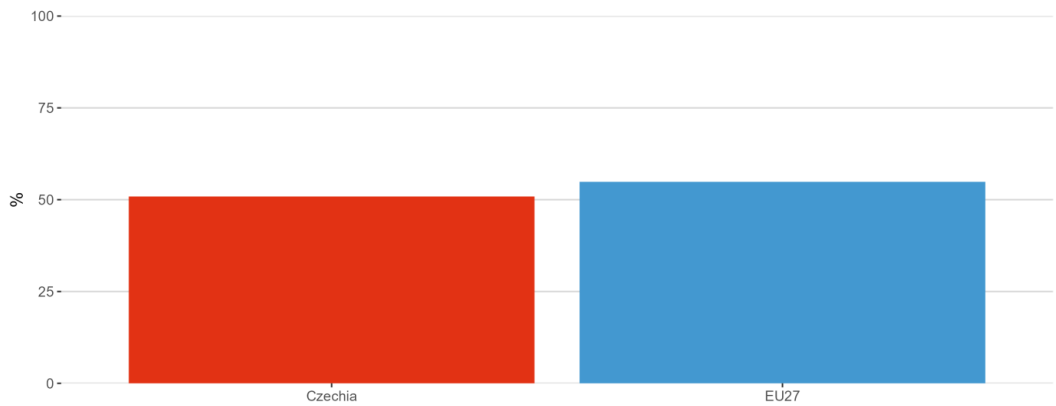


Figure 10: Women in Digital Index in 2022

Sub-priority 1.4: Researchers' careers and mobility and research assessment and reward systems

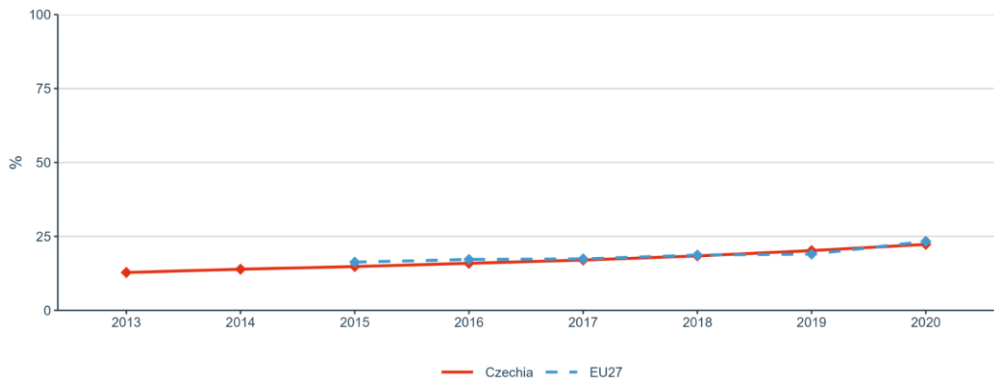


Figure 11: Share of foreign doctorate students as a percentage of all doctorate students

