

COUNTRY BRIEFING SLOVENIA

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 (Grieverson 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.

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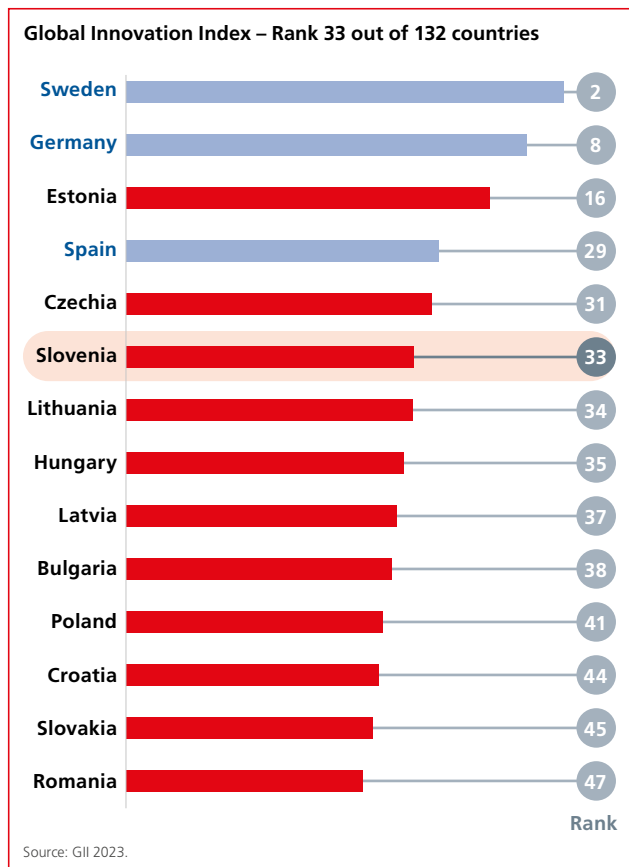
INNOVATION LANDSCAPE

Slovenia is an average innovator by EU standards: stronger than most of EU-CEE, but still well behind the front-runners of Western Europe. Its innovation ranking is generally in line with its development level.¹ However, in recent years, the pace of improvement in Slovenia’s innovation performance has slowed. Although its performance, ranked by the European Innovation Scoreboard, has improved for three years in a row since 2019, the gap to the most innovative European countries remains large. Slovenia is improving at a slower pace than the EU on average and more slowly than some other EU-CEE countries. Based on the 2023 Global Innovation Index, Slovenia ranks 33rd, behind Estonia and Czechia.

Despite the decelerating trend, Slovenia still performs well above the EU-CEE average in various innovation system indicators. Slovenia’s key strength is its human capital, shown by a high share of the population with a tertiary education, high scores in PISA rankings and solid academic output in terms of doctorates and publications.

Slovenia’s export-oriented economy produces a relatively high share of medium and high-tech exports, slightly above the EU average. The domestic pharmaceutical industry can be seen as a success in this regard. The domestically owned pharmaceutical company Krka ranked 179th in the 2022 EU Industrial R&D Investment Scoreboard’s top 1,000, and second in EU-CEE. The pharmaceutical company Lek acts as the innovation centre for the corporation Sandoz, an example of successful positioning in global value chains (GVCs). However, there is a lack of large-scale participation in future-oriented value chains, as shown by the lack of participation in the EU policy initiative Important Projects of Common European Interest (IPCEI).

The key strength of Slovenian small and medium-sized enterprises (SMEs) lies in cutting-edge engineering and product innovation, as shown by examples of highly innovative SMEs in various sectors, such as satellite technology, plastics and automotive components. However, the success of these firms has more to do with the technical expertise of founders, and participation in GVCs, rather than being the result



of support policies. Meanwhile, the export of knowledge-intensive services lags far behind the EU-CEE average.

