

COUNTRY BRIEFING CZECHIA

Vienna Institute for International Economic Studies

Toward Innovation-driven Growth

Innovation Systems and Policies in EU Member States
of Central Eastern Europe

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EXECUTIVE SUMMARY

The EU member states of Central Eastern Europe (EU-CEE) – Poland, Czechia, Slovakia, Hungary, Slovenia, Croatia, Romania, Bulgaria, Estonia, Lithuania and Latvia – have undergone an impressive economic catch-up process since the early 2000s. However, the previously successful model of adopting labour-intensive production steps as an 'extended workbench' for Western corporations is increasingly reaching its limits, as we demonstrated in a previous study (Grieveson et al., 2021). The fundamental problem is that the key technological competencies and the segments of production with the highest added value are situated in the 'headquarter economies' of Western Europe. In contrast, the EU-CEE countries continue to specialise in labour-intensive production. Coupled with major structural changes such as decarbonisation and digitalisation, this growth model must therefore be replaced by a new one, more strongly driven by innovation. Only then will these countries be able to catch up with Western Europe in terms of productivity and living standards.

In a follow-up study (Zavarská et al., 2023), we investigated how a customised industrial policy could help EU-CEE countries to escape their 'middle-income trap'. The main finding: industrial policy needs to be stepped up in the region, all the more so at a time when countries around the world are rediscovering its significance. In this necessary effort to climb the technological ladder, there is much for EU-CEE to learn from the East Asian tiger states. They share a similar starting-point, namely the dominance of multinational corporations and a highly export-oriented nature, which the East Asian tigers have successfully leveraged to their advantage. With a highly successful industrial policy, these countries have managed to take the technological lead in some areas and create world-class companies, for instance in electronics or semiconductors.

Having established the need for a new growth model and made the case for industrial policy, we turn to innovation, the other 'missing piece' that will be required to achieve the next stage of convergence in EU-CEE. We explore how these countries could establish innovation systems at the national level, enabling them to catch up technologically and economically with the front-runners in Western Europe.

In this endeavour, EU-CEE countries face several challenges. For one, they do not spend enough on research and development (R&D), which undermines their innovation

activities. R&D expenditure is, however, slowly rising, particularly in Poland, Czechia and Croatia. Nevertheless, all countries in the region fall far short of the official EU target of 3% of GDP for R&D. Only Slovenia and Czechia record R&D expenditure of 2% of GDP, while Slovakia, Bulgaria, Latvia and Romania are below 1%. Although some countries excel in exporting medium and high-tech products, in many cases this is driven by foreign direct investment (FDI) and historical industrial strengths, rather than contemporary domestic innovation. As a result, high-level technological expertise mainly resides within large multinational companies that maintain extensive production sites in these countries, while R&D is carried out primarily in their Western European headquarters. This means that cutting-edge expertise and technology are only available on the 'islands' of the production plants of these companies in the EU-CEE countries. Because of this isolated existence, local companies, especially small and medium-sized ones, struggle to benefit from cutting-edge technology. Exports of innovative services are currently very limited.

Although the region has quite a high share of graduates in science, technology, engineering and maths (STEM subjects), the education system struggles to achieve quality and universities are underfunded. The region has a long way to go in green innovation, hampering its competitiveness in this crucial area of the EU's envisaged 'twin' (digital and green) transformation. By contrast, the region appears better positioned for the digital transformation. In particular, there are a number of emerging innovative enterprises in EU-CEE countries in digital technologies. However, many of them lack strong connections to the broader innovation system and tend to operate as isolated success stories.

Reflecting these challenges, the innovation performance of the region is not particularly promising, although there are some positive developments. With the exception of Estonia, all EU member states in Central Eastern Europe are below the EU average and outside the global top 30. However, the innovation performance is generally in line with the economic development of each country, albeit with some exceptions. Estonia clearly outperforms, while Poland, Slovakia and Romania underperform.

From the policy side, despite recent progress, an overarching problem is the lack of co-ordination and financial

support for innovation and R&D activities by national governments. The disconnect between FDI policies and innovation policies further complicates the implementation of strategies to enhance industrial innovation and upgrade EU-CEE's position in value chains. Although EU membership provides opportunities for collaboration and learning, the current innovation policy approach of the EU, which is focused more heavily on the needs of advanced countries, hinders active participation by EU-CEE countries. Only a few EU-CEE countries utilise their national policy space to engage more actively in EU initiatives.

