12 Science, technology and innovation (Dimension 9)

An effective institutional and policy context for science, technology and innovation (STI) is essential to boost the knowledge economy. For the small open economies of the Western Balkans, STI activities play an important role in the region's path to EU accession and are viewed as key for regional integration. This chapter assesses the STI policy framework and support structure in the six Western Balkan (WB6) economies. After a brief analysis of overall STI trends and performance in the region, the chapter explores three sub-dimensions considered instrumental to the development of sustainable and impactful STI policies and processes. The first, governance of domestic STI systems, reviews the strategic and regulatory framework for STI, including key strategies, institutional set-up and co-ordination, as well as international collaboration and alignment with EU good practice. The second sub-dimension, public research systems, analyses the governance of the public scientific research sector, funding approaches and human resource capacity to foster academic research excellence. The third sub-dimension, business-academia collaboration, assesses the policy framework that supports integration between scientific research and the private sector, which is critical for technology transfer, successful commercialisation, and the economic impact of STI. The chapter concludes with a set of recommendations to further enhance STI policy development and implementation.

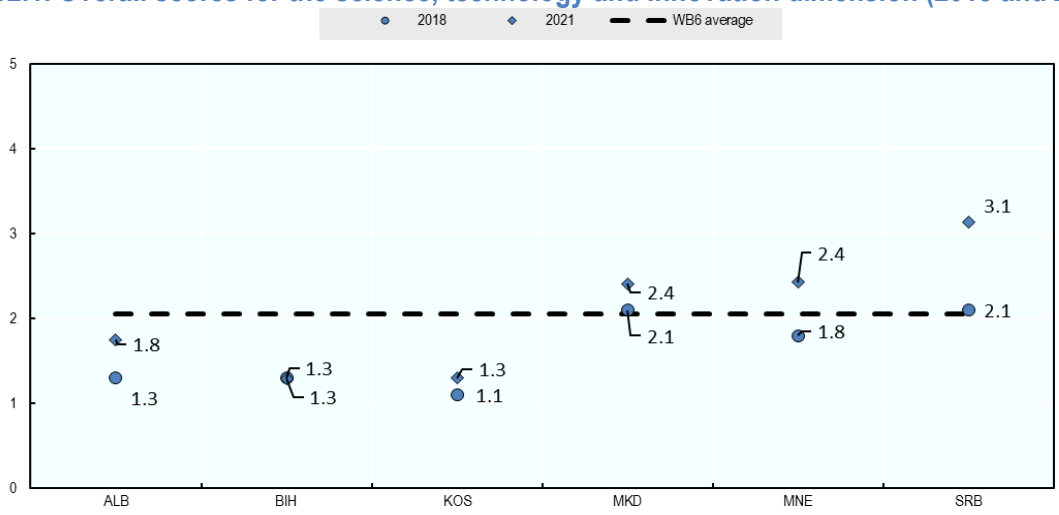
Key findings

- **Most WB6 economies have a comprehensive STI strategic framework in place** or are in the process of renewing their framework. However, effective implementation is sometimes hindered by limited co-ordination and a lack of policy prioritisation and impact evaluation. Smart specialisation strategies have been adopted in Montenegro, North Macedonia and Serbia, and are being prepared in the other economies.
- **Overall research and development (R&D) expenditure in WB6 economies remains well below regional peers and the EU target**. Although domestic funding is increasing, many critical policy initiatives and programmes continue to rely heavily on international donor support.
- **Some economies operate or are setting up an innovation fund** as a key vehicle for implementing STI policy. The funds in North Macedonia and Serbia are the largest in scope and size and implement STI financial schemes in line with international best practice.
- **A weak track record of enforcing intellectual property protection (IPP),** coupled with low awareness of intellectual property (IP) rights and use, impedes STI development.
- **All economies are embedded in and connected to European and international research networks**; however, these linkages do not always produce the desired scientific outputs. International research collaboration is growing, albeit from low levels. Regional integration of STI, however, remains limited and lacks a systematic approach.
- **Public research remains systemically underfunded**, while the available funds are not used optimally, resulting in subdued research outputs and outcomes. Some economies, notably Serbia, have taken steps to reform the funding model for research by introducing a stronger focus on performance and competitive project-based funding.
- **Human capital remains below potential** amid weak funding, limited development opportunities and few incentives to seek the commercialisation of research. Some economies are increasingly promoting young researchers and linkages with their diaspora to tackle falling numbers of researchers and accelerating brain drain.
- **Linkages between academic research and industry remain nascent**, and a clear strategic policy approach is lacking. As a result, private sector investment in R&D has remained low. All economies have experimented with financial incentives for business-academia collaboration, but non-financial incentives are virtually non-existent. Where voucher schemes are available, they are underfunded, while sophisticated competitive co-operative grants are only available in Serbia and are being introduced in North Macedonia. All economies have expanded institutional support for collaboration; however, the support infrastructure is often provided in the form of incubators for start-ups.

Comparison with the 2018 assessment

The WB6 region has made some progress in the science, technology and innovation dimension, albeit mostly from a relatively low base (Figure 12.1). While the economies that already had an emerging STI framework and policies in place in the 2018 assessment (Montenegro, North Macedonia, and Serbia) have further consolidated and expanded policy measures, the gap has widened for those positioned at the lower end of the performance review. This suggests an increasing tendency towards a two-speed development of STI policy within the Western Balkans, which – unless effectively addressed in the short to medium term – will intensify disparities across the region.

Figure 12.1. Overall scores for the science, technology and innovation dimension (2018 and 2021)



Note: Scores for 2021 are not directly comparable to the 2018 scores due to the addition/removal of relevant qualitative indicators. Therefore, changes in the scores may reflect the change in methodology more than actual changes to policy. The reader should focus on the narrative parts of the report to compare performance over time. See the Assessment methodology and process chapter for information on the assessment methodology.

Implementation of the Competitiveness Outlook 2018 recommendations

Progress on implementing the policy recommendations made in the Competitiveness Outlook (CO) 2018 has been moderate overall (Table 12.1), although some economies have pursued STI policy reform more proactively than others. At a regional level, moderate progress has been made in areas such as making available financial STI support schemes, creating better linkages between academia and industry, introducing technology diffusion and absorption policies, integrating the diaspora and improving statistical data collection in STI, whilst only limited progress has been made in reforming procurement policies to incentivise STI.

Table 12.1. Implementation of the CO 2018 policy recommendations: Science, technology and innovation dimension

Competitiveness Outlook 2021		
CO 2018 policy recommendations	**Main developments during the assessment period**	**Regional progress status**
Increase and consolidate financial support for research and development	• All economies have increased the budget for STI; however, gross domestic expenditure on research and development (GERD) remains significantly lower than peer economies. • Some economies, notably Montenegro and Serbia, have reformed their financing approaches for scientific research and have announced a significant increase in funding for STI in the coming years. • Serbia established a dedicated Science Fund in 2019 that provides financial support to foster research activities. • In North Macedonia and Serbia, the activities of the respective innovation funds are increasingly funded though domestic budget allocations.	Moderate
Place more emphasis on technology diffusion and absorption policies	• Serbia has put in place a Technology Extension Facility and North Macedonia launched a grant scheme to support technology extension in 2018.	Moderate
Use procurement to encourage innovation	• Serbia has introduced an element of support for innovation in its 2019 Public Procurement Law.	Limited
Develop a structured approach to creating links between business and	• The Serbian Innovation Fund offers a variety of financial support schemes to support collaboration.	Moderate

academia	• Institutional support structures, primarily in the form of science and technology parks and centres of excellence, have advanced in most economies.	
Make better use of the WB economies' highly educated diaspora and tackle brain drain	• The STI framework in most economies makes reference to leveraging connections with diaspora communities. • Only Serbia has implemented a dedicated finance scheme to foster such linkages through the Science Fund, while Albania is exploring a digital platform for ideas exchange.	Moderate
Improve the creation of STI-related statistics to enable the development of evidence-based policies	• In 2020, Montenegro participated in the European Innovation Scoreboard for the first time, joining North Macedonia and Serbia. • In other economies, STI-related statistics remain highly limited.	Moderate

Introduction

Effective STI policies, processes and organisations, which define the institutional and policy context for science, technology and innovation, are essential aspects of the toolbox available to policy makers to boost the knowledge economy. STI policy spans the entire innovation value chain, ranging from the creation of fundamental knowledge in basic and applied sciences and technology to the transfer of knowledge to the economic sphere to foster product, process and organisational innovation. STI policies, if designed well, provide the strategic framework for embracing the knowledge economy, embed targeted financial and human capacity-building measures for research and innovation, and incentivise the exchange of knowledge between the public and the private sector, thereby ultimately facilitating the commercialisation of innovation and increasing productivity.