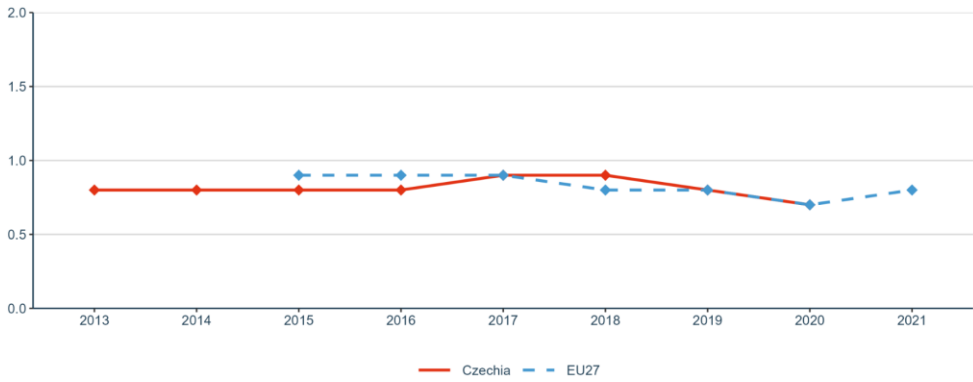


Figure 12: New doctorate graduates per 1,000 inhabitants aged 25-34

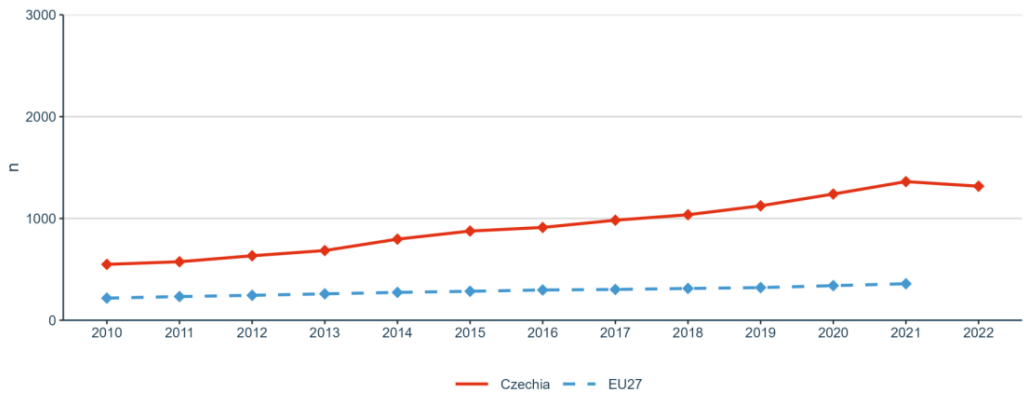


Figure 13: Job-to-job mobility of Human Resources in Science and Technology

Sub-priority 1.5: Knowledge valorisation

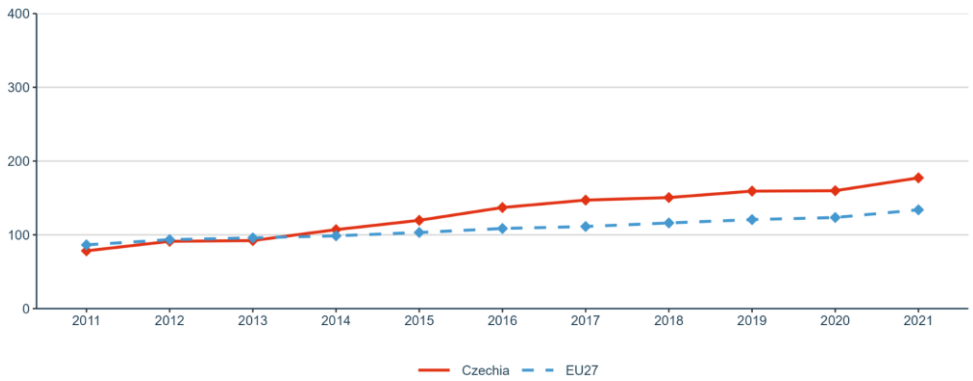


Figure 14: Share of public-private co-publications

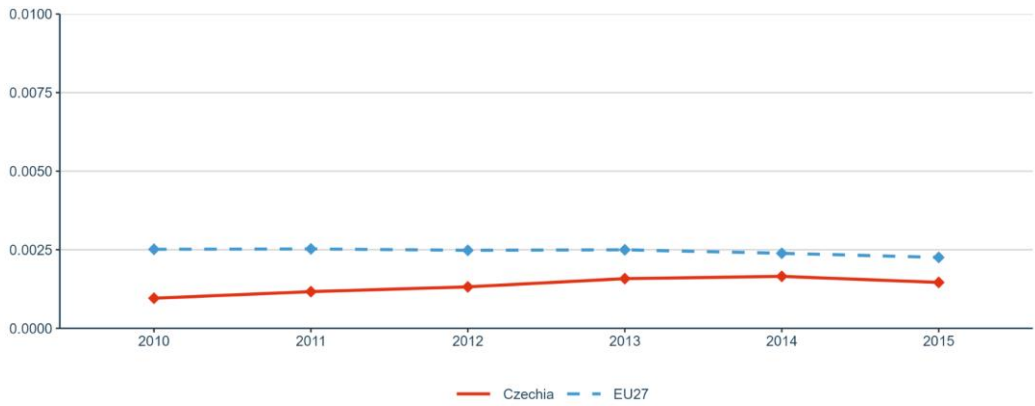


Figure 15: Number of PCT patent applications divided by GDP in million Euros

