

COUNTRY BRIEFING HUNGARY

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.

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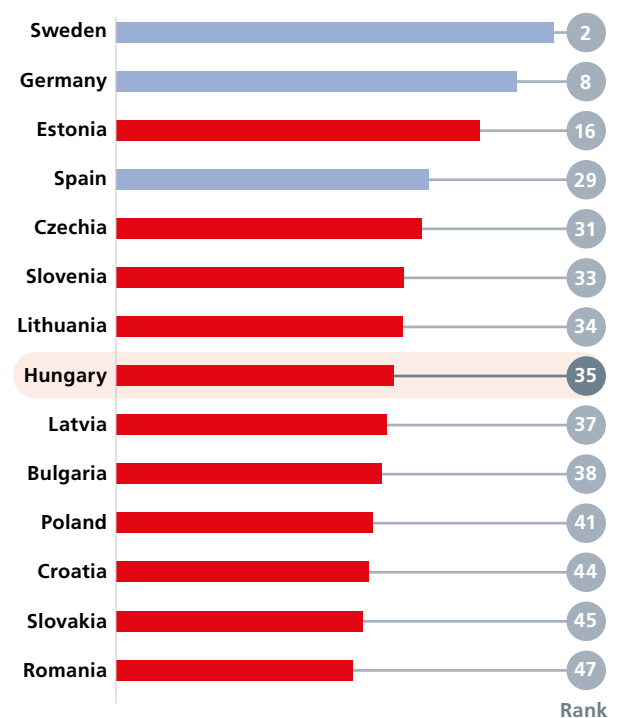
INNOVATION LANDSCAPE

Hungary has advanced to a higher innovation performance group in 2023, earning the title of a moderate innovator among EU member states. Its position in the Global Innovation Index is relatively high, at 35th out of 132 economies, although in comparison to other EU-CEE countries this represents only a middle-ranking position. Nevertheless, Hungary has set goals to be among the top 25 global innovators by 2030 and the top 10 by 2040.¹ It also aims to raise research and development (R&D) expenditure to 3% of GDP by 2030. In line with such radical ambitions, Hungary has implemented various initiatives to bolster its national innovation system through, for example, financing start-ups and small and medium-sized enterprises (SMEs), including venture capital (VC) funding. It has also been trying to strengthen links between different system actors, which are currently at moderate levels. This effort includes initiatives such as internationalising the Eötvös Loránd Research Network (ELKH), promoting collaboration between universities and businesses through the Co-operative Doctoral Programme, or revitalisation of science and innovation parks. However, as many of these initiatives have been set up recently, the tangible outcomes are yet to fully materialise and the effectiveness of implementation is still to be seen. Moreover, with R&D spending stagnating at 1.6% of GDP, coupled with economic challenges such as limited absorption of EU funds, deteriorating fiscal space and weak medium-term economic prospects, reaching these targets in such a short period of time is likely unrealistic.

Hungary's innovation strength primarily lies in its innovation outputs. For example, its share of high-tech manufacturing within total manufacturing is well above the EU average, it has a strong export orientation (in both medium and high-tech products, and knowledge-intensive services) and high export complexity. Much of this favourable performance is driven by the country's attraction of inward foreign direct investment (FDI) and R&D expenditures from abroad.

However, the performance of Hungary's education system is below the EU and EU-CEE average. Government spending on tertiary education and the number of graduates, including those in STEM subjects, has been on a declining trend. This is especially problematic, given Hungary's ambition to

Global Innovation Index – Rank 35 out of 132 countries



become a knowledge-based economy capable of creating high value added, which will undoubtedly require more software-intensive skills and higher digital technology integration by companies.

A handful of highly innovative, large domestic companies can be found in Hungary, including Gedeon Richter and Egis in the pharmaceutical and life sciences industry, which dedicate significant funds into their R&D activities. Although still below EU and EU-CEE averages, the share of Hungarian SMEs introducing product innovation has seen a dramatic increase over the past decade. This signals the high potential of SMEs, and the need to further facilitate domestic innovation capabilities, especially those of SMEs. This need is also reflected in shrinking activity across several intellectual property indicators (patent, trademark and design applications)² and innovative product sales.

¹ John von Neumann Program.

² PCT patent, trademark and design applications, EIS 2023.