The outbreak of COVID-19 has highlighted another benefit of a well-functioning and modern STI system. Science, technology and innovation have proven essential in the global response to the pandemic and will be vital to support recovery and strengthen economic resilience and competitiveness in the long term.

STI policy is closely intertwined with other policy dimensions covered by the Competitiveness Outlook 2021. Most notably these include:

- **Chapter 4. Investment policy and promotion** aims to facilitate foreign direct investment (FDI), which can generate significant and instrumental grassroots investment and investment in knowledge-intensive sectors. Economies demonstrating strong STI-enabling ecosystems are more attractive to international investors, who can leverage their investment with existing local infrastructure and skills.
- **Chapter 5. Trade policy** and STI reinforce each other, as STI increases local productivity and provides a competitive edge.
- **Chapter 6. Access to finance** remains a key obstacle to private sector innovation. Conventional funding is often ill suited for innovative firms, but alternative finance instruments such as venture capital or business angel investments remain at an early stage of development.
- **Chapter 10. Education policy** is essential for building a knowledge economy as successful STI systems rely heavily on human capital.
- **Chapter 8. Employment policy** can support and attract human resources for research and innovation, strongly affected by brain drain in the region.
- **Chapter 13. Digital society** is important as effective digital communication and information infrastructure are the main enabling tools for fostering "open science", while e-commerce and e-business facilitate firm innovation.

Assessment framework

Structure

This chapter assesses policies to develop science, technology and innovation in the WB6 through three broad sub-dimensions:

1. **Sub-dimension 9.1: STI system** focuses on the overarching strategic framework for STI. It assesses the comprehensiveness and relevance of STI strategies and how they are implemented.
2. **Sub-dimension 9.2: Public research system** focuses on the governance of public scientific research and how well policies ensure academic excellence. It examines how public research is funded and assesses policy approaches to foster human resource capacity.
3. **Sub-dimension 9.3: Business-academia collaboration** focuses on the collaboration framework and analyses how policies encourage technology transfer, commercialisation and co-operation between academia and the business community. It also examines the support mechanisms, both financial and others, available to encourage science-industry collaboration, and how the institutional support infrastructure encourages such linkages.

Figure 12.2 shows how the sub-dimensions and their indicators make up the STI dimension assessment framework. The assessment was carried out by collecting qualitative data with the help of questionnaires filled out by governments, as well as face-to-face interviews undertaken with relevant non-government stakeholders. Alongside these qualitative inputs, quantitative data on certain indicators – provided by the economies' statistical offices, relevant ministries and agencies, and other databases – formed an integral part of this assessment. For more information on the methodology see the Assessment methodology and process chapter.

Figure 12.2. Science, technology and innovation dimension assessment framework

Science, technology and innovation dimension		
Sub-dimension 9.1 STI system	**Sub-dimension 9.2** Public research system	**Sub-dimension 9.3** Business-academia collaboration
Qualitative indicators 1. STI strategy 2. Institutional framework 3. Regulatory framework 4. International collaboration 5. Alignment with EU STI policies	**Qualitative indicators** 6. Institutional structure of the public research system 7. Public research funding 8. Human resources for research and innovation	**Qualitative indicators** 9. Collaboration promotion framework 10. Financial incentives for collaboration 11. Non-financial incentives for collaboration 12. Institutional support for collaboration
Quantitative Indicators 1. Gross domestic expenditure on R&D (% of GDP) 2. Gross domestic expenditure on R&D by source of funds (% of GDP) 3. Volume of international competitive research grants (e.g., Horizon 2020, Eureka, WBEDIF) 4. Number of projects receiving international competitive research grants	**Quantitative Indicators** 5. Number of researchers, per million population 6. Government budget appropriations or outlays on R&D (% of GDP)	**Quantitative Indicators** 7. Total amount of financial support for business-academia collaboration 8. Charges for use of IP receipts

Note: GDP = gross domestic product; IP=intellectual property.

For the small open economies of the Western Balkans, the opportunities of STI activities go beyond just economic impact; research and innovation play an important role in the region's path to EU accession and are viewed as key for regional integration. Against this background, the leaders of the WB6 endorsed the Common Regional Market 2021-2024 Action Plan (AP) at the Berlin Process Summit held on 10 November 2020 in Sofia. The AP sets out a roadmap towards deeper regional and European integration. It is made up of targeted actions in four key areas: (1) a regional trade area; (2) a regional investment area; (3) a regional digital area; and (4) a regional industrial and innovation area. The findings of this CO assessment can inform the implementation of the actions under the "regional innovation area" (Box 12.3).

Key methodological changes to the assessment framework

The methodology for this dimension has changed substantially since the last Competitiveness Outlook, with the number of sub-dimensions reduced from five to three. Most notably, the sub-dimension on innovation in firms has been removed, reflecting the strong focus on policies that enable research excellence as a prerequisite for the knowledge economy, and the shift away from a focus on start-up innovation. Firm innovation continues to feature strongly in the OECD SME Policy Index (OECD, 2019[1]).

Several aspects of the previous CO assessment framework have been consolidated in the new methodology. Sub-dimensions 9.1 and 9.3 remain largely unchanged, whereas sub-dimension 9.2 now also includes all aspects related to human resource capacity, which had previously been covered in a separate sub-dimension.

In this edition, the qualitative data collected through the assessment framework has also facilitated the WB6 economies' participation in the EC-OECD STIP Compass database (Box 12.1).

Box 12.1. STIP Compass: International database on science, technology, and innovation policy

The Science, Technology and Innovation Policy (STIP) Compass is a joint initiative of the European Commission (EC) and the OECD that aims to bring together quantitative and qualitative data on domestic trends in STI policy in one place. The STIP Compass portal supports the continuous monitoring and analysis of economies' STI policies and provides a platform for policy research and advice to support government officials, analysts and scholars.

STIP Compass data are gathered through responses to the EC-OECD STI Policy survey, sent every two years to government officials working on STI policies. The CO 2021 STI dimension's assessment framework and indicators include several policy areas that feature in the 2019 edition of the survey:

Sub-dimension 9.1: STI system includes a number of policy themes from the EC-OECD survey, including part of the "Governance" area, such as an STI plan or strategy, horizontal policy co-ordination and international STI governance policy. It also partially reflects the survey's "Emerging trends in STI policy" module.

Sub-dimension 9.2: Public research system incorporates indicators based on different policy themes from two areas of the survey: "Public research system", which focuses on research infrastructure, financing, and structural changes; and "Human resources for research and innovation", which includes themes of research careers and international mobility.

Sub-dimension 9.3: Business-academia collaboration partially reflects the policy area "Science-industry knowledge transfer and sharing", including collaborative research and innovation and intersectoral mobility themes.

Source: (EC and OECD, n.d.[2]), *STIP Compass*, https://stip.oecd.org/stip.html.

Science, technology and innovation performance and context in the WB6

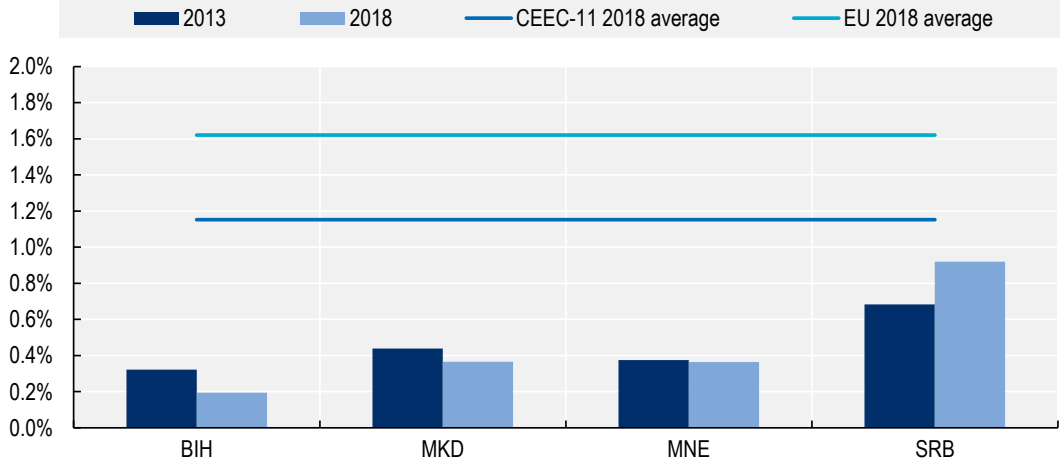
Reliable statistical data on key areas of STI are still scarce in some WB6 economies, which limits a comprehensive analysis of the state of play of science, technology and innovation across the region. Only North Macedonia and Serbia regularly participate in the European Innovation Scoreboard, with Montenegro having joined for the first time in 2020.