IRELAND AND SINGAPORE AS ROLE MODELS

In this context, Ireland and Singapore can serve as an inspiration for EU-CEE, as they each successfully transitioned from an FDI-dominated to a more balanced innovation system, in which domestic firms actively contribute to the generation of innovations. Like the EU-CEE countries, their early economic growth was mainly driven by large multinational enterprises (MNEs) – similar to the 'extended workbench' model in EU-CEE. Later in their development stage, however, Ireland and Singapore changed their growth strategies. One notable element was the focus on a highly selective investment promotion approach (called 'innovation by invitation' in Ireland), which involved specifically attracting investments that corresponded to the country's own industrial strengths and potential. Additionally, a systematic and highly focused approach was taken to connect foreign companies with local firms and suppliers to establish industrial clusters in promising niches. Incentives were also created to encourage foreign companies already operating in the country to carry out more R&D locally, thus bringing in more added value.

A critical factor here was well-trained skilled labour. Both Ireland and Singapore have made great efforts to orient vocational training and, above all, university education in STEM subjects as closely as possible to the needs of their own economies. Other success factors included significant government funding of R&D through grants and tax breaks, the strengthening of scientific research at universities, the creation of government research funding agencies, the networking of university and commercial research, good framework conditions for start-ups, and easier immigration of highly qualified people from abroad.

POLICY RECOMMENDATIONS

Considering the specific innovation landscape of EU-CEE countries and building on the success stories from other parts of the world, this study articulates a series of recommendations aimed at guiding the EU-CEE region's next growth phase, advocating for a transition from imitation to innovation.

1. FACILITATE EFFECTIVE CO-ORDINATION OF THE INNOVATION SYSTEM

- Encourage the establishment of a long-term innovation strategy that provides stability and planning security and is not subject to the electoral cycle. This is linked to the creation of a central innovation agency to co-ordinate the various elements of a coherent innovation policy at the national level.
- Improve the utilisation of EU funds and provide more money at the national level for the promotion of innovation. From a converging country's perspective, the reality that EU-CEE can lean on EU finances is a substantial advantage, which needs to be leveraged more strongly.
- Improve the public administration and its institutions. In addition to expanding the pool of innovation policy experts within the public sector, this includes a shift towards a culture of evidence-based policy making, establishing and strengthening in-house capacities to analyse different policies and their interactions.

2. ENABLE COMPANIES TO CLIMB UP THE TECHNOLOGICAL LADDER

- Strengthen the innovative potential of domestic companies, helping them to upgrade and grow. Key strategies in this direction involve fostering local supplier development, offering targeted R&D incentives, as well as promoting clusters. Avoiding an arbitrary over-emphasis on high-tech sectors is also crucial, ensuring that innovation policies are locally relevant for realistic and effective outcomes in the region.
- Select FDI in a targeted way and focus on areas that align with the country's traditional industrial strengths in order to build upon them. Create incentives for foreign MNEs operating in the country to conduct more R&D locally, thereby bringing additional value.
- Connect MNEs operating in the country with local companies so that the latter can benefit from their technological expertise and know-how. Eventually, industrial clusters should emerge that reflect the country's strengths and specialisations.
- Identify and develop promising industrial niches. Facilitate a targeted specialisation of the economy in the most promising areas that offer the greatest comparative advantage. The EU-wide approach, known as 'smart specialisation', can be especially useful, as it seeks to achieve intelligent, inclusive and sustainable growth within the given economic conditions.
- Move away from tax incentives as the main instrument to stimulate R&D spending by companies towards more direct grants, especially in EU-CEE countries with fewer fiscal constraints.

3. STRENGTHEN UNIVERSITIES AND RESEARCH INSTITUTIONS

- Increase the exchange and improve networking between science and business. This includes making collaboration between universities and industry a prerequisite for certain types of funding, reviewing the regulatory frameworks governing publicly funded institutions, and establishing and actively using technology transfer offices, as well as participating in EU-wide initiatives that encourage the commercial application of research.
- Promote international partnerships and create opportunities for the cross-border mobility of researchers. There are various means of stimulating such partnerships, such as making research collaboration grants more widely available, negotiating various fellowship programmes (also within the EU-CEE region), and simplifying work permits and visa procedures for international researchers.
- Stimulate internationally outstanding scientific excellence. This should, however, be relevant to the local economy and its industrial base and take their needs into account.

