

COUNTRY BRIEFING ROMANIA

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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About the authors

Vienna Institute for International Economic Studies (wiiw):

Zuzana Zavarská, Economist at wiiw

Alexandra Bykova, Economist and Deputy Head of Statistics Department and Economist at wiiw

Richard Grieveson, Economist and Deputy Director of wiiw

Francesca Guadagno, Economist at wiiw

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 ROMANIA

INNOVATION LANDSCAPE

Despite significant improvement on multiple fronts, Romania's innovation policy still has a long way to go to improve its lowly (47th) position in the Global Innovation Index. This is also shown by the fact that Romania is an underperformer in innovation, given its GDP per capita level.¹ The main weaknesses include the low level of research and development (R&D) expenditures, amounting to 0.5% of GDP (the lowest among EU-CEE countries); the small number of researchers per million of population and inadequate investment in human capital. These indicators, together with firms' low intangible asset intensity, reflect the 'dependent market economy'-character of Romania's FDI-driven development.

Romania's innovation system is excessively fragmented, and the poor predictability of policy interventions exacerbates the weakness of its institutional environment. In contrast, the overall development level of infrastructure, including ICT (access and usage) and environmental performance, is on par with the European average.

Although R&D spending is very low, business enterprises account for a high share of total funding. This explains the fact that Romania can relatively effectively translate innovation inputs into outputs. Effective knowledge creation is substantiated by the higher than the CEE-average share of knowledge-intensive services exports within total services exports, the growing volume of venture capital investment in Romanian technology companies,² and the increasing number of start-ups and scale-ups. However, after the IPO of UiPath, Romania has no 'unicorns'³ and its patent-based innovation performance is still far lower than the CEE average.

Domestic-owned Romanian companies are not present in the EU Industrial R&D Investment Scoreboard's top 1,000 database. The top R&D spenders are the local subsidiaries of global companies.

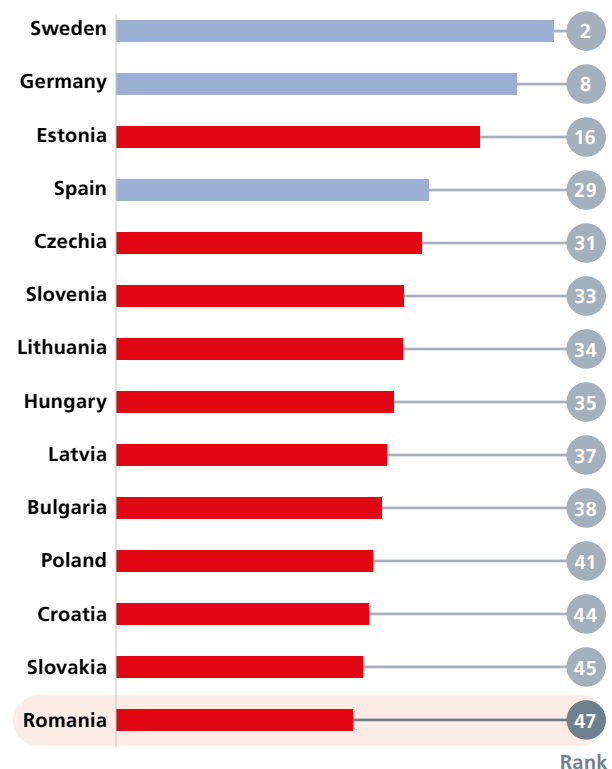
Romania's 2023 National Reform Programme specifically addresses research, development and innovation (RDI) is-

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

² ~EUR 102m in 2022 – a 12-fold growth since 2017.

³ <https://www.cbinsights.com/research-unicorn-companies>

Global Innovation Index – Rank 47 out of 132 countries



sues, covering aspects such as emphasising improvements in the legislative framework, public procurement for innovation, development of human resources, R&D infrastructure and R&D centres, and supporting public-private partnerships for innovation. Most recently, there are projects connected to the Recovery and Resilience Plan of Romania, addressing in particular digitalisation-related issues.