The latest scoreboard assessment for the participating WB6 economies is not particularly positive. All three economies rank near the bottom, with Montenegro and North Macedonia categorised as "modest innovators" (ahead of Romania and Ukraine), which means that their performance is less than 50% of the EU average. Serbia is categorised as a "moderate innovator", with its relative performance between 50 and 95% of the EU average. Although there are significant gaps with the European average, the 2020 edition of the innovation scoreboard also emphasises that significant improvements have been made since the previous annual assessment, suggesting that capacity for innovation is gradually increasing in the three economies (EC, 2020[3]).

Spending on R&D as a percentage of GDP (GERD) remains low in all six economies (Figure 12.3) and is well below the EU target of 3%. Even when compared with the CEEC,[1] gaps remain significant. Despite a stronger focus on STI in recent years, an increase in spending is only evident in Serbia. In 2018, average R&D investment was only 0.5% of GDP in the region, compared to 1.15% in the CEEC and 1.62% in the EU.

Figure 12.3. Gross domestic expenditure on R&D (GERD) (2013 and 2018)

% of GDP



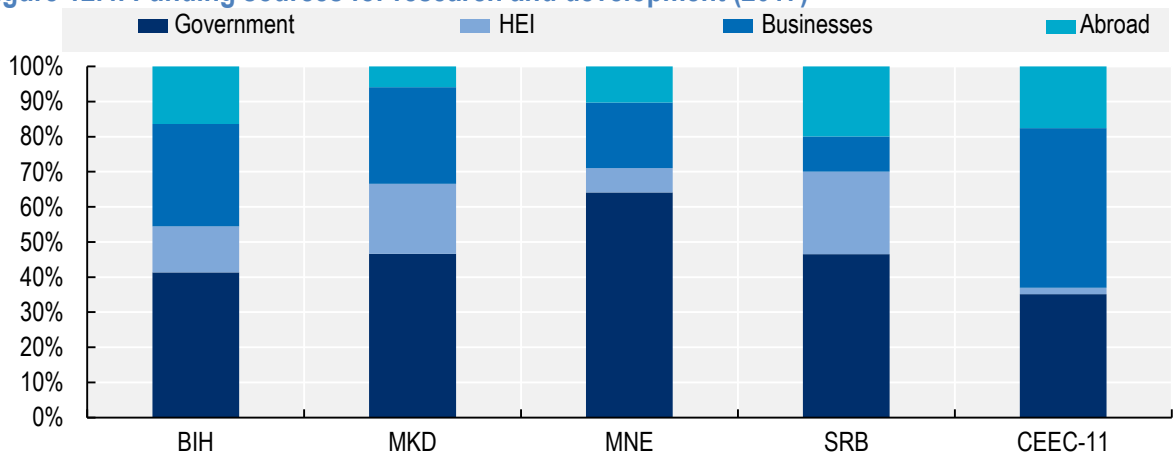
Note: Data for Albania and Kosovo are unavailable. EU and CEEC-11 averages are calculated as simple averages. EU average includes 27 EU Member States. CEEC-11=Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia.

Source: (UIS, 2021[4]), *Science Technology and Innovation Database*, http://data.uis.unesco.org/; (Eurostat, 2020[5]), "Gross domestic expenditure on R&D (GERD) at national and regional level", https://ec.europa.eu/eurostat/data/database.

StatLink https://doi.org/10.1787/888934254221

R&D investment in the Western Balkans continues to be driven by the public sector, with activities concentrated in public centres and institutes, higher education institutions (HEIs), and government agencies. Company investment in research is only slowly gaining pace. Across the region, public sector investment (government and HEI) accounted for around two-thirds (65%) of overall GERD in 2017, compared to around one-third (37%) in the CEEC region. In contrast, private sector investment in R&D was around 20% on average across the region, which is less than half the CEEC average (Figure 12.4). This suggests an overall low capacity of firms in the Western Balkans to innovate, and limited appetite to invest in risky R&D.

Figure 12.4. Funding sources for research and development (2017)



Note: Data for Albania and Kosovo are unavailable. CEEC-11=Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia. HEI=higher education institutions.
Source: (UIS, 2021[4]), *Science Technology and Innovation Database*, http://data.uis.unesco.org/.

StatLink https://doi.org/10.1787/888934254240

Research output and quality remain subdued in the WB region, with the six economies significantly lagging behind CEEC peers for patent applications. Very few patents granted by the European Patent Office (EPO) or the United States Patent and Trademark Office (USTPO) originate in any of the WB6 (Table 12.2). Of the patent applications made to the EPO from the region (just over 100 between 2010 and 2019), fewer than half were granted, which suggests substantial shortcomings in the quality of research (EPO, n.d.[6]).

Table 12.2. Patents granted, WB region and CEEC averages (2019)

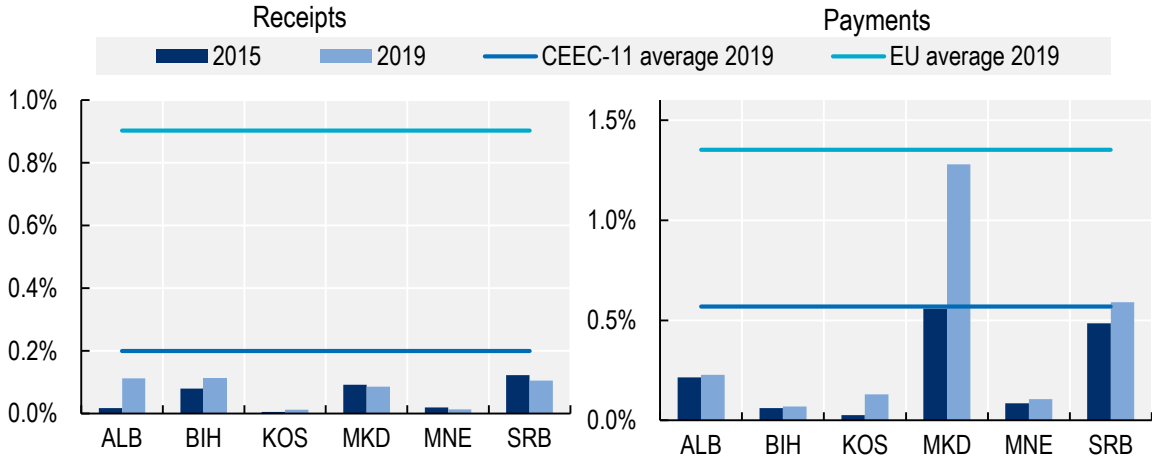
Number of patents	EPO	USPTO	CEEC-11 average EPO	CEEC-11 average USPTO
ALB	0	1	61	121.9
BIH	0	3	61	121.9
MKD	1	0	61	121.9
MNE	0	1	61	121.9
SRB	6	27	61	121.9

Note: Data for Kosovo are unavailable. CEEC-11=Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia. EPO: European Patent Office; USPTO: United States Patent and Trademark Office
Source: (EPO, n.d.[6]), *Patent statistics*, https://www.epo.org/about-us/annual-reports-statistics/statistics.html#data; (USTPO, 2019[7]), *Patent count by country of origin and type 2019*, https://www.uspto.gov/web/offices/ac/ido/oeip/taf/st_co_19.htm.

Figure 12.5 suggests that monetary returns on patents remain negligible. Receipts for the foreign use of domestic IP are less than half the CEEC average and significantly below the EU average. The gap in payments for foreign IP is also substantial, suggesting a low technology absorption and diffusion capacity of the Western Balkan economies compared to the EU. However, the gap with the CEEC region is narrowing.