National Innovation System Indicators

Priority areas	Indicator	Hungary	EU	EU-CEE
Education system	Tertiary education graduates in STEM, share in % (UNESCO)	21.6	24	24.2
	Spending on tertiary education per student, in EUR at PPP (Eurostat)	5,770	7,990	6,600
	PISA scales in reading, maths and science (GII)	479	484	480
Technological capacities of enterprises	R&D (GERD) financed by business, share in % (Eurostat)	50.6	57.7	43.5
	R&D expenditures (GERD) in % of GDP (Eurostat)	1.6	2.3	1.3
	SMEs with product innovations, share in % (EIS)	19.9	27.0	22.8
	SMEs with business process innovations, share in % (EIS)	23.5	41.6	32.4
	Finance for start-ups and scale-ups, average perception scores from 0 to 10 (GII)	5.0	4.3	4.5
Collaborations and linkages	Innovative SMEs collaborating with others, share in % (EIS)	9.9	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)	64	586	86
	Exports of medium and high-technology products, in % of total product exports (EIS)	65.5	61.2	49.5
	Knowledge-intensive services exports, in % of total services exports (EIS)	55.5	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	National Research, Development and Innovation Office (NRDI Office) National Innovation Agency (NIÜ), to be established	Funding agency with increasing number of clients and expenditure allocation. To be complemented by the establishment of NIÜ as a service provider agency, supporting innovation from idea to commercialisation. NRDI's budget in 2021 was HUF 182bn (~EUR 477m).
Programmes for human capital development	Yes	Cooperative Doctoral Programme for Doctoral Scholarships Postdoctoral and Young Researchers' Excellence Programme and Call for Thematic Research Projects (OTKA)	Cooperative Doctoral Programme encourages PhD students, including in STEM subjects, to do research in collaboration with the business sector. Popular scheme, running since 2020.
Programmes for human capital attraction and retention (e.g. reverse brain drain)	Yes	National Excellence Programme Forefront and Forefront Plus – Research Excellence Programme Internationalisation of Eötvös Loránd Research Network (ELKH) rebranded into Hungarian Research Network Welcome Home programme (Hazaváró programme)	New National Excellence Programme calls, supporting research scholarships for undergraduate, graduate and PhD students, postdoctoral researchers, teachers, researchers at the Hungarian Academy of Sciences, students entering higher education (general programme making higher education more attractive). Forefront, Forefront Plus and internationalisation of ELKH aim to attract Hungarian and foreign researchers to Hungary. A project with a budget of up to HUF 350m (~EUR 900,000) and duration of maximum 60 months undertaken at a Hungarian research centre or university. Welcome Home programme is a general scheme that provides personalised information and administrative assistance to those returning home. Does not differentiate by skills.
Start-up programmes (incubators, dedicated financing, etc.)	Yes	Startup Factory incubator programmes Hungarian Startup University Programme (HSUP) Eurostars: Support for Hungarian participation in the European Partnership on Innovative SMEs Convertible notes and SAFE notes as financing instruments for start-ups (planned)	Startup Factory 2023 granting HUF 5bn (~EUR 13m) to technology incubators: old incubators, specialised incubators, new incubators, defence incubators. Running since 2013, funded about 200 ideas, attracted private and foreign investment. HSUP to create an entrepreneurial ecosystem, improve perception of/educate university students on/create database of start-ups.

Venture capital programmes	Yes	Smart Specialisation Venture Capital Programme National Technology and Intellectual Property Venture Capital Programme	Smart Specialisation Venture Capital Programme supporting high-growth potential startups and early-stage SMEs related to the priorities set out in smart specialisation strategy (S3). Central Hungary region. HUF 5.5bn (~EUR 14 m), 10 projects. National Technology and Intellectual Property Venture Capital Programme supporting high growth potential start-ups and early-stage SMEs in less developed regions of Hungary. Priority to projects related to S3 priorities. HUF 30bn (~EUR 78m), 100–200 projects.
Cluster programmes	Yes	Territorial Innovation Platforms (TIP) Establishing and Developing Centres of Excellence Review and renewal of Science and Innovation Park Developments, to be undertaken	TIPs are territorial partnerships bringing together university knowledge bases and other actors strengthening local co-operation and influencing and being informed by RDI policy. Establishing and Developing Centres of Excellence to develop industry-service co-operation organisations including development of R&D infrastructure capacity, engaging researchers and students, long-term R&D co-operation with economic partners, developing innovative business models.
Technology-specific policies	Yes	John von Neumann Program (NJP) 2023 Grant for Innovation Projects in Focus Areas	NJP identified a set of four research, development and innovation (RDI) focus areas: health, green transition, digital transition of economy, defence. These four priorities align with Hungary's eight priorities set out in its S3 Strategy, while providing a narrower focus. Grant for Innovation Projects in Focus Areas supports areas identified in NJP. To commercialise near-market innovations.
Tax incentive schemes	Yes	R&D tax allowance in corporate income tax R&D tax allowance in innovation contribution Social Security Contributions (SSC) and Vocational Training Contributions (VTC) exemption KIVA exemption and credit available to small companies (optional small business tax, replacing SSC and corporate income tax) Development tax credit incentive (capital, intangibles)	
Others	Yes	Strategies: National Smart Specialisation Strategy (S3) 2021–2027 Research, Development and Innovation (RDI) Strategy 2021–2027 John von Neumann Program (NJP) 2023 SME Strategy Digitalisation Strategy IPR: Grants supporting applications for domestic and international IPR International co-operation: Grants supporting participation in Horizon Europe, Horizon Europe Key Digital Technologies partnership, EUREKA, other EU programmes and international co-operation Scale-up: Fast Track Programme Research Excellence 'Proof of Concept' Programme, to be announced Other: Establishment and Complex Development of the National Laboratories Grants supporting the use of international and national research infrastructures University Innovation Ecosystem Programme	The new S3 Strategy identified eight national economic priorities (e.g. digital economy, cutting-edge tech, health, energy, agriculture, creative industry), which may be too broad in scope. NJP, a strategic action package adopted in 2023, focuses on linking universities and research institutions with the economy, relying on nine key actions (e.g. rebrand and restructure ELKH network into Hungarian Research Network, set up a Research Excellence Council). University Innovation Ecosystem Programme encourages universities to establish units facilitating commercialisation, co-operation between academia and industry, and participation in EU R&D programmes. Includes the creation of an online platform to align RDI services of academia and industry.