Slovenia’s key weakness is chronic underinvestment in innovation, both public and private. In 2021, public research and development (R&D) expenditure reached 2.14% of GDP, its highest share to date. However, this is still almost 0.5 percentage points lower than that of the leading innovators in the EU. The corporate sector has only slowly been increasing its share of R&D investment as a share of GDP, while also underperforming in non-R&D innovation expenditure. The issue of underinvestment is also related to the lack of domestic options for innovation financing, including access to credit and venture capital funding for start-ups.

In the context of innovation connected to the twin transition, Slovenia performs moderately well. Considering its strategic aims to support the development of the green economy, Slovenia performs averagely in terms of eco-inno-

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

vation, scoring above the EU average in terms of outputs, but shows a relative weakness in terms of producing eco-innovation related patents.² Slovenia is also performing averagely in terms of the digital transition. There are several areas where Slovenia is either stagnating or losing its relative

advantage to the rest of the EU, including human resources and digitalisation of the economy, where it nevertheless performs well in terms of use of digital sales channels and robotics. On a positive note, Slovenia has set up a Digital Innovation Hub to provide advice and mentoring for SMEs.³

² See the Eco-Innovation Scoreboard.

³ See Digital Economy and Society Index Country profile 2022.

National Innovation System Indicators				
Priority areas	Indicator	Slovenia	EU	EU-CEE
Education system	Tertiary education graduates in STEM, share in % (UNESCO)	28.1	24	24.2
	Spending on tertiary education per student, in EUR at PPP (Eurostat)	8,430	7,990	6,600
	PISA scales in reading, maths and science (GII)	504	484	480
Technological capacities of enterprises	R&D (GERD) financed by business, share in % (Eurostat)	48.7	57.7	43.5
	R&D expenditures (GERD) in % of GDP (Eurostat)	2.1	2.3	1.3
	SMEs with product innovations, share in % (EIS)	34.8	27.0	22.8
	SMEs with business process innovations, share in % (EIS)	41.6	41.6	32.4
	Finance for start-ups and scale-ups, average perception scores from 0 to 10 (GII)	4.8	4.3	4.5
Collaborations and linkages	Innovative SMEs collaborating with others, share in % (EIS)	13.1	11.7	10.1
	University-industry R&D collaborations, average perception scores from 0 to 7 (GII)	3.9	4.2	3.8
Innovation outcomes	Granted patents per million inhabitants (WIPO)	245	586	86
	Exports of medium and high-technology products, in % of total product exports (EIS)	63.6	61.2	49.5
	Knowledge-intensive services exports, in % of total services exports (EIS)	42.6	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	Slovenia Business Development Agency (SPIRIT)	Not purely an innovation agency, but also offers various services aimed at innovation (facilitation of learning, funding calls, support for international business, etc.), as well as investment, entrepreneurship and internationalisation support.
Programmes for human capital development	Yes	Public Scholarship, Development, Disability and Maintenance Fund of the Republic of Slovenia	Develops projects funded through Cohesion Funds; projects for 2021–2027 have not been developed yet; one example is Competence Centres for Human Resources Development, which provided training for employees (now completed).
Programmes for human capital attraction and retention (e.g. reverse brain drain)		2023 amendments to the Aliens Act	Aimed at accelerating the administrative procedures for hiring foreign workers.
Start-up programmes (incubators, dedicated financing, etc.)	Yes	Slovenian Entrepreneurship Fund (SPIS), SPIRIT	Issue yearly calls for funding start-ups.

Venture capital programmes	Yes	Slovenian Entrepreneurship Fund with the Slovenian Development Bank (SID)	Via the Central Europe Fund of Funds – CEFoF and the European Cohesion Funds.
Cluster programmes	Yes	Strategic Research & Innovation Partnership, part of the national smart specialisation strategy	10 clusters connecting private, public and academic actors around priority themes.
Technology-specific policies	Yes	Strategy of Digital Transformation of the Economy (in planning); formation of the Digital Innovation Hub (DIH)	Strategy is still in development.
Tax incentive schemes	Yes	Corporate Income Tax Act	Tax incentives for R&D investment (100%), investments for equipment and for non-material assets (40%).
Funding mechanisms	Yes	Loans for R&I in SMEs from the European Cohesion Funds, offered by the Slovenian Development Bank (SID)	Loans for R&I, covered by guarantees by the SID.
Digital innovation agency	Yes	Digital Innovation Hub Slovenia	Provides advice and mentoring for SMEs.