4. DEVELOP HUMAN CAPITAL

- In order to have enough well-trained specialists available for an innovation-based growth model, vocational training and university education need to be expanded, especially in the STEM subjects of science, technology, engineering and mathematics.
- Talented workers from abroad should be recruited in a targeted manner, and skilled citizens who have emigrated should be enticed with special incentives to return home. It is well known that the EU-CEE countries are grappling with a pronounced 'brain drain' and, consequently, a significant shortage of skilled labour. This situation is often linked to challenging living conditions, ranging from expensive housing to a lack of childcare and inadequate healthcare. This also necessitates a new social policy to improve living conditions.
- Vocational training and apprenticeships should be made more attractive so that young, talented people follow these pathways, especially in technical and scientific fields. EU-CEE countries can build on the presence of MNEs to advance apprenticeship and internship programmes, career exploration programmes, and mentorship initiatives to ensure that students get hands-on experience from a relatively early age. The aim is to also ensure a more balanced talent distribution, so that high-achieving students are more drawn to, and can excel in, vocational pathways.

5. IMPROVE ACCESS TO FUNDING FOR INNOVATIVE COMPANIES

- In order to offer innovative companies better access to suitable financing from the outset, a legal framework and market conditions that reward innovation and risk-taking need to be cultivated. In particular, simplifying regulations, encouraging new fund creation, and promoting regional funds for smaller markets can be useful. Governments should cautiously explore co-investment mechanisms, avoiding disruption to private funding.

COUNTRY BRIEFING CZECHIA

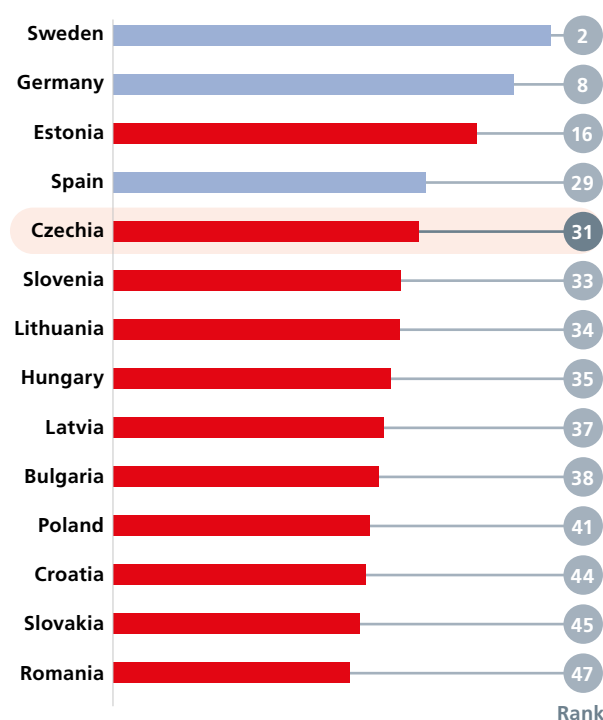
INNOVATION LANDSCAPE

Czechia is one of the strongest countries in the EU-CEE region for innovation performance, and is positioned as a moderate innovator among EU member states. In global comparisons, the country ranks 31st, which is generally in line with its level of development.¹ Given Czechia's high level of industrialisation, fuelled by foreign investment, particularly in sophisticated manufacturing sectors, innovation outputs in the form of high-tech exports are the country's core strength. However, foreign value added is the dominant contributor behind this outcome, especially in advanced sectors such as ICT, electronics and automotive.²

The robust education system and skilled workforce are Czechia's main assets in innovation performance, as shown by the high share of graduates in STEM subjects, the good quality of learning outcomes in secondary education and relatively high education spending – all of which exceed the EU average, as seen in the data below. There are growing efforts to foster linkages between academia and industry, with leading universities such as Charles University, Czech Technical University and Masaryk University establishing technology transfer offices and focusing more on applied research. The collaboration of universities and other innovation actors at the local level is contributing to dynamic regional innovation systems in some parts of the country, notably around the capital, Prague, and in the region of South Moravia, home to Czechia's second-largest city, Brno. These regions also boast rather well-functioning smart specialisation strategies and regional policy instruments that contribute to the creation of start-ups, particularly in the ICT sector.

However, Czechia consistently struggles to boost the innovation spending of businesses, which remains a major weak point. Only the country's large energy conglomerate (ČEZ Group) reaches internationally competitive levels of research and development (R&D) investment.³ As a result, little patenting activity takes place, reflecting the country's weak ability to produce and market its own technologies. Policy has contributed to the emergence of a number of

Global Innovation Index – Rank 31 out of 132 countries



clusters, especially in the digital sphere, some of which partake in various EU collaboration platforms.⁴

Considering the 'megatrends' of the twin transition, Czechia's performance is mixed. With respect to the green transition, it fares rather well in innovation activities, but weakly in innovation outputs, suggesting that the efforts made do not translate into effective outcomes.⁵ The digital transition offers more promise, with a few highly successful domestic firms emerging in the ICT sector. Two Czech firms (Mycroft Mind and Codaship) participate in Important Projects of Common European Interest (IPCEI) on microelectronics and communication technologies. Nevertheless, broader digitalisation of the economy and society remains a challenge. Investments planned under the Recovery and Resilience Facility are a step in the right direction.