COUNTRY-SPECIFIC POLICY PRIORITIES AND RECOMMENDATIONS

In recent years, Hungary has taken several steps to improve its national innovation system by bringing together different actors into an ecosystem and financing start-ups and SMEs. However, many of these efforts are yet to materialise. Building on its current strategy, we propose a set of policy recommendations to improve Hungary's innovation performance:

- **Clearly define the role of the new National Innovation Agency (NIÜ) and expand its role to include workforce development and training.** As the National Research, Development and Innovation Office (NRDI Office) is well established, with responsibilities for innovation and its funding, there is a need to distinguish the new agency's role to avoid duplication of agendas as well as to create co-ordination mechanisms (see also Recommendation 1.1 of the main report). NIÜ's role, as suggested in Hungary's recent innovation strategy (John von Neumann Program 2023), seems to emulate functions of research and technology organisations (RTOs), as a 'one-stop shop' providing innovation-related services to companies. In order to bring it in line with current best practices, the NIÜ should expand its role to focus on workforce development and training, helping companies to keep up with industrial developments and international trends.
- **Enhance funding efficiency and improve the institutional environment.** Despite Hungary's support for innovation through a number of policy programmes, several initiatives with significant budgets have not yet yielded tangible outcomes, while others have faced efficiency challenges. Instances include start-up and incubator programmes, as well as recent VC initiatives. Thus, Hungary could benefit from enhancing its institutional environment, and engaging a wider variety of stakeholders in policy making. These improvements would also lead to more realistic innovation performance targets, which are more conducive to the development of the innovation system. Moreover, although the NRDI Office has streamlined research and innovation calls across NRDI funding and EU development funds, there is a need for further streamlining, as research and innovation should not be seen separately from other programme calls. The list of Hungary's current programmes is also rather extensive and contains potential overlaps, calling for consolidation.
- **Strengthen domestic innovation capabilities by supporting national companies, especially start-ups and SMEs.** For start-ups and SMEs to flourish, they need an enabling environment that encourages and induces innovation. This extends beyond financial support to encompass currently missing services such as helping to access research facilities, locating partners throughout supply chains, developing business models and protecting intellectual property. Such support from the government could signal its interest in entrepreneurship and attract private-sector funding, which is currently low in Hungary. It is necessary to facilitate access to R&D and scale-up facilities (such as research laboratories, pilot lines and testbeds) as a predecessor to commercialisation. Only a limited number of programme calls are presently supporting this stage of innovation.
- **Put more emphasis on linkage creation between foreign-owned subsidiaries and domestic firms.** Large foreign-owned companies are not well connected to the domestic innovation system, limiting the transfer of knowledge and technology into Hungarian firms. This calls for more assertive spill-over promoting policies, such as knowledge and technology transfer agreements going beyond metrics such as number of jobs created, steering foreign investments into existing clusters or innovation hubs to induce collaboration between foreign and domestic firms, establishing networking platforms between local firms and multinational enterprises (MNEs), or negotiating greater training and collaboration with local education institutions (see the recommendations in Section 5.2 of the main report).
- **Increase spending on education and skills, and redesign curricula in line with evolving market needs.** A highly educated and well-prepared workforce will be the key to achieving Hungary's ambitions to digitalise the economy and accelerate the green transition. This requires dedicated efforts to boost digital skills and ICT literacy, producing more STEM graduates and ICT specialists, making upskilling and reskilling programmes widely available. All of these aspects necessitate increased education spending. Furthermore, to bring the education system closer to the innovation system, there is a need to redesign curricula, taking into consideration industry's evolving needs (see Recommendations 4.1 and 4.3 in the main report). This includes providing more hands-on experience through apprenticeships, dual technical training and dual PhD training. Including entrepreneurship education at an early stage could also contribute to making innovation more attractive, in addition to preparing a pool of future entrepreneurs. Some programmes have started to emerge that focus on these aspects such as the Cooperative Doctoral Programme and the Hungarian Startup University Programme (HSUP), but there is a need to extend these to earlier stages and other types of education.

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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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