Significant regional differences and inequalities characterise the country, and explain the existence of various regional-level programmes and the setting up of innovation hubs. The South-East region particularly supports inter-regional and international co-operation projects and partnerships, including participation in the Horizon Europe programme and within S3 platforms for regional smart specialisation areas.

In recent years, Romania has been converging with the EU in terms of small and medium-sized enterprises (SMEs)

with at least a basic level of digital intensity. At the same time, the country has been actively targeting the development of the ICT sector. Nevertheless, adoption of advanced digital technologies (AI, cloud, big data) lags far behind the EU, and only one-tenth of SMEs are capable of selling their offerings online. Romania's performance in the Eco-Innovation Index deteriorated between 2013

and 2022.⁴ The only index component showcasing good performance is the number of companies with ISO 14001 certificates, related to environmental management.

⁴ <https://www.eea.europa.eu/en/analysis/indicators/eco-innovation-index-8th-eap>

National Innovation System Indicators

Priority areas	Indicator	Romania	EU	EU-CEE
Education system	Tertiary education graduates in STEM, share in % (UNESCO)	29.3	24	24.2
	Spending on tertiary education per student, in EUR at PPP (Eurostat)	6,200	7,990	6,600
	PISA scales in reading, maths and science (GII)	428	484	480
Technological capacities of enterprises	R&D (GERD) financed by business, share in % (Eurostat)	55.2	57.7	43.5
	R&D expenditures (GERD) in % of GDP (Eurostat)	0.5	2.3	1.3
	SMEs with product innovations, share in % (EIS)	6.7	27.0	22.8
	SMEs with business process innovations, share in % (EIS)	5.3	41.6	32.4
	Finance for start-ups and scale-ups, average perception scores from 0 to 10 (GII)	4.1	4.3	4.5
Collaborations and linkages	Innovative SMEs collaborating with others, share in % (EIS)	1.5	11.7	10.1
	University-industry R&D collaborations, average perception scores from 0 to 7 (GII)	3.5	4.2	3.8
Innovation outcomes	Granted patents per million inhabitants (WIPO)	28	586	86
	Exports of medium and high-technology products, in % of total product exports (EIS)	56.0	61.2	49.5
	Knowledge-intensive services exports, in % of total services exports (EIS)	52.9	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	UEFISCDI – Executive Agency for Higher Education, Research, Development and Innovation Funding	Covers higher education, research, development and innovation, under the authority of the Romanian Ministry of Education, Research, Youth and Sport.
Programmes for human capital development	Yes	CRED (improvement of digital skills of teachers); PROF (digital training for teachers) UEFISCDI programme PNCDI IV – 5.2 Human resources	Specific programmes for researchers and teachers. ¹
Programmes for human capital attraction and retention (e.g. reverse brain drain)	Yes	UEFISCDI programme PNCDI IV – 5.1 Ideas and PNCDI IV – 5.2 Human resources	Programmes include measures to attract and maintain human resources from the country and abroad, to strengthen the national RDI system through grants for financing research projects and workshops; ² to reduce brain drain and attract researchers from abroad; ³ to provide scholarships and research grants to support the mobility of young and experienced <i>diaspora</i> researchers; supporting their participation in meetings, visits and scientific events organised by research organisations in Romania.

