

COUNTRY BRIEFING POLAND

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 Zavarová, 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 POLAND

INNOVATION LANDSCAPE

Poland, with its robust and dynamic economy, is a significant economic player in Central Europe. Yet it ranks only 41st in the Global Innovation Index, and is in the lowest category of emerging innovators in the European Innovation Scoreboard. These positions are below expectation, given the country's size and level of economic development.¹ This reflects the reality that Poland's growth so far has been driven primarily by production capabilities, rather than innovation capabilities. In general, the Polish government's proactive attitude towards the area of innovation, reflected in the extensive system of institutional and financial support, constitutes a solid basis for the development of the country's innovation system.

Poland's main advantage in innovation performance is the quality of its human capital, as reflected by the strong performance of pupils in PISA tests, outperforming the EU on average.² Spending on tertiary education also surpasses average EU-CEE levels, although it falls short of the EU average. However, the challenge lies in a below EU-CEE average share of tertiary graduates in STEM fields (19.6%), indicating a potential future shortage of skilled STEM workers. Recent trends also reveal a deterioration in relevant indicators, highlighting the need to defend the quality of Polish human capital.

As the largest economy of the EU-CEE region, Poland also holds the advantage of market size and domestic demand, which can be leveraged to stimulate domestic innovation. A handful of highly innovative national firms have emerged in Poland. When it comes to the EU policy initiative Important Projects of Common European Interest (IPCEI), four Polish companies and one Polish-German firm participate.³ The EU Industrial R&D Investment Scoreboard's top 1,000 contains three companies from Poland, which makes it a regional leader in this respect.

However, linkages between individual innovation actors remain weak, as exemplified by the low levels of collaboration among innovative small and medium-sized enterprises (SMEs), as well as university-industry collaborations (see the

¹ According to GII's expected vs. observed innovation performance.
² Based on the 2018 survey, latest available at the time of writing.
³ Polish companies Synthos, Orlen, Vigo Photonics, Elemental Strategic Metals, and Polish-German company SGL Carbon.

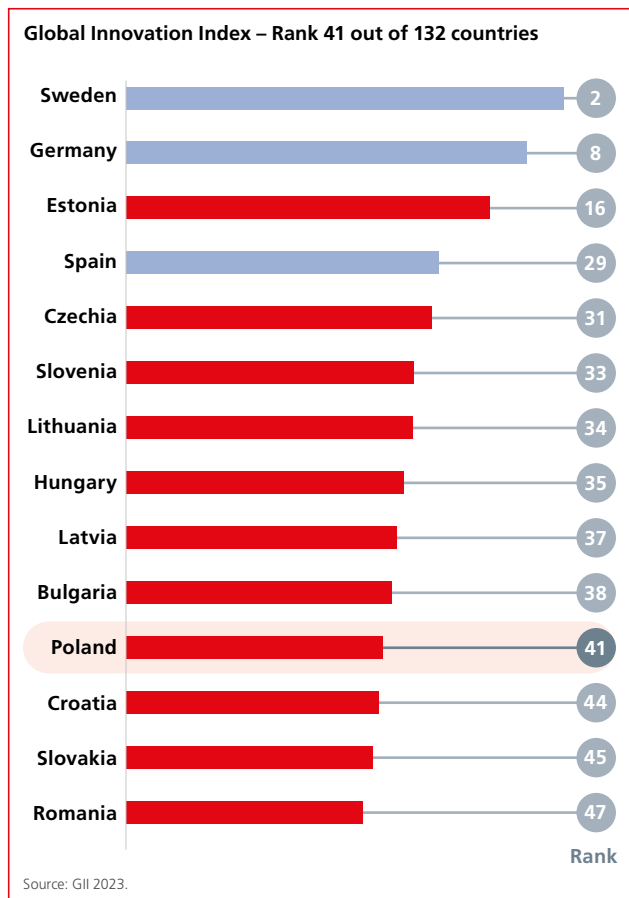


table below). To improve the interlinkages in the innovation system, clusters – particularly in IT, biotechnology, aviation and energy – have been recognised by the government as vital. They are supported by policy initiatives, but so far remain relatively underdeveloped.