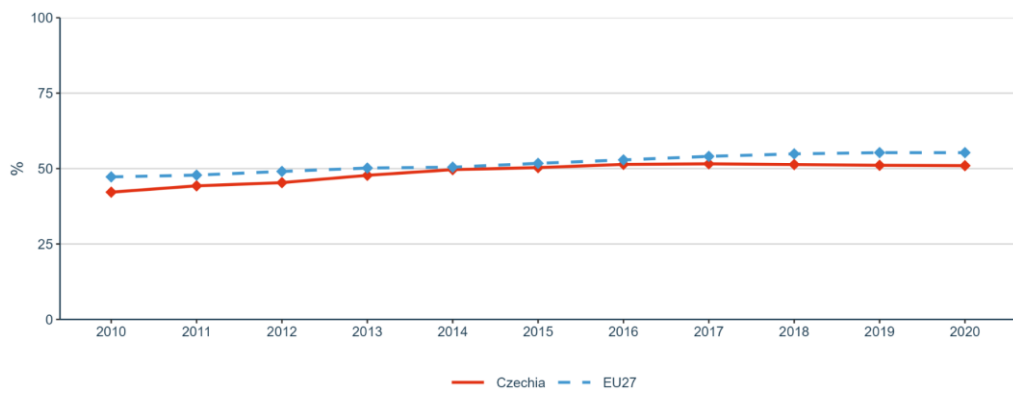


Figure 16: Business enterprise researchers as % of national, total

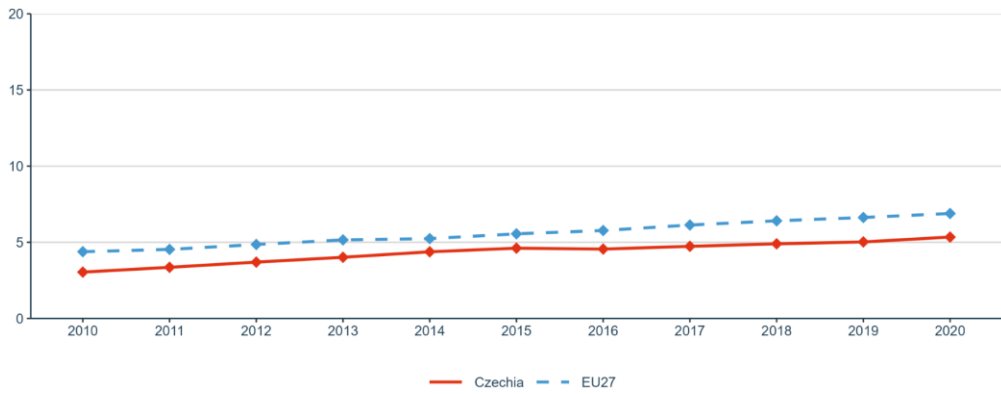


Figure 17: Business enterprise researchers in full-time equivalent per thousand employment in industry

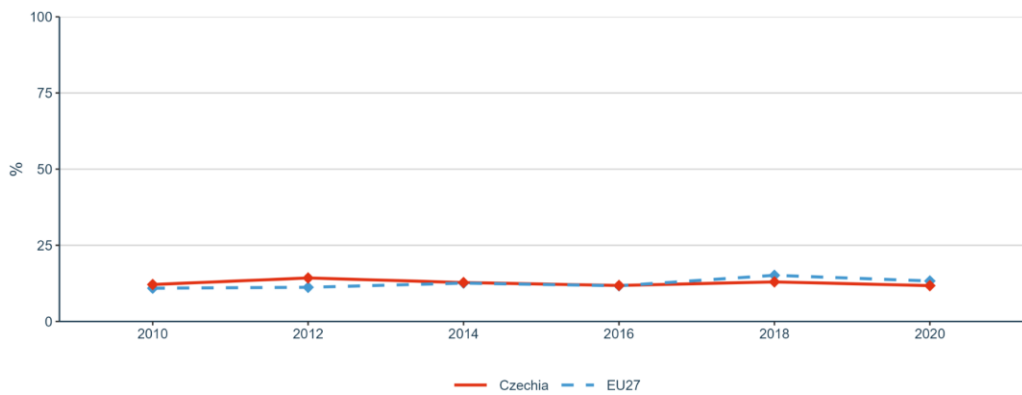


Figure 18: Share of innovating firms collaborating with higher education institutions or public/private research institutions