Figure 12.5. Charges for the use of intellectual property, receipts and payments (2015 and 2019)

% of GDP



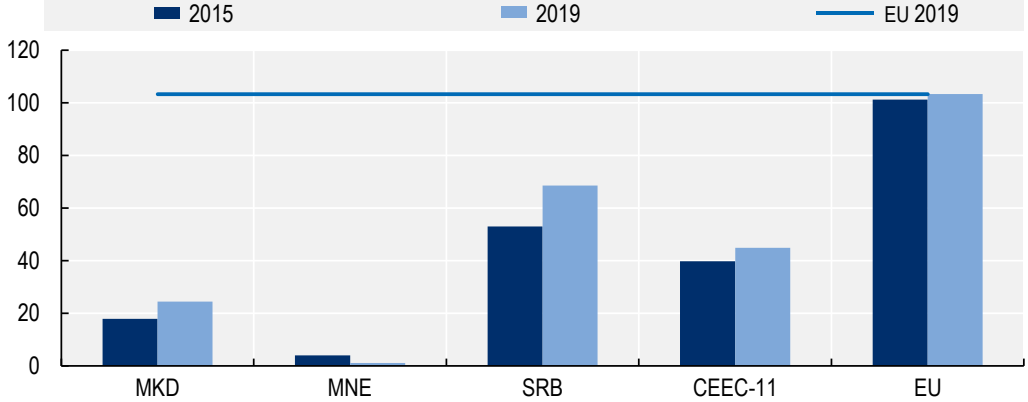
Note: Receipts include domestic inventions owed to foreign clients, payments include use of foreign inventions. EU average includes 27 EU Member States . CEEC-11=Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia.

Source: (World Bank, n.d.[8]), *World Bank Development Indicators*, https://data.worldbank.org/.

StatLink https://doi.org/10.1787/888934254259

The WB economies are predominately service-oriented, and the limited ability of the region to innovate and leverage its innovation potential is evident when looking at high value-added exports. The share of knowledge-intensive service exports can be a robust indication of an economy's capacity to export services with a high level of value added, notably resulting from innovation, and to successfully take part in knowledge-intensive global value chains. Data for the economies participating in the European Innovation Scoreboard suggest that the WB region is catching up with, or exceeds in the case of Serbia, the performance of the CEEC region (Figure 12.6). This is mainly linked to the increasing importance of the information and communication technology (ICT) sector in the Serbian economy, with ICT service exports accounting for over 17% of total service exports in 2017, compared to 12.7% in the EU (World Bank, n.d.[8]). However, comparing the region's performance to the European average highlights the overall relatively weak performance in STI.

Figure 12.6. Knowledge-intensive service exports, European Innovation Scoreboard (2020)



Note: Data indicate normalised performance of economies in 2019 relative to that of the EU in 2012. Data are unavailable for Albania, Bosnia and Herzegovina and Kosovo. EU average includes 27 EU Member States. CEEC-11=Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia.

Source: (EC, 2020[3]), *European Innovation Scoreboard 2020*, https://ec.europa.eu/docsroom/documents/42981.

StatLink https://doi.org/10.1787/888934254278

The following sections analyse in more detail the policy tools available to the Western Balkan economies to unlock their innovation potential and move towards a knowledge economy.

STI system (Sub-dimension 9.1)

Science, technology and innovation is an inherently interdisciplinary area that covers a broad set of policy areas, including science and education, economic development, industrial policy and entrepreneurship. This makes the governance of STI complex as it requires a comprehensive strategic framework, clearly mandated implementation bodies, and attentive and consensus-driven cross-cutting co-ordination to ensure effective and impactful implementation. If poorly designed, the policy framework may create overlapping, insufficiently financed or even contradicting support measures, and leave gaps where support may be most needed. In the STI system sub-dimension, these aspects are assessed by looking at domestic STI strategies, including the overall strategic framework, its scope and implementation status, as well as the presence of a smart specialisation strategy. In addition, the sub-dimension includes a review of institutional frameworks, including implementation mechanisms such as innovation or science and technology agencies, the mandate and operational capacity of such bodies, and horizontal policy co-ordination efforts. The regulatory framework in which the STI system is embedded, including regulations on intellectual property protection, is also assessed.

Taking into account the increasingly important international dimension of STI, the analysis also includes policies and initiatives that support international collaboration, and further reflects on economies' capacity to implement effective STI policies by looking at the alignment of domestic STI priorities with EU STI policies. It also explores ways of incorporating EU good practice into domestic policies.

Across the STI dimension, the WB6 achieves the highest average score (2.4) for the STI system sub-dimension (Table 12.3). This score, however, remains relatively low, since relevant policies and mechanisms are formally in place in Serbia, Montenegro and North Macedonia, but remain nascent in the remaining three economies. Implementation of these policies in most WB6 economies is still at an early stage, and the full impact of the policy frameworks will only become evident in the years to come.

Table 12.3. Scores for Sub-dimension 9.1: STI system

Sub-dimension	Qualitative indicator	ALB	BIH	KOS	MKD	MNE	SRB	WB6 average
STI system	STI strategy	2.8	1.3	1.3	2.5	3.5	3.5	2.5
	Institutional framework	1.8	1.2	1.5	2.8	2.5	4.0	2.3
	Regulatory framework	2.0	1.3	2.0	2.0	2.0	3.0	2.1
	International collaboration	1.8	2.0	2.0	2.5	2.8	3.0	2.3
	Alignment with EU STI policies	2.5	2.5	2.0	3.3	3.5	3.5	2.9
Sub-dimension average score		2.2	1.7	1.8	2.6	2.9	3.4	2.4

STI policy frameworks are comprehensive and strategic in most economies, but implementation varies

Innovation is a key driver of productivity, growth and well-being, and plays an important role in helping address core public policy challenges (OECD, 2015[9]). However, seizing the full potential of innovation remains a challenge for many economies. Therefore, an economy-level STI strategy that covers areas such as fostering academic excellence in basic and applied science, technology transfer, commercialisation, firm innovation and business-academia collaboration is essential for policy makers to harness innovation.

The need for a comprehensive domestic STI strategy has been increasingly recognised by most WB6 economies. Albania, Montenegro and Serbia have approved STI strategies that include clear objectives,

action plans, key performance indicators and some level of monitoring and evaluation mechanisms. The strategies were designed following public consultations and reflect, to varying extents, feedback from relevant stakeholders. Since the last assessment, Albania also adopted the National Strategy of Scientific Research, Technology, and Innovation (2017-2022). The STI policy frameworks in Albania, Montenegro and Serbia include strategic cross-cutting themes related to brain drain, although key policy measures to tackle this increasingly evident trend are scarce. Some strategies also address elements of digitalisation, climate change and artificial intelligence, but only Serbia has adopted a dedicated strategy (in 2019) to address and develop artificial intelligence more comprehensively. For the other three WB economies, North Macedonia's strategic framework expired in 2020 and a renewed strategy is still under preparation. In Bosnia and Herzegovina, the complex governance structure means that STI policy making predominately falls under the responsibility of the entities and/or cantons, which results in an incomplete and fragmented policy framework. In Kosovo, where STI is governed through numerous high-level strategic frameworks, no progress has been made in developing a clearly defined STI strategy.

Good progress has been made by some economies in developing smart specialisation strategies (Box 12.2). Montenegro adopted such a strategy in 2019, followed by Serbia in 2020. Similar strategies are expected to be adopted in Albania and North Macedonia in 2021, which will further boost the STI framework in these economies. All economies have received support from the European Commission's Joint Research Centre to prepare their smart specialisation strategies and have greatly benefitted from its experience.

Box 12.2. Smart specialisation in the Western Balkans

Smart specialisation considers the assets and resources available in economies, as well as their specific socio-economic challenges, and aims to identify competitive advantages and opportunities for growth. Smart specialisation leverages industrial, education and innovation policies to address a small number of priority sectors and technologies relevant for knowledge-based investment.

The concept of smart specialisation is still relatively new to economic development theory and was first initiated by the European Union. The smart specialisation process includes an in-depth feasibility assessment to identify and target the most competitive industries with innovation potential to accelerate economic growth.

Despite its huge potential, smart specialisation cannot be an alternative to a broader STI framework, but rather complements robust, holistic and impactful innovation policy actions.

Smart specialisation strategies as a tool in the EU accession process

The EU's strategy for the Western Balkans defines how smart specialisation can be used to boost entrepreneurship and innovation across the region. In 2017, the heads of government of all WB6 economies endorsed the Multi-annual Action Plan for a Regional Economic Area in WB. This encompasses economic development strategies based on knowledge and innovation and builds on EU experiences of smart specialisation.

Smart specialisation remains at an early stage in the region. However, with support from the European Commission's Joint Research Centre, which provides policy advice, methodological guidance, and implementation support, it is increasingly becoming a priority in the STI frameworks of the WB6.