¹ <https://uefiscdi.gov.ro/pncdi-iv-program-2>

² <https://uefiscdi.gov.ro/pncdi-iv-program-1>

³ <https://uefiscdi.gov.ro/pncdi-iv-program-2>

Start-up programmes (incubators, dedicated financing, etc.)	Yes	UEFISCDI programme PNCDI IV – 5.7 Partnership for innovation COP, Action 1.2.1 – Stimulating enterprises' demand for innovation through RDI projects SGDFIP, Priority 1, Action 1.1. – Support for the private sector and for collaboration between actors from the public system and the business environment in the field of RDI	Specific support for innovative SMEs (for finance and patents)⁴ e.g. seed capital matching fund or 'incubator' grant or pre-spin-off funds. One interesting part is the innovation vouchers programme, the aim of which is to finance the purchase of RDI services from RDI organisations for SMEs. The budget allocated for this action is Lei 5m (more than EUR 1m) for 2023. De minimis rules apply; a company can receive a maximum of EUR 200,000 in three consecutive years.
Venture capital programmes	Yes	Part of RRF/PNRR: Recovery Equity Fund of Funds	Financial instrument for the private sector, EUR 400m: to finance SMEs, mid-caps and infrastructure projects via fund partners. ⁵
Cluster programmes	Yes	Support for industrial parks and support for organisation and development of innovative cluster UEFISCDI ONCDI IV Subprogramme 5.7.1 and support for organisation and development of innovative cluster UEFISCDI ONCDI IV Subprogramme 5.7.1	Investors setting up manufacturing locations or offices in an industrial, scientific or technological park benefit from: exemption on land tax, building tax and urban planning tax; and exemption on taxes charged for changing the land destination for plots located within industrial parks. Furthermore, according to EU evaluation, there is no consistent and dedicated cluster policy, although various elements are present in development programmes.⁶
Technology-specific policies	Yes	Cyber Security Strategy plus Action Plan COP, PA 1, Action 1.1.1. – Large R&D infrastructures ERDF	COP: in strategic areas (public and private infrastructure with critical importance for national security). European Regional Development Fund: innovation hubs in areas of strategic interest (e.g. Romanian Artificial Intelligence Hub).
Tax incentive schemes	Yes	Tax reductions/abolitions for R&D and innovation-related activities	0% income tax for employees working in IT&C companies, in compliance with current Romanian legislation. 0% profit tax on reinvested profit in new technological equipment used for business purposes. 0% income tax for employees working in R&D companies. 0% profit tax for the first 10 years of activity. Specific deduction in case of R&D eligible expenses: – accelerated depreciation of R&D equipment; – additional corporate tax deduction of 50% of the eligible expenditure for these activities.
Others		RO-NET: IT infrastructure development Romanian Artificial Intelligence Hub: AI resources; ION: AI-based governmental counsellor UEFISCDI PNCDI IV: other elements RRF UEFISCDI PNCDI IV: other elements RRF	UEFISCDI PNCDI IV: Innovation vouchers.⁷ Patent voucher (with no details given). RRF: participation in IPCEI (microelectronics) supported: UEFISCDI PNCDI IV: Innovation vouchers.⁸ UEFISCDI participates in NCP WIDERA.net to improve opportunities under the Framework programmes.⁹ Patent voucher (with no details given). RRF: participation in IPCEI (microelectronics) supported.¹⁰ UEFISCDI participates in NCP WIDERA.net to improve opportunities under the Framework programmes.¹¹

4 <https://uefiscdi.gov.ro/pncdi-iv-program-7>

5 https://www.eif.org/what_we_do/resources/rrf-romania/index.htm

6 <https://clustercollaboration.eu/sites/default/files/2021-12/eccp-factsheet-romania.pdf>

7 <https://uefiscdi.gov.ro/voucher-cec-de-inovare>

8 <https://uefiscdi.gov.ro/voucher-cec-de-inovare>

9 https://uefiscdi.gov.ro/ro-ncp_widera-net-0

10 https://ec.europa.eu/commission/presscorner/detail/en/ip_21_4876

11 https://uefiscdi.gov.ro/ro-ncp_widera-net-0

COUNTRY-SPECIFIC POLICY PRIORITIES AND RECOMMENDATIONS

Although the development level of the Romanian innovation landscape is far behind the EU average in multiple respects, innovation policy interventions need to avoid being overly fragmented. A focused policy needs to target some low-hanging fruits and at the same time implement a consistent long-term strategy, in the case of which progress will be slow and gradual. Specifically, we propose the following measures.