Sub-priority 1.6: Scientific leadership

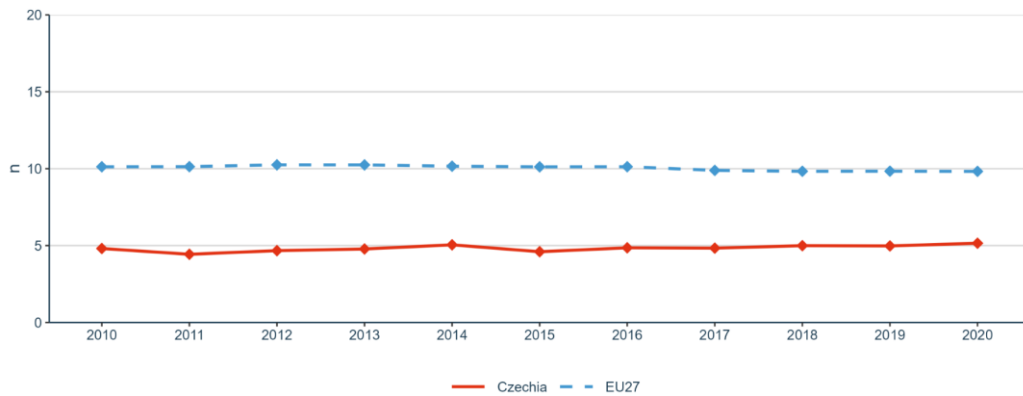


Figure 19: Number of scientific publications among the top-10% most cited publications worldwide as a percentage of all publications

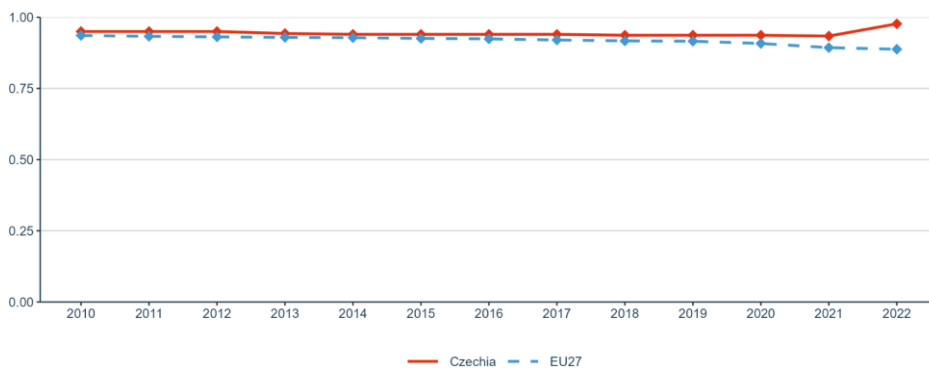


Figure 20: Academic Freedom Index (AFi)

Sub-priority 1.7: Global engagement

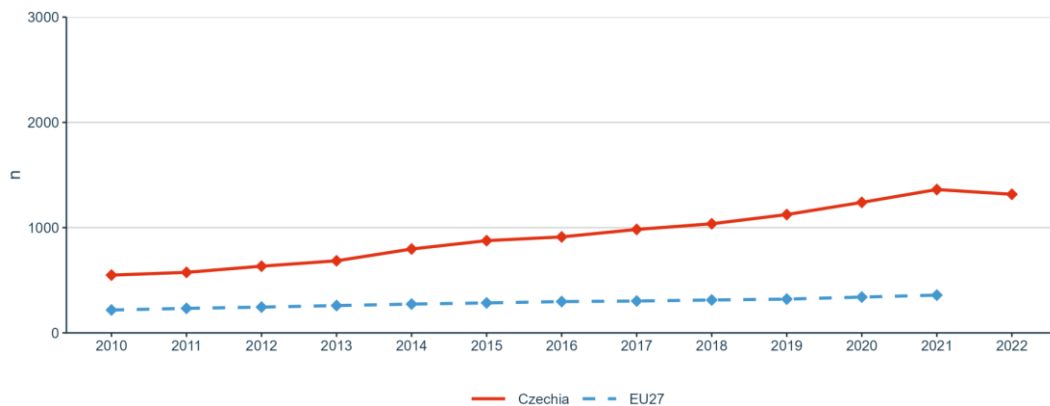


Figure 21: International co-publications with non-EU partners per 1,000 researchers in the public sector