COUNTRY-SPECIFIC POLICY PRIORITIES AND RECOMMENDATIONS

Slovenia provides a solid foundation for innovation in terms of education, infrastructure, and connection to GVCs. It offers a multitude of support policies, and has improved in terms of digitalisation both in the private and the public sector. However, the gap to the most innovative EU countries remains large and is not closing. Despite the numerous positive developments and policies in place, it is clear that ‘business as usual’ will not provide the developmental jump the country seeks. Although underinvestment is seen as a key issue, the impact that the recent series of crises has had on Slovenia’s fiscal space should also be noted. With the 2023 floods (which will channel large amounts of public money into reconstruction) and the return of EU fiscal rules, policy makers will need to be creative in providing targeted support in areas which will reap the largest benefits in terms of improved innovation performance. To this end, we propose the following measures.

- **Increase direct funding and co-investment opportunities aiming to improve the innovation output of SMEs.** Targeted funding should be provided for start-ups and SMEs via a specialised state capital fund that will support companies in bridging the ‘death valley’ between patent stage and commercialisation (TLR4-TLR7). Financing should pursue tangible goals, such as increasing the number of patents, scaling of innovative solutions and bringing innovations to market. Investments should also serve as a de-risking instru-

ment to leverage private capital from domestic sources, including large companies that might be interested in acquiring high-potential start-ups.

- **Streamline immigration procedures for highly skilled workers and provide tax incentives to bring back talent.** Although progress has been made, the rigid legislation and slow administrative procedures (coupled with high taxes on high earners) make Slovenia a relatively unattractive option for top talent, both domestic and foreign, despite its positive traits in form of quality of life, security and education system. Temporary tax incentives on returning professionals and PhDs could make the domestic labour market more attractive for domestic top talent. Accelerating procedures to acquire citizenship and long-term living security could increase its attractiveness for foreign professionals. As many of Slovenia’s largest and most technologically advanced companies are part of international ownership groups, tax incentives should be provided to ensure that more innovation-focused activities take place in Slovenia.
- **Co-ordinate industrial policy and climate strategies more effectively to accelerate the green transition via domestic innovation.** Both energy-intensive large companies and SMEs providing semi or end products to automotive value chains will need to transform, the latter to adapt to the gradual shift towards electric vehicles, and the former to decarbonise production and switch to non-fossil fuel energy inputs. This represents an opportunity for companies investing in

the green transition as well as to companies providing solutions and services. Grants, channelled through the national Climate Change Fund should tie R&D closer to green technology adoption to improve the rate of eco-innovation. The Climate Change Fund should also provide instruments to fund technical assistance for large companies to develop R&D projects that will successfully compete for EU funding sources aimed at innovative low-carbon technologies, such as the Innovation Fund or the Modernisation Fund. Innovative instruments, such as carbon contracts for difference, could provide a degree of long-term stability for large-scale green innovation that would make projects more attractive for additional private and EU sources of funding.

- **Accelerate the rate of the digital transformation of the economy.** Slovenia has been losing ground relative to the Visegrád countries, as well as to ‘high innovating’ countries according to the Digital Economy and Society Index (DESI), both in the uptake of new technologies and human resources. Slovenia still has competitive advantages in specific technologies, such as artificial intelligence. Targeted programmes, such as for-purpose digital vouchers, are needed to ensure that large companies accelerate their digital transformation processes. In addition, training and information should be provided to SMEs (outside high-tech sectors), via the SPIRIT agency or other established public structures, so that they can understand the potential of AI and other new technologies. Instruments, similar to innovation vouchers, could be used to fund smaller investments in skills and equipment needed to explore cutting-edge technologies.

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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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