Montenegro was the first non-EU economy to adopt a smart specialisation strategy. Key areas identified include energy and sustainable environment, agriculture and food value chains, and sustainable and health tourism, with ICT as a horizontal priority. Serbia adopted its smart specialisation strategy in February 2020, with priority sectors including computer programming and ICT, agriculture (including high tech agriculture and agri-food production), machines and manufacturing systems (including Industry 4.0) and creative industries (including audio-visual production and smart packaging).

The smart specialisation process in both economies has mobilised over 1 600 stakeholders, including 450 representatives of the private sector involved in the entrepreneurial discovery process. In addition, 80 public administration representatives have been trained to build capacity and engagement.

Source: (EC, n.d.[10]), *Smart Specialisation Platform*, https://s3platform.jrc.ec.europa.eu/; (OECD, 2019[1]), *SME Policy Index: Western Balkans and Turkey 2019: Assessing the Implementation of the Small Business Act for Europe*, https://doi.org/10.1787/g2g9fa9a-en.

The institutional framework for STI policy implementation varies significantly across the region

Inter-ministerial co-ordination remains weak in most economies, with significant impact on outcomes and efficiency of policy implementation. Serbia remains the top performer in this regard, with its Innovation Fund, operational since 2011, continuing to be a key vehicle for innovation policy implementation. It also established a Science Fund in 2019. In North Macedonia, support for the Fund for Innovation and Technological Development has increased substantially in recent years, but operational capacity remains below potential. In Montenegro, the Council for Innovation and Smart Specialisation, established in 2019, oversees the implementation of innovation policies, and the creation of a dedicated Innovation Fund is in the final planning stage. Albania lacks a clear co-ordination and implementation body, and its budget is insufficient. As a result, the Albanian SME Agency and the National Research Agency have been slow to implement comprehensive STI-related policy measures. Kosovo and Bosnia and Herzegovina have no dedicated agencies in place to support the implementation of STI policy. The Scientific Innovation Council of Kosovo oversees some aspects of STI policy, and there are plans in Republika Srpska to establish an Innovation and Science Fund.

Legal and regulatory frameworks are mostly in place, but could be better enforced

STI is embedded in a solid legal and regulatory framework in all economies except Bosnia and Herzegovina, where only Republika Srpska and three cantons within the Federation of Bosnia and Herzegovina (FBiH) have adopted a legal framework (the FBiH science law has been pending adoption for several years). Montenegro and Serbia have put forward dedicated laws regulating the public financing of scientific or innovation activities, which provide the legal foundation for the Serbian Science Fund and forthcoming Innovation Fund in Montenegro, as well as a modern STI-enabling legal framework. However, despite some ambitious measures outlined in these laws, legal frameworks have not always been fully implemented.

Regarding intellectual property protection (IPP), nearly all economies have implemented reforms to align their IPP framework with the EU *acquis* since the last assessment. The European Commission's annual progress reports for the WB6 economies identified significant shortcomings in enforcing IPP, which has led the economies to raise awareness of the importance of patenting. Some economies, such as Kosovo, have strengthened the capacity of their IPP enforcement offices. However, further action will be needed to educate the research and business community about IP rights, build capacity and fully enforce international standards and practices.

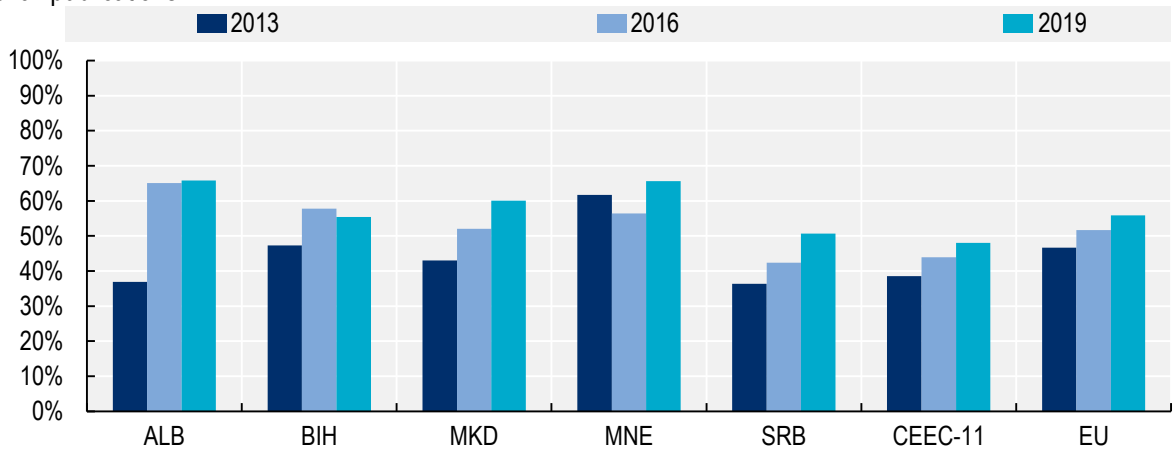
The region is well connected with international networks, and regional integration is gaining momentum

International collaboration is recognised in most domestic STI strategic frameworks. Most economies provide financial support for participation in international conferences and fairs, as well as scholarships to mobilise international research co-operation, although these remain at a low level and are often not focused on identified priority areas. In addition, the region benefits from access to a diverse set of European and global research networks, including EURAXESS[2] (except Kosovo) and Eureka,[3] which Serbia, Montenegro and North Macedonia have joined as full members, while Albania and Bosnia and Herzegovina continue to maintain national information points. In line with their strategic frameworks, some economies, such as Albania and Serbia, are also increasingly focusing on outreach and collaboration with their diaspora (Box 12.5).

As a result, the number of international co-publications has grown substantially in the last decade, even outperforming some European peers (Figure 12.7). While this is encouraging, it remains unclear whether collaboration is predominately intra-regional or based on European or global co-operation.

Figure 12.7. International co-publications originating from the WB6 (2013-2019)

% of all publications



Note: Data for Kosovo are unavailable. Document ratio whose affiliation includes more than one economy address. EU average includes 27 EU Member States. CEEC-11=Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia.

Source: (SCImago, 2020[11]), *SCImago Journal and Country Rank*, https://www.scimagojr.com/countryrank.php?region=Eastern%20Europe&year=2019.

StatLink https://doi.org/10.1787/888934254297

All six Western Balkan economies participate in and have received financial support from the EU's Horizon 2020 Programme.[4] However, the scope of activities under the framework varies significantly. Overall, the region has participated in over 706 research projects as part of Horizon 2020, receiving total funding of more than EUR 146.9 million. Serbia continues to attract the most projects (413) and overall funding (EUR 116.2 million in total); however, other economies, notably Kosovo and Montenegro, have picked up in recent years amid targeted measures to raise awareness about the programme and help with project applications (EC, n.d.[12]).

The need for deeper regional integration and research collaboration has been recognised in the economies and has gained traction in recent years. In 2017, the Montenegrin Government launched an initiative to establish the South East European International Institute for Sustainable Technologies (SEEIIST), which provides an important opportunity for intensified regional research integration. The need for a more regional approach to STI also prominently featured in the joint Action Plan for a Common Regional Market (Box 12.3).

Alignment with EU STI policies remains a priority for all six economies

The WB6 economies have committed to the priorities of the European Research Area:[5] 1) effective national research systems; 2) transnational co-operation and competition; 3) an open labour market for researchers; 4) gender equality in research; 5) circulation of scientific knowledge; and 6) international collaboration (EC, n.d.[13]). All economies except Kosovo participate in the European Strategy Forum on Research Infrastructures (EFSRI). Serbia adopted a national ESFRI Research Infrastructure Roadmap in 2018, and Montenegro revised its current roadmap in 2019. The research infrastructure roadmap in North Macedonia remains at the drafting stage, and in Bosnia and Herzegovina, only Republika Srpska has adopted a roadmap, while Albania has not started the preparation of a roadmap to date.

All economies are committed to open science, and open access initiatives are underway across the region. In 2019, nearly half of all publications were provided as open access resources (in line with the EU average), and up from less than one-third in 2010 (SCImago, 2020[11]).

Box 12.3. Towards regional innovation in the Common Regional Market

The following key findings of the CO 2021 STI system sub-dimension can inform implementation of the "regional innovation area" in the Common Regional Market (CRM) 2021-2024 Action Plan:

- There is no strategic approach in place to increase the regional integration of domestic STI systems, although some best-practice sharing exists, especially in areas related to STI implementation bodies such as innovation funds.
- As the design and implementation of smart specialisation strategies progresses, opportunities are increasing for knowledge exchange and the sharing of lessons learnt, particularly through collaboration with the EC's Joint Research Centre.
- Despite the potential opportunities, economies' research infrastructure roadmaps continue to focus on domestic levels or European Strategy Forum on Research Infrastructures initiatives, without considering a regional approach to research infrastructure.