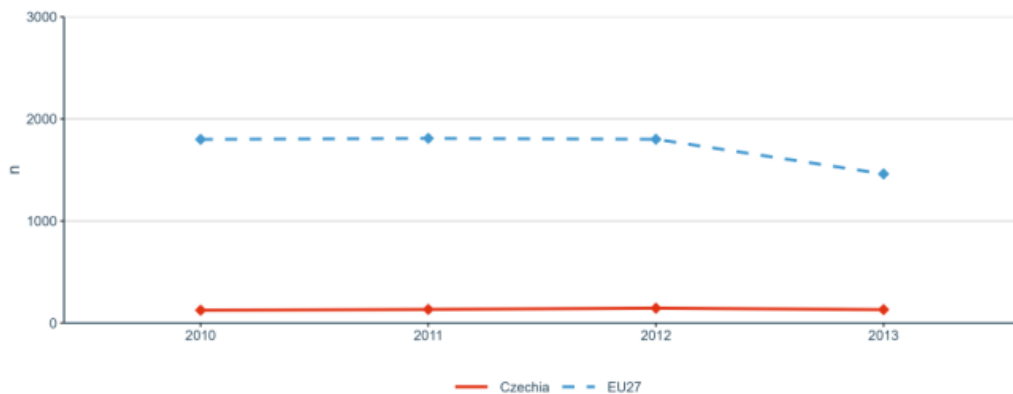


Figure 22: European and international co-patenting in EPO applications at national and EU level

Priority 2: Taking up together the challenges posed by the twin green and digital transition, and increasing society's participation in the ERA

Sub-priority 2.1: Challenge-based ERA actions

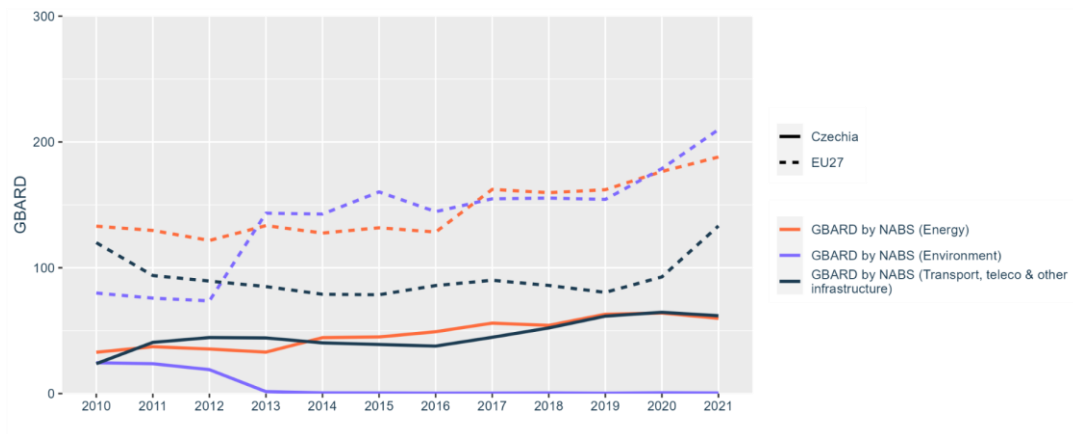


Figure 23: Government budget allocations for R&D (GBARD) by NABS

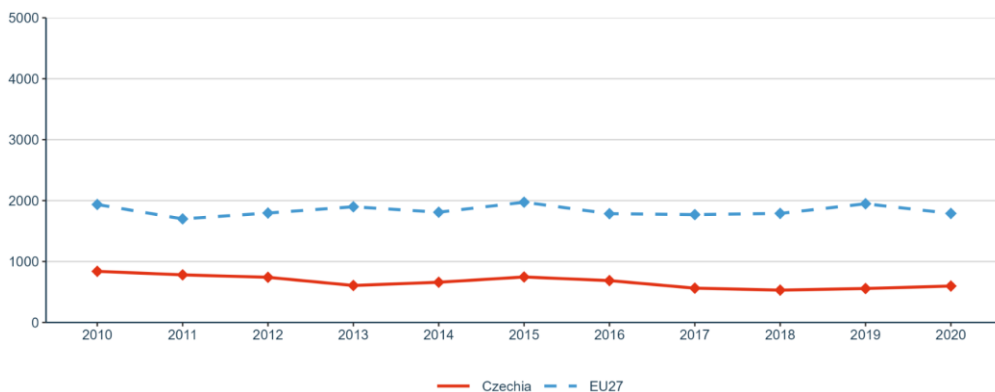


Figure 24: R&I investments (transnational cooperation): GBARD (EUR) allocated to Europewide transnational, bilateral or multilateral, public R&D programmes per FTE researcher in the public sector