The core challenge lies in the prevalence of foreign capital concentrated in non-innovative activities and insufficient investment in innovation. General research and development (R&D) expenditures in Poland constitute only 1.4% of GDP, far below the EU average; this creates unfavourable conditions for enhancing innovation. SMEs display limited engagement in innovation compared with the EU average, and start-ups are voicing their struggles with skills shortages.⁴

⁴ According to a report by the Startup Poland Foundation, 52% of start-ups in Poland in 2022 signalled problems with recruiting employees, with a simultaneous rapid increase in the costs of employing them.

Poland displays rather weak preparedness for the twin transition, which calls for stronger efforts in this direction. The country suffers from a low level of digitalisation, ranking 24th of 27 EU member states in the Digital Economy and Society Index 2022. This is a consequence of multiple factors, such

as insufficiently developed infrastructure, low level of digital awareness and limited public spending in this area. Moreover, when it comes to the green transition, Poland ranks next to last in the Eco-Innovation Index, and faces a number of formidable challenges, such as moving away from coal.

National Innovation System Indicators				
Priority areas	Indicator	Poland	EU	EU-CEE
Education system	Tertiary education graduates in STEM, share in % (UNESCO)	19.6	24	24.2
	Spending on tertiary education per student, in EUR at PPP (Eurostat)	7,180	7,990	6,600
	PISA scales in reading, maths and science (GII)	513	484	480
Technological capacities of enterprises	R&D (GERD) financed by business, share in % (Eurostat)	51.0	57.7	43.5
	R&D expenditures (GERD) in % of GDP (Eurostat)	1.4	2.3	1.3
	SMEs with product innovations, share in % (EIS)	14.2	27.0	22.8
	SMEs with business process innovations, share in % (EIS)	25.5	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)	6.7	11.7	10.1
	University-industry R&D collaborations, average perception scores from 0 to 7 (GII)	3.2	4.2	3.8
Innovation outcomes	Granted patents per million inhabitants (WIPO)	120	586	86
	Exports of medium and high-technology products, in % of total product exports (EIS)	49.9	61.2	49.5
	Knowledge-intensive services exports, in % of total services exports (EIS)	49.1	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	The National Centre for Research and Development (NCBiR) Polish Development Fund Group (PFR)	The agenda of the NCBiR overlaps partially with that of PFR. NCBiR covers science and research, connecting R&D with business. PFR is focused on financing innovation activities in the country.
Programmes for human capital development	Yes	A large number of programmes focused on development of human capital	Adopted within the Strategy for Development of Human Capital 2030.

<p>Programmes for human capital attraction and retention (e.g. reverse brain drain)</p>	<p>Yes</p>	<p>Fund for Polish Science offers some grants to foreign as well as Polish scientists abroad, for work in Poland</p> <p>Polish Agency for Enterprise Development (PARP) offers Poland Prize programme aimed at bringing foreign start-ups to Poland</p>	<p>Established programmes.</p>
<p>Start-up programmes (incubators, dedicated financing, etc.)</p>	<p>Yes</p>	<p>PARP offers a set of services focused on development of SMEs, including improving their innovative output</p> <p>Multiple programmes available at PFR School of Pioneers</p>	<p>PARP is a well-established institution.</p>
<p>Venture capital programmes</p>	<p>Yes</p>	<p>Seven available schemes within the PFR Ventures programme (PFR Starter, Biznest, OI, KOFFI, NCBR CVC, Green Hub FoF, PE)</p>	<p>PFR Ventures is the development finance institution dedicated to fund investments.</p>
<p>Cluster programmes</p>	<p>Yes</p>	<p>A variety of national clusters including:</p> <p>Silesia Automotive & Advanced Manufacturing; Silesian NANO Cluster; Silesian Aviation Cluster;</p> <p>West Pomeranian Chemical Cluster Green Chemistry;</p> <p>Pomeranian ICT Cluster Interizon;</p> <p>Bydgoszcz Industrial Cluster Dolina Narzędziowa;</p> <p>Cluster LifeScience Kraków;</p> <p>North-South Logistics and Transport Cluster</p>	
<p>Technology-specific policies</p>	<p>Yes</p>	<p>PFR Tech Hub focused on supporting: Electronics and robotic industries, 5G connectivity and the Internet of Things, AI and digital technologies, advanced chemistry and materials, engineering, drone industry (U-space), space industry</p>	<p>PFR Tech Hub is a strategic programme of the Polish Development Fund, the purpose of which is to support investment in the high-technology sector.</p>
<p>Tax incentive schemes</p>	<p>Yes</p>	<p>R&D tax relief supporting conceptual work on a new product;</p> <p>Prototype tax relief supporting the transfer of the idea into the language of practice and production;</p> <p>Tax relief to support innovative employees, making it easier to compete for specialists with key skills and competences;</p> <p>Tax relief for robotisation, which will facilitate the opening of a production line dedicated to the product;</p> <p>Possibility of simultaneous use of the R&D tax relief and the IP Box tax relief, reducing the burden at the stage of its sale</p>	<p>A large number of tax incentive programmes.</p>
<p>Others</p>		<p>Various other programmes including:</p> <p>NCBiR schemes supporting participation of Polish institutions in the Horizon Europe programme and supporting IPCEI participation;</p> <p>Vouchers offered by PARP to SMEs for financing R&D spending;</p> <p>Innovation centres recognised and registered by the Ministry of Development of Technology institutions;</p> <p>State purchasing policy 2022–2025</p>	<p>NCBiR conducts joint advisory, information and support activities to support Polish scientific and business community in the European research area.</p> <p>Innovative centres are involved in technology transfer and providing pro-innovation services and co-operation with business.</p> <p>The state purchasing policy outlines ambitious targets for the public procurement of innovation.</p>