The way forward for the STI system

STI systems have advanced in most economies, but further efforts are needed to consolidate policy measures and ensure effective implementation. Policy makers should consider the following:

- **Complete the strategic framework.** In the economies with an advanced STI framework (Montenegro, Serbia, and to a lesser extent Albania and North Macedonia), the focus should be on enhancing implementation and monitoring and evaluating relevant policy measures. These economies should also prioritise the full adoption of smart specialisation strategies and ensure that they are well embedded in the broader STI framework. Bosnia and Herzegovina and Kosovo should focus on completing their strategic frameworks for STI.
- **Increase implementation capacity and co-ordination**. Increased ministerial co-ordination will ensure the smooth implementation of STI policies and the consolidation of financial support (see Box 12.4 for an example from Japan). Implementation agencies should be given clearly defined mandates to avoid overlap, and capacity building should be secured to ensure the mirroring of international best practice. Increasing the state budget allocation is positive but not sufficient, as it is important to first design efficient and effective policies.
- **Integrate STI policy development regionally, in line with the CRM action plan**. Regional integration is key to the long-term economic success of the region. Economies should identify further scope for collaboration, for example by creating cross-regional research infrastructure,

through the cross-fertilisation of policy design and implementation, and by strengthening regional co-operation in international platforms.

- **Strengthen IPP enforcement**. The weak enforcement of intellectual property remains a major obstacle to STI development across the region. Efforts are needed to raise awareness of IPP, provide technical and financial support to facilitate patent applications, and build the capacity of enforcement agencies.

Box 12.4. Co-ordinating innovation policy in Japan

Innovation has been a core driver of Japan's economic resurgence and sustainable growth. Under the auspice of the Prime Minister and Ministry of State for Science and Technology, Japan's Council for Science, Technology and Innovation oversees the planning and co-ordination of comprehensive basic science, technology and innovation policies, taking a bird's eye view of Japan's entire science and technology landscape. As a result, Japan's STI policy framework is based on three overarching pillars: 1) strategic formulation of overall governmental science and technology budget; 2) the Cross-ministerial Strategic Innovation Promotion Program (SIP); and 3) the programme on Impulsing Paradigm Change through Disruptive Technologies (ImPACT).

The Japanese government established the Cross-ministerial Strategic Innovation Promotion Programme (SIP) in 2014, spearheaded by the Council for Science, Technology and Innovation. Its aim was for the council to lead science, technology and innovation beyond the framework of government ministries and traditional disciplines. The SIP identified 11 themes addressing the most important social problems facing Japan, as well as contributing to the resurgence of the Japanese economy. Each research project is led by an experienced team who are responsible for end-to-end focused research and development, facilitating co-ordination among government, industry and academic entities, supporting their projects from basic research to practical application and commercialisation, and ultimately to a clear exit strategy.

The key features of the SIP programme include:

- projects selected by the Council for Science, Technology and Innovation based on competitive advantage and potential to address critical social needs
- cross-ministerial, multidisciplinary initiatives
- promotion of focused, end-to-end research and development, from basic research to practical application and commercialisation
- intellectual property management system facilitating strategic corporate use of research results.

The SIP programme has selected programme directors (PDs) to be responsible for each of the 11 individual programmes making up this government initiative. This strong, centralised implementation structure of the SIP has been vital for effective co-ordination between ministries and among industry, academia and government agencies.

Source: (Science Council of Japan, n.d.[14]), *About SCJ*, http://www.scj.go.jp/en/; (Government of Japan, 2017[15]) *What is Cross-ministerial Strategic Innovation Promotion Program (SIP)*, https://www8.cao.go.jp/cstp/panhu/sip_english/4-6.pdf.

Public research system (Sub-dimension 9.2)

Research excellence provides the basis for knowledge creation and is fundamental for economies transitioning to a knowledge economy. Research and development can occur both in the public and private sector; however, typically public HEIs and public sector research and development institutes (RDIs) account for the overwhelming majority of R&D capacity in emerging economies. The management and

performance assessment approach of HEIs and RDIs, and the mode of financing scientific research, are therefore critical aspects of the STI policy framework. Targeted measures to attract and retain academic researchers, particularly in areas of strategic importance, are also essential to strengthen human capital in research to produce high-quality scientific output.[6]

The public research system sub-dimension assesses these aspects based on the institutional structure for public research and through an analysis of the governance of HEIs and RDIs, including quality assurance and performance assessment. It assesses the impact of public research funding on research excellence and analyses approaches to funding scientific research. It also explores the available policy initiatives to strengthen human resources for research and innovation.

Overall performance in this sub-dimension is low, with an average score of 2.0. Serbia leads the way, followed by North Macedonia. Bosnia and Herzegovina and Kosovo continue to rank very low, with an average score of just above 1.0. This reflects the limited overall availability of funding for public sector research and the level of scientific output (Table 12.4).

Table 12.4. Scores for Sub-dimension 9.2: Public research system

Sub-dimension	Qualitative indicator	ALB	BIH	KOS	MKD	MNE	SRB	WB6 average
Public research system	Institutional structure of the public research system	1.5	1.3	1.5	2.3	2.5	2.5	1.9
	Public research funding	2.0	1.3	1.5	1.8	1.8	3.3	2.0
	Human resources for research and innovation	2.3	1.0	1.0	3.3	2.5	3.0	2.2
Sub-dimension average score		1.9	1.2	1.3	2.5	2.3	2.9	2.0

Institutional structures are moving towards public research quality assurance

The volume and quality of academic research in the Western Balkans remain low. Although scientific output has increased in the past decade in all economies, the productivity of researchers still underperforms many European peers. Efforts have been made to increase the quality and integrity of research outputs, although overall support for research excellence remains limited.

HEIs and RDIs in the WB6 are typically governed by a law on higher education or on research activities and are subject to regular reporting that is usually strongly focused on teaching. Independent evaluation is starting to be introduced in some economies, but overall remains ad hoc and without clear evidence of having a substantive impact on performance or approaches to research. In Bosnia and Herzegovina, research activities are further constrained amid fragmented competences within the institutional structure, while there is no comprehensive cross-entity accreditation system in place. Nevertheless, an increasing focus on creating quality assurance by fostering academic integrity in scientific research has become evident across the region. For instance, Montenegro's participation in the World Bank's Higher Education and Research for Innovation and Competitiveness (HERIC) project has led to reforms of the quality assurance system and the adoption of the Law on Academic Integrity in 2019. Similar efforts have been made in Albania and North Macedonia, where new agencies have been created to monitor quality in higher education. In all WB6 economies, HEI and RDIs benefit from a fair level of autonomy, with governments holding a minority representation (if any) in public universities. While this approach aims to ensure independent and transparent research, it limits governments' ability to introduce a strategic approach to public research in line with a domestic STI framework.

As mentioned above, all economies except Kosovo participate in EURAXESS, with HEIs and RDIs across the region having adopted its human resource strategy for researchers, which aims to harmonise human resource policies with the principles of the EURAXESS Charter and Code of Conduct.

Public research remains chronically underfunded

In most developed economies, public research funding consists of a combination of institutional "block" funding and competitive research grants. While block funding ensures funding security and long-term planning, competitive research grants can be used as a strategic policy tool to encourage impact-oriented research and prioritisation of areas of strategic importance (OECD, 2016[16]).

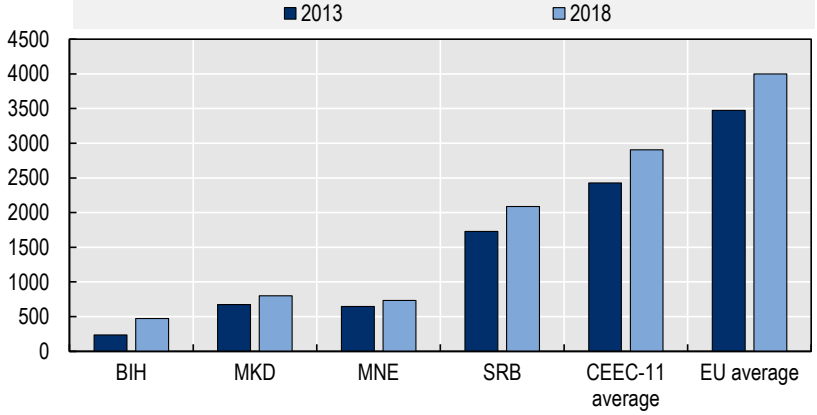
As discussed above, investment in R&D remains very low in the WB6 economies. However, an increased focus of public spending on scientific research has become evident in recent years, albeit often from very low levels, underlining the growing importance of this sector for governments across the region. In all economies except Serbia, where public research funding has traditionally been project-based, research is predominantly dependent on institutional block funding, with small-scale competitive research grants available for research-associated activities. In most economies, R&D is mainly performed in HEIs. These receive most of their public funding for teaching, with often extremely low levels of funding specifically allocated for R&D activities. Funding for teaching is typically based on numbers of enrolled students, but the methodology for awarding funding for R&D is not always clear.