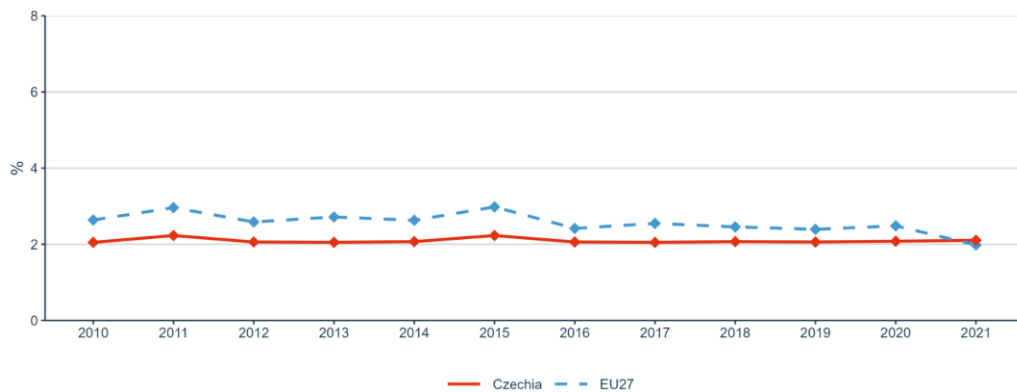


Figure 25: Environmentally related government R&D budget as percentage of total government R&D

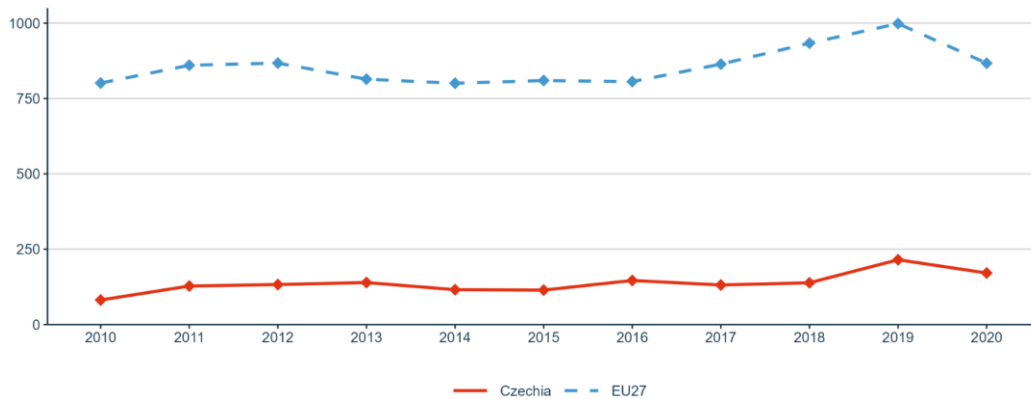


Figure 26: National public and private investments as suggested in the SET Plan progress report 2021