COUNTRY-SPECIFIC POLICY PRIORITIES AND RECOMMENDATIONS

- **Make more strategic use of incoming foreign direct investment (FDI), bringing investment promotion programmes closer to innovation objectives.**⁵ FDI has played a pivotal role in the economic development of Poland, but this channel has not been leveraged to its full. In most industries, foreign capital continues to be the main driver, with local firms playing more marginal roles. Arguably, some policies even contribute to this mode of development. A rethinking of FDI promotion policy is therefore needed, in a way that is conducive to the upgrading of Poland in value chains and the building up of innovative capacities potential (see also the recommendations in Section 5.2 of the main report). A variety of policy instruments may be used for this purpose: a much more selective approach to tax breaks and subsidies offered to foreign investors is needed, in a way that prioritises investments aligned with Poland's innovation ambitions, tying it together with the priority areas identified within the smart specialisation framework (also refer to the Irish 'innovation by invitation' approach discussed in Section 2.2 of the main report). Furthermore, incentives should be set in a way in which they help to create linkage between the foreign investors and local suppliers, for instance by making contribution to existing clusters, using Polish suppliers, or providing training and collaborating with local education institutions, a precondition for financial support.
- **Tackle the weak performance in green innovation through stepped-up policy efforts.** As noted above, Poland significantly falls behind in the Eco-Innovation Index, ranking next to last in 2022. To turn this weakness into a strength, the Polish government needs to implement policies that more effectively encourage eco-innovation. These can include grants and/or subsidies for companies investing in green technologies, but also joint, private-public funding for R&D projects, sharing resources and expertise, and co-developing sustainable technologies. Another step would be the establishment of an additional key cluster, focused on eco-innovation. Furthermore, establishing of a network of eco-innovators can facilitate knowledge sharing and collaboration. This network can include businesses, research institutions, government agencies and NGOs, working together to foster eco-innovation. Additionally, setting up clear, long-term environmental goals can provide a stable framework for businesses to invest in eco-innovation. Clear goal-setting would allow progress with the general development of eco-strategy for Poland, which at present hardly shadows steps made by other, more advanced economies. Additional financial and technical incentives for FDI in this area would strengthen available capital and access to new technologies.
- **Provide access to a motivated and educated workforce in Poland, particularly in areas of innovative technologies.** This involves several key strategies. First, strengthening the education system to focus on STEM subjects is crucial. This includes updating the curriculum to include cutting-edge technologies and practical skills, as well as promoting university programmes and vocational training in fields such as IT, biotechnology, robotics and AI. Second, creating partnerships between educational institutions and technology companies can be beneficial. Internships, apprenticeships and co-operative education programmes can provide students with real-world experience and a pathway to employment in innovative technologies. Third, implementing policies that attract skilled workers from other countries and bring back Polish talent from abroad can enhance the capabilities of the local workforce. This can include easing visa restrictions for skilled workers, offering competitive salaries in the public sector and creating an expatriate-friendly environment. Finally, encouraging continuous learning and professional development for current employees in the tech sector is also vital. This can be achieved through workshops, online courses and conferences to keep the workforce abreast of the latest technological advancements (also see the recommendations in Section 5.4 of the main report).

⁵ See also the Polish country report in Zavorská et al. (2023), where we discuss this point.

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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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