- **Avoid ‘indicator targeting’ by radically increasing the overall research budget.** This runs the risk of deteriorating the effectiveness of translating innovation inputs into outputs – a current strength of the Romanian system. There is a need to be selective. Although the lagging innovation landscape of Romania in multiple respects has to be acknowledged, innovation policy interventions need to avoid trying to address too many deficiencies at the same time. One area where ambitious targets are needed, however, is the improvement of the education system at all levels. This requires the implementation of a well-funded and carefully drafted long-term strategy. This covers a wide variety of aspects, such as enhancing the appeal and quality of vocational training, reviewing the regulatory frameworks governing publicly funded research institutions, and motivating greater cross-border collaborations of universities (see recommendations in Sections 5.3 and 5.4 of the main report)
- **Revise the mix of policy instruments used, to give greater emphasis to intangible investments.** Romania dedicates a disproportionate share of its funds – and also EU funds – to tangible investments, underemphasising the role of intangibles, which are particularly important in innovation capacity building (see Recommendation 1.2 of the main report). This calls for a re-evaluation of how available funds are being spent, shifting the weight from supporting investment in tangible research infrastructure, to facilitating enterprises’ investment in intangible assets (e.g. company-specific software and digital solutions) created in the framework of innovation collaboration. This will foster the commercialisation of innovative actors’ research outputs. As one of the poorest countries of the EU-CEE, it is crucial for Romania to leverage all available EU financial instruments to these goals, necessitating enhancements in the absorption of funds.
- **Promote R&D collaboration between foreign-owned subsidiaries and local SMEs or research institutes.** It is vital to boost linkages between foreign firms, which are the top R&D spenders in the country, and local enterprises. As we emphasised in the main report (see recommendation in Section 5.2), there are a variety of policy instruments that may be used for this purpose, such as implementing FDI promotion policies that prioritise sectors aligned with a country’s innovation goals (such as priority areas identified in S3), steering foreign investments into existing clusters or innovation hubs to induce collaboration between foreign and domestic firms, establishing networking platforms between local suppliers and multinational enterprises (MNEs), or negotiating greater training and collaboration with local education institutions.
- **Gradually tackle the issue of innovation policy fragmentation through institutional improvements, avoiding quick fixes.** Although a number of external experts have urged Romania to implement a radical reorganisation and consolidation of the fragmented public research system, we propose not to consider such drastic organisational restructuring as a means of cutting costs. This is because the restructuring of the system – especially in environments of low institutional quality – often involves larger than expected costs and can potentially have a devastating effect on the performance of the country’s key resources: researchers. Instead, prioritising institutional improvements by setting clear expectations in terms of research outputs, promoting meritocracy, removing superfluous regulatory restrictions, and reducing the administrative burden are more likely to prove effective in combating the fragmented policy landscape.
- **Support the wider adoption of digital technologies by enterprises, combined with investments in digital skills.** Romania has been aiming to position itself as a preferred digital outsourcing destination, and a handful of local competitive enterprises have emerged in the digital sector. However, as we discussed above, the digitalisation of the economy and society remains weak. Although low taxation in the IT&C sector offers a competitive edge in attracting FDI, investors need better digital infrastructure, a higher-qualified workforce and digital public services to bring more sophisticated technology into the country.⁵ Therefore, it is necessary for Romania to support private-sector digital skills programmes, incentivising SME employees’ participation in advanced courses that cover data science, machine learning or cybersecurity. At the same time, including basic digital skills training in primary school curriculums is called for, so that the use of common software and critical thinking about internet content is gradually picked up by the wider Romanian population from a young age.

⁵ See also the Romanian country chapter in Zavorská et al. (2023).

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Publisher: Friedrich-Ebert-Stiftung Budapest

1056 Budapest | Fővám tér 2–3.

Email: budapest@fes.de

Responsible for content and editing:

Dr. Ernst Hillebrand

ernst.hillebrand@fes.de

Orders/Contact: budapest@fes.de

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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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