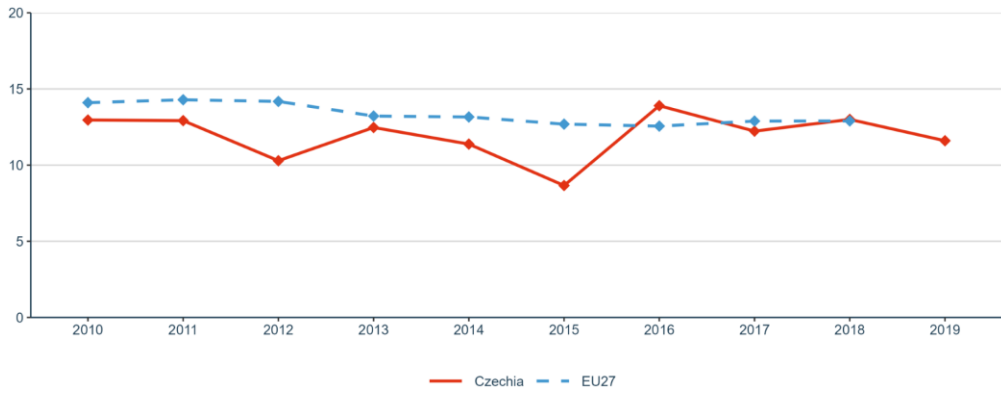


Figure 27: OECD Patents on environment technologies

Sub-priority 2.2: Synergies with education and the European Skills Agenda

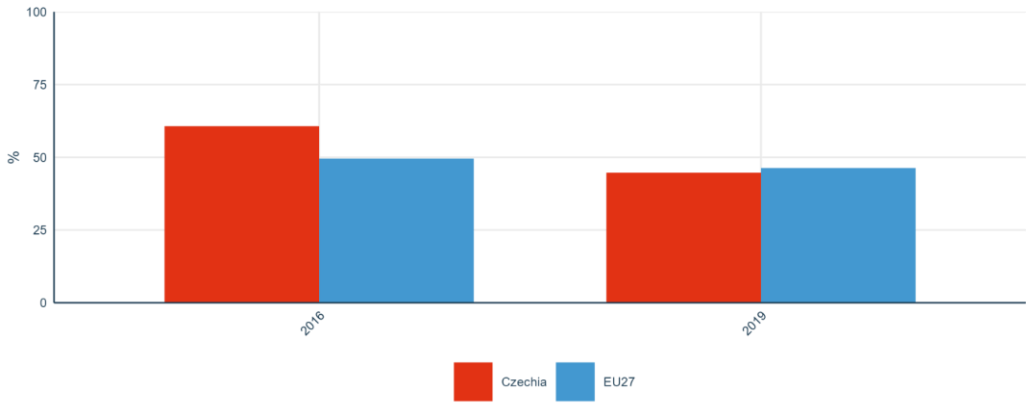


Figure 28: Share of researchers receiving transferable skills training

Sub-priority 2.3: Synergies with sectorial policies and industrial policy, in order to boost innovation ecosystems

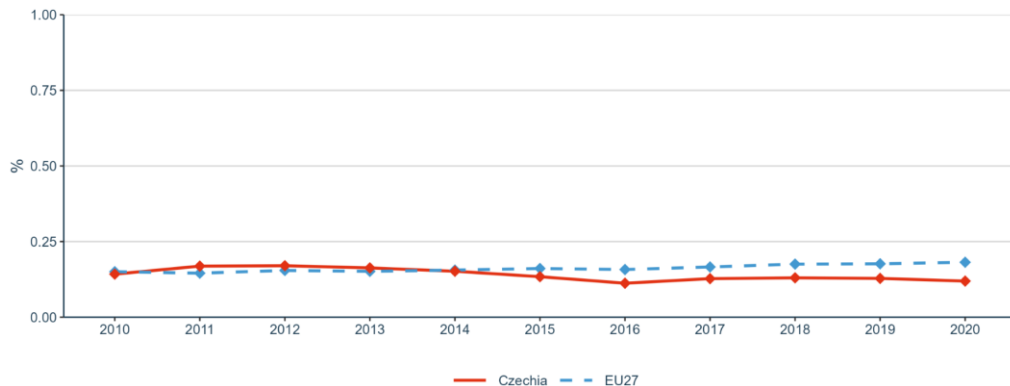


Figure 29: Direct government support and Indirect government support through R&D tax incentives as a percentage of GDP

Sub-priority 2.4: An active citizen and societal engagement in R&I in all its dimensions

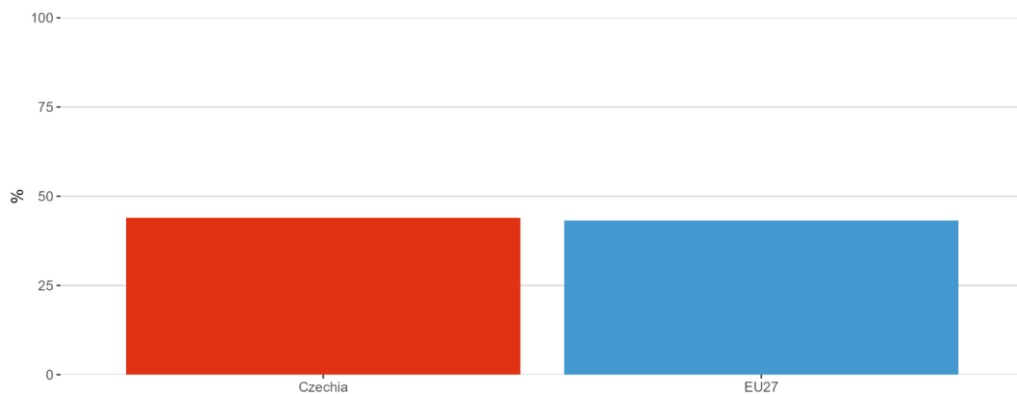


Figure 3030: Trust in science in 2021

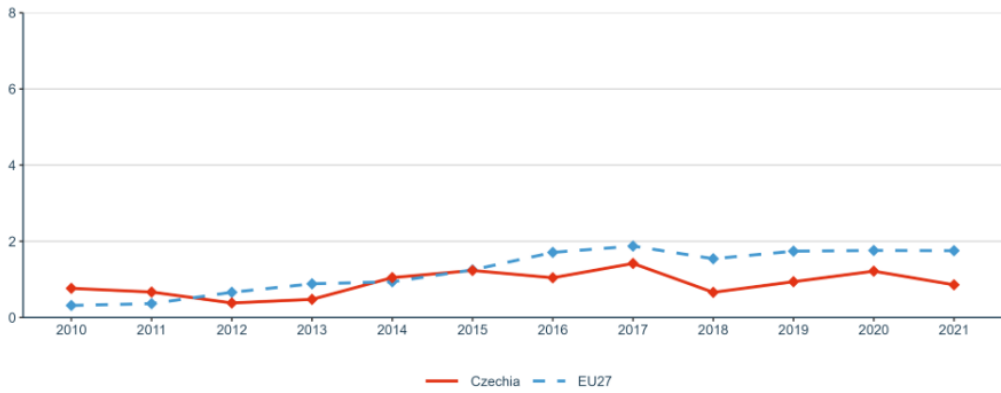


Figure 3131: Research on social innovation (publications on 'social innovation' or 'social entrepreneurship') per million population

Priority 3: Amplifying access to research and innovation excellence across the Union

Sub-priority 3.1: More investments and reforms in countries and regions with lower R&I performance

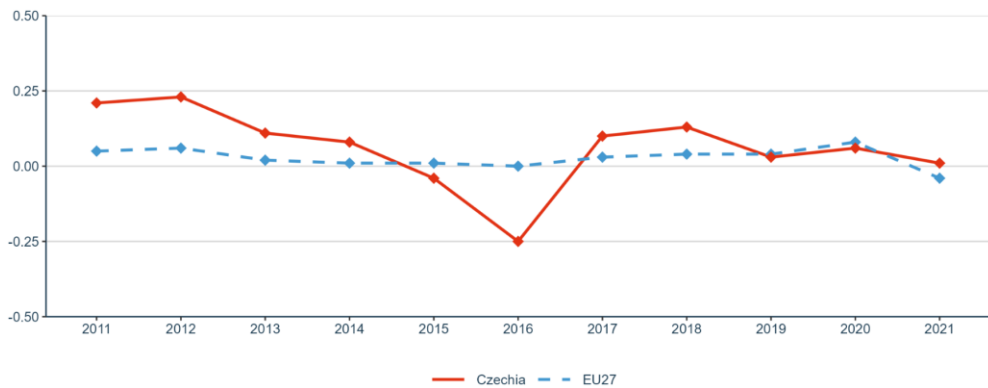


Figure 3232: Increase (in percentage points) of total R&D expenditure expressed as a percentage of GDP

Priority 4: Advancing concerted research and innovation investments and reforms

Sub-priority 4.1: Coordination of R&I investments

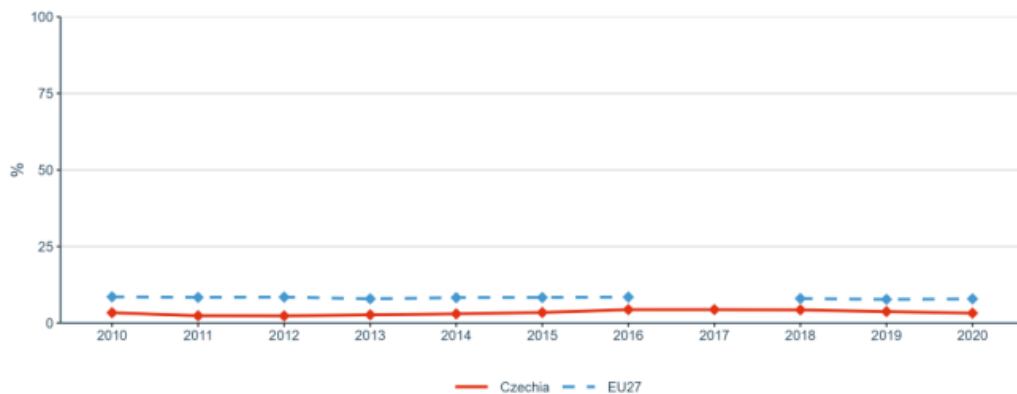


Figure 3333: Share of public R&D expenditures financed by the private sector

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ERA Monitoring 2023: ERA Country Report Czechia.

Research and Innovation policy