¹ According to GII's expected vs. observed innovation performance.

² Refer to the OECD TiVA database for details.

³ Based on the EU R&D Scoreboard 2022.

⁴ See the Czech National Cluster Association: <https://nca.cz/mapa-klas-tru-v-cr/>

⁵ See the Eco-Innovation Scoreboard.

National Innovation System Indicators

Priority areas	Indicator	Czechia	EU	EU-CEE
Education system	Tertiary education graduates in STEM, share in % (UNESCO)	25.5	24	24.2
	Spending on tertiary education per student, in EUR at PPP (Eurostat)	9,270	7,990	6,600
	PISA scales in reading, maths and science (GII)	495	484	480
Technological capacities of enterprises	R&D (GERD) financed by business, share in % (Eurostat)	36.1	57.7	43.5
	R&D expenditures (GERD) in % of GDP (Eurostat)	2.0	2.3	1.3
	SMEs with product innovations, share in % (EIS)	35.2	27.0	22.8
	SMEs with business process innovations, share in % (EIS)	52.2	41.6	32.4
	Finance for start-ups and scale-ups, average perception scores from 0 to 10 (GII)	n/a	4.3	4.5
Collaborations and linkages	Innovative SMEs collaborating with others, share in % (EIS)	14.5	11.7	10.1
	University-industry R&D collaborations, average perception scores from 0 to 7 (GII)	4.7	4.2	3.8
Innovation outcomes	Granted patents per million inhabitants (WIPO)	92	586	86
	Exports of medium and high-technology products, in % of total product exports (EIS)	67.9	61.2	49.5
	Knowledge-intensive services exports, in % of total services exports (EIS)	54.2	63.6	48.6

Sources: EIS 2023; Eurostat; GII 2023; UNESCO; WIPO; World Bank, WDI.

Note: data for EU and EU-CEE are simple averages, except for EIS and Eurostat, with original data for EU.

Data for 2021 or the most recent available year; more details on the methodology and data availability to be found in the Annex.

Mapping innovation policy initiatives

	Yes/No	Name of the initiative/programme	Comments
Innovation agency	Yes	Technology Agency of the Czech Republic (TACR); Research, Development and Innovation Council (RVVI)	TACR acts as an innovation agency in the country, preparing and realising relevant policy programmes. RVVI is an advisory body of the government and oversees the national innovation policy agenda and also nominates board members of TACR.
Programmes for human capital development	Yes	Reforms proposed under the second pillar of the Innovation Strategy of the Czech Republic 2019–2030: ‘Polytechnical education’	Progress on the implementation of proposed instruments not clear.
Programmes for human capital attraction and retention (e.g. reverse brain drain)	Yes	Promotion of foreign students through programme ‘Support for foreign scholarship holders studying at public universities’	Initiatives to attract foreign students into universities dominate; programmes for reversing brain drain generally absent.
Start-up programmes (incubators, dedicated financing, etc.)	Yes	Various support measures from CzechStartups.org by the investment promotion agency CzechInvest; Start-up internationalisation support by the export promotion agency CzechTrade; Further initiatives envisaged under the third pillar of the Innovation Strategy of the Czech Republic 2019–2030: ‘National start-up and spin-off environment’	A variety of programmes to support start-ups exist in the country, facilitated mostly by CzechInvest.
Venture capital programmes	No		No specific programmes in this area.

Cluster programmes	Yes	Promotion of innovative clusters through the operational programme TAK ('Spolupráce-Klastry')	Calls aimed at SMEs and research organisations.
Technology-specific policies	Yes	THETA2 administered by TACR (Modernisation of the energy sector); The Czech Hydrogen Strategy of the Ministry of Industry and Trade	Initiatives related to the technological development in the area of clean energy tend to dominate.
Tax incentive schemes	Yes	Application of deductions for R&D costs from the tax base (latest revision in 2019)	There are indications that fiscal incentives are not frequently picked up by SMEs.
Others		Other initiatives include: 'Innovation vouchers – call II' as part of the operational programme 'Technology and Applications for Competitiveness 2021–2027' Various programmes of TACR to support cross-border research collaborations (e. g. KAPPA, DELTA2)	

COUNTRY-SPECIFIC POLICY PRIORITIES AND RECOMMENDATIONS

- **Integrate FDI policy more closely with the national innovation and industrial strategies, with the intention of upgrading the position of Czechia in global value chains.** Although Czechia's FDI incentive scheme sets out strategic areas that are of particular interest for the country, the available support still remains broad. The issue of upgrading in value chains is partly identified in the Innovation Strategy of the Czech Republic 2019–2030, but the defined goals and tools remain very vague. More emphasis needs to be placed on local supplier development and on incentives for the creation of spill-overs, such as steering foreign investments into existing clusters or innovation hubs to induce collaboration between local and domestic firms, establishing networking platforms between local suppliers and multinational enterprises (MNEs), or negotiating greater training and collaboration with local education institutions. The experiences of Ireland and Singapore can offer particularly useful insights for Czechia on how to effectively leverage an MNE-driven economic structure to build up domestic innovative capacities (see recommendations in Section 5.2 of the main report). Moreover, investment promotion activities and innovation initiatives can be co-ordinated more effectively if they fall within the competence of one overseeing authority. Although CzechInvest has been moving in this direction by establishing the 'Czech Startups' programme, going beyond the focus on start-ups to encompass a wider firm population would be called for. Recent developments in Estonia, which has been consolidating its innovation and investment promotion activities under the Enterprise Estonia umbrella, might offer some inspiration⁶.
- **Motivate higher R&D investments by firms, placing more emphasis on non-fiscal R&D incentives, such as direct grants.** As mentioned above, low R&D spending by businesses is a major weakness of Czechia, which has not significantly improved over time. The small uptake of R&D-related tax breaks compounds the issue. This reality is acknowledged by the Innovation Strategy of the Czech Republic 2019–2030, which sets out the goal of increasing the actual use of the available tax deductions. However, in order to boost R&D spending by firms, the discussion needs to extend beyond tax-based tools. This is because, as we emphasised in our study, non-fiscal financial incentives (both repayable and non-repayable) are a more effective means of boosting R&D investments in the region (see Recommendation 2.5 in the main report). Given Czechia's relatively well-developed institutions and sound fiscal space, there is room for administering more grant-type instruments to support innovation activities in the country.
- **Leverage the well-developed human capital present in the country by fostering tighter linkages between the education system and industry.** Czechia has made notable progress in recent times in establishing departments within its major universities to support the commercial application of academic research. Innovation vouchers⁷ are also available to stimulate collaboration of universities with firms. However, there are indications that the industry-academia linkages remain ad hoc and case-based rather than systematic, even in parts of the country that have high-quality universities and a relatively well-established regional innovation sys-

⁶ See the Estonian country chapter for more details.

⁷ Innovation vouchers are small lines of credit given to businesses (especially SMEs) by governments, which allow them to obtain tailored scientific outputs and expertise from public research institutions.

tem.⁸ Hence, stronger incentives relating to universities and their financing structures (such as making collaboration between universities and industry a prerequisite for certain types of funding) are needed. Likewise, platforms that would encourage more frequent interactions between actors to build trust and stimulate closer collaborations are also required. These require policies such as the establishment of innovation hubs, joint appointment programmes and networking platforms, through which trust can be built (see also Recommendation 2.3 in the main report). Furthermore, given the persistent skill shortages in Czechia, there is a need to align educational programmes with the evolving needs of the labour market. A particular focus should be placed on the development and expansion of vocational training and polytechnic education initiatives, ensuring that students acquire practical skills and knowledge that directly translate into the workforce. The smart specialisation strategy can offer further insights regarding the specific areas that could be prioritised.

⁸ See, for example, the SWOT analysis presented in the Regional Innovation Strategy 2021–2027 for the South Moravian Region.

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Toward Innovation-driven Growth: Innovation Systems and Policies in EU Member States of Central Eastern Europe

This country briefing contains a short summary of a much broader study that deals with the perspectives of innovation policies in Central Eastern and Southern Eastern Europe.

Twenty years after EU enlargement, the economies of Central and South Eastern Europe have become important components of Europe's industrial production system. Now, these countries are faced with the task of taking a new step towards a more sustainable and productive growth model.

This step can only be taken if the countries succeed in becoming innovating economies with national companies that are strong in research, development and innovation. To succeed, the countries have to develop not only strong industrial policies, but also policies that aim at creating solid national innovation systems. The study analyses the region's potential and uses the examples of Ireland and Singapore to describe successful innovation strategies. It is authored by a team from the Vienna Institute for International Economic Studies.

It is part of a series of FES studies on the growth model in EU-CEE and its prospects which have been published in recent years.

The full study can be found here:

<http://library.fes.de/pdf-files/bueros/budapest/21198.pdf>



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