Montenegro and Serbia have taken significant steps to reform their funding models for public research in recent years. In line with its revised legal framework and conclusions from the HERIC project, Montenegro adopted a new performance-based financing model for the University of Montenegro in 2018, which introduced more competitive funding schemes. In Serbia, the new legal framework envisages a clear shift towards performance-based institutional funding combined with targeted competitive grants available through the Science Fund. In North Macedonia, similar efforts to reform public research funding are under consideration following a feasibility study conducted during the previous CO assessment cycle.

Human resources in R&D are increasingly lost through brain drain

The number of researchers (per 1 million inhabitants) steadily increased across all WB6 economies between 2013 and 2018, doubling in Bosnia and Herzegovina and growing at 18% on average in Montenegro, North Macedonia and Serbia. Nevertheless, significant discrepancies remain within the region, with the number of researchers (proportionally) the highest in Serbia and by far the lowest in Bosnia and Herzegovina (UIS, 2021[4]). All are well below the EU and CEEC-11 average (Figure 12.8). In addition, numbers have recently stagnated or even declined in some economies, suggesting increasing brain drain from the scientific research sector, which is becoming particularly evident in key areas such as medical and health (EC, 2020[17]).

Figure 12.8. Number of researchers per million population (2013-18)



Note: CEEC-11=Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic and Slovenia. EU average includes all EU Member States in 2013-20 period. Data for Albania and Kosovo are unavailable.
Source: (UIS, 2021[4]), *Science Technology and Innovation Database*, http://data.uis.unesco.org/.

StatLink https://doi.org/10.1787/888934254316

All economies provide some level of support for research mobility, participation in conferences and research networks, and scholarships; however, these measures are often scattered and limited in scope and scale due to funding constraints. In addition, the focus of postgraduate programmes continues to be on teaching. Some economies offer technical support to help researchers complete patent applications and write proposals, as well as improve other technical skills, although these are often untargeted. All economies also participate in the Marie Skłodowska-Curie Actions (MSCA),[7] but with mixed results. As outlined in Table 12.5, Serbian researchers have benefitted most from the MSCA, having been awarded over EUR 7.7 million since 2014. In contrast, only three researchers from Kosovo have participated.

Table 12.5. WB6 participation in the Marie Skłodowska-Curie Actions (2014-2020)

	ALB	BIH	KOS	MKD	MNE	SRB
Number of researchers funded by MSCA	32	41	3	30	12	246
EU budget awarded (EUR million)	0.08	0.98	n.a.	0.28	0.08	7.76

Source: (EC, n.d.[18]), *Marie Skłodowska-Curie Actions*, https://ec.europa.eu/research/mariecurieactions/msca-numbers_en.

Fostering research excellence is embedded as a strategic focus in the STI frameworks in Montenegro, North Macedonia and Serbia, which have taken steps to increase the attractiveness of research as a profession in recent years. Montenegro implemented a dedicated reform programme to increase human capital between 2018 and 2020, while North Macedonia has launched an initiative to support gender mainstreaming in the sector and is championing young researchers. In Serbia, the newly established Science Fund provides dedicated programmes to foster research excellence. Increasingly, economies are exploring opportunities to leverage their diaspora by facilitating exchange or joint research collaboration. For instance, in Albania there are plans to set up a digital platform to circulate research ideas, whereas in Serbia the Science Fund has launched a dedicated programme to facilitate collaboration with the diaspora (Box 12.5).

Box 12.5. Integrating the diaspora into domestic scientific research activities

The international migration of skilled labour has long been considered an obstacle to economic development and building innovation capacity in the economies of origin. However, more recently the concept of turning “brain drain” into “brain gain” through more pro-active engagement with the skilled diaspora has gained momentum.

The resources that diaspora communities have are multi-dimensional, typically ranging from skills, knowledge and ideas to cultural capital, finance, and trade opportunities, and are therefore considered as important vehicles for development, particularly in transferring human capital and increasing innovation.

The diaspora as a tool for the Western Balkans’ long-term economic prosperity

For the Western Balkans, integrating its wide diaspora community can help unleash the region’s potential in STI. A good example is the Serbian Diaspora Collaboration Programme, launched by the recently established Science Fund in 2019. The programme provides financing to local RDIs to develop research collaborations with the Serbian diaspora and build their human resource capacity through short-term visits of researchers from Serbia to diaspora experts.

The aim of the programme is to establish scientific co-operation and knowledge exchange and widen the collaborative network between researchers from Serbia and their counterparts abroad. The programme supports basic and applied research in all research areas, without pre-defined priority topics. Within this framework, a pilot programme, Vouchers for Knowledge Exchange, was launched in

2020. As part of this programme, 92 projects were awarded almost EUR 800 000 (up to EUR 10 000 per project). The programme involved the Serbian diaspora across 22 countries, ranging from EU Member States to Australia, The People's Republic of China and the United States. The vast majority of approved projects were submitted by Serbian HEIs and covered areas such as natural science, technology, engineering and medical science.

Source: (Agunias and Newland, 2012[19]), *Developing a Road Map for Engaging Diasporas in Development*, https://publications.iom.int/system/files/pdf/diaspora_handbook_en_for_web_28may2013.pdf; (Science Fund of the Republic of Serbia, n.d.[20]), *Science Fund of the Republic of Serbia homepage,* http://fondzanauku.gov.rs/?lang=en.

The way forward for the public research system

Public research requires significantly more and better funding to fully exploit the region's potential for research excellence. Policy makers should consider the following:

- **Introduce a more balanced and strategic approach for public sector research funding, with a stronger emphasis on research outputs**. Economies should consider performance-based institutional funding coupled with regular self-assessments and external evaluations of public research institutions. Governments can encourage research in areas of strategic importance linked to business needs if they combine performance-based institutional funding with competitive project-based funding designed in line with international best practices (in particular regarding international peer review and independent expert selection bodies).
- **Promote scientific research as an attractive profession to develop human capital and counteract brain drain**. Public research systems across all WB6 economies require significant investment to create an attractive environment that fosters research excellence. Efforts are needed to increase the reputation of research and recognise it as an important profession, including through creating more opportunities for mobility.
- **Leverage diaspora linkages**. All WB6 economies have diaspora communities across the globe. The economies could leverage the expertise of these communities, including at the regional level, and encourage the transfer of knowledge through targeted internationalisation policies and financial support schemes (Box 12.5).

Business-academia collaboration (Sub-dimension 9.3)

A strong partnership between the private sector and academia helps accelerate the value creation of innovation. Knowledge is created by researchers and adapted by industry, which develops practical applications in the shape of products and services. To optimise this process, research is ideally demand-driven and under constant review by the business community, which provides feedback on its viability for commercialisation. However, in reality, this approach implies several challenges. For example, academics may not have the time or knowledge to engage effectively with the business community, or they may not be sufficiently encouraged by their organisations to collaborate. Equally, while a researcher's priority may be to publish, businesses may be more focused on protecting IP as this enables commercialisation. Academics may further want to focus on meaningful research with societal benefits, while the business community may prioritise financial returns over the impact on society. For these reasons, the co-creation of innovations between business and academia is often subdued and requires involvement from policy makers. Through a "triple helix" approach, governments can gain valuable insights into the obstacles preventing full collaboration, which will help them design supportive measures to incentivise the transfer of knowledge and commercialisation (OECD, 2013[21]).

The business-academia collaboration sub-dimension analyses collaboration promotion frameworks and the availability and scope of incentives for business-academia collaboration. These incentives include

innovation vouchers, competitive co-operative grants, tax, and procurement incentives; and non-financial incentives such as opportunities for professional exchanges with the business community, and evaluation of research and legislative incentives for commercialisation. This sub-dimension also assesses institutional support for business-academia collaboration by looking at the support infrastructure for business innovation and partnerships. Beyond incubators and accelerators, which typically cater to the needs of start-ups, this assessment includes science and technology parks (STPs), technology transfer offices and centres of excellence, which provide space and services for both researchers and the business community.

Overall, performance in this sub-dimension remains below potential for all WB6 economies due to the lack of targeted policies in this area. The average score shown in the Table 12.6. is just 1.6, which is the lowest for the entire STI dimension. As elsewhere, Serbia ranks the highest in this sub-dimension due to its comprehensive set of financial incentives and solid institutional support structure. It is followed by North Macedonia and Montenegro, with the remaining economies ranking at the lower end of the scoring.

Table 12.6. Scores for Sub-dimension 9.3: Business-academia collaboration

Sub-dimension	Qualitative indicator	ALB	BIH	KOS	MKD	MNE	SRB	WB6 average
Business-academia collaboration	Collaboration promotion framework	1.3	0.8	0.0	2.8	3.0	3.0	1.8
	Financial incentives for business-academia collaboration	1.0	1.0	1.0	2.8	2.0	3.3	1.9
	Non-financial incentives for business-academia collaboration	0.5	0.0	0.5	1.0	1.0	2.0	0.8
	Institutional support for business-academia collaboration	1.5	1.8	1.3	1.8	2.0	3.5	2.0
Sub-dimension average score		1.1	0.9	0.7	2.1	2.0	3.0	1.6

The collaboration framework is weak, and academic research is rarely linked to business needs

Support for business-academia partnerships must be carefully structured and implemented to overcome the barriers identified above. It should also aim to facilitate communication and co-operation and combine the market knowledge of entrepreneurs with the technology from academia.

Increasing ties between academia and the business community is recognised as a strategic priority for STI development across the region, but the overall collaboration promotion framework remains weak in most economies and is largely limited to awareness-raising activities. As a result, joint research by academia and the business community remains limited, as evidenced, for instance, by the low level of public-private co-publications in Montenegro and Serbia, which remains well below the EU average, according to the EU's Innovation Scoreboard (EC, 2020[3]).[8] Going forward, and aligned with the objectives of the respective STI frameworks, efforts are likely to focus on increasing financial measures to encourage collaboration and commercialisation, as well as strengthening the institutional support structure.

Financial incentives for collaboration are mostly limited in scope, size and predictability

Many economies have been experimenting with financial incentives to foster innovation, although these often do not have a specific focus on collaboration between academia and industry. Small-scale innovation voucher schemes may support businesses to undertake initial exploratory projects with RDIs and test collaboration at a minimal risk. In contrast, co-operative grants provide more substantial support and usually require a rigorous selection process based on technological merit and commercialisation potential.

Among the WB6 economies, Serbia has the most comprehensive financing scheme to support business-academia collaboration. Its Innovation Fund has provided collaborative grants for joint technological projects since 2016, complemented by an innovation voucher scheme in 2017. Previously, in 2015 a technology transfer facility was established. In North Macedonia, the Fund for Innovation and

Technological Development plans to develop a dedicated co-operative grant instrument. In Montenegro, a programme for funding innovative projects was successfully implemented between 2018 and 2020. In Republika Srpska, a small-scale programme is currently being piloted for promoting technology transfer and absorption and raising awareness of the potential of business-academia collaboration. In Albania and Kosovo, financial support has at times been made available through small-scale voucher schemes, although these predominately supported firm innovation. Many of these schemes in the WB6 economies have been dependent on donor funding, although the Serbian Innovation Fund and to a lesser extent North Macedonia's fund are increasingly co-financed domestically.

No economy implements specific procurement practices to encourage joint business-academia activities; however, the new Procurement Law in Serbia, adopted in 2019, introduces some elements of support for innovation. Tax incentives, where available, focus on ICT and other equipment to stimulate innovation. Only in Montenegro and Serbia do the governments offer tax breaks for businesses that employ qualified researchers.

Non-financial incentives for collaboration remain scattered

The aforementioned support to provide scholarships and mobility schemes does not usually focus on fostering exchange with the private sector, and measures such as entrepreneurial leave of absence are non-existent. There is also no evidence of a systemic approach to evaluate researchers' performance based on private sector collaboration, which provides few incentives to actively seek partnerships. Finally, IP legislation does not favour collaboration or the commercialisation of research, as royalty splits and IP ownership between the individual researcher and the organisation obtaining a patent are not sufficiently nuanced.

An institutional support structure is emerging, but focuses on start-ups

Some progress has been made in expanding institutional support for businesses-academia collaboration. However, there is often no systemic approach and efforts collide with broader policy measures to create an innovation ecosystem focusing on start-ups. Further efforts are needed to leverage the existing infrastructure to stimulate joint collaboration.

Serbia has the most advanced infrastructure in place among WB6 economies, notably through a strong network of science and technology parks (STPs). The number of centres of excellence has also expanded in recent years. In Montenegro, construction of its flagship STP in Podgorica is expected to be completed in 2021, and in North Macedonia a feasibility study for STP construction has been finalised. A number of STPs operate or are planned throughout Bosnia and Herzegovina, but these serve predominately as start-up incubators. However, the establishment of a competence centre for quality assurance in Mostar in 2019, with support from private investment from Slovenia, is a welcome step. In Kosovo, the support infrastructure is limited to a number of innovation centres. Among these, the Innovation Centre Kosovo has been instrumental in building the local start-up ecosystem. Increasing attention is also being given to the establishment of technology transfer offices, although their operational capacity remains limited. In Albania, efforts are underway to create a technology transfer office with EU support, while North Macedonia established such an office in 2018. In Montenegro, a technology transfer office was established as part of the new Centre of Excellence for Research and Innovation at the University of Montenegro.

The way forward for business-academia collaboration

A more strategic approach is needed to encourage business-academia collaboration. Policy makers should consider the following:

- **Identify bottlenecks in the framework for business-academia collaboration.** A thorough analysis of the key obstacles, including financial support, the IP framework, evaluation criteria for

researcher mobility schemes and the tax regime, should result in an action plan to systematically address shortcomings in the promotion framework for business-academia collaboration.

- **Raise awareness and communicate more about the opportunities of business-academia collaboration**. For instance, a platform could be provided through STPs for exchange and communication between researchers and the business community. This would help all parties to better understand different needs and requirements and identify opportunities for more collaboration.
- **Develop more focused and well-funded financial incentives.** Voucher schemes are under-used across most economies in the region and often focus more on broader innovation than specifically on collaboration between researchers and the industry. If coupled with awareness raising, targeted voucher schemes could serve as an effective tool to encourage firms to seek co-operation with academic researchers, as long as they are implemented consistently (not just as one-off events) and in line with international good practice.
- **Introduce collaborative grants in economies where voucher schemes have been tested.** As a follow-up, economies could consider introducing higher value co-operative grants (see Box 12.6 for an example from Israel). These should be implemented in line with international practice and follow clear assessment criteria that include international peer review and independent selection bodies. This will require significant operational capacity. In economies where such collaborative grants are already available, the focus should be on monitoring and evaluation, with adjustments made, when applicable, to maximise impact.
- **Leverage the increasing support infrastructure.** Governments should rationalise investments in large-scale infrastructure such as STPs and ensure that they serve as an effective platform to create linkages between research and businesses, rather than just incubators. Small-scale competency centres and well-staffed and experienced technology transfer offices, or a more regional approach to STPs, may be more cost efficient.

Box 12.6. Enabling business-academia collaboration through Israel's Magnet programme

With the objective of stimulating greater co-operation between public sector research and the business community, Israel launched the large-scale Magnet programme to support pre-competitive R&D. The goal of the programme is to assist the development of generic technologies in areas in which Israeli industries may have a competitive advantage.

The programme is aimed at Israeli companies that are interested in developing innovative technologies which can be the basis for the advanced generation of products, and Israeli academic scientific or technological research groups seeking to promote applied research as part of a consortium with industry and to study market needs.

Magnet provides grants for R&D collaboration, thereby providing opportunities for businesses to collaborate either with peers or with academia. Magnet also specifically supports infrastructure technologies which enable the distribution of knowledge and co-operation between companies operating in the same field which otherwise may be difficult to achieve. Grants are provided for up to two-thirds of the costs of enterprises and up to 80% of the costs of scientific research contribution over a period of three years. The average funding per project is about USD 5-6 million.

In order to apply for funding under the programme, members of the consortia have to sign an agreement, part of which promises all parties the rights to the intellectual property created by the consortium, and create a legal entity. Funding decisions are made by the Magnet Committee, taking into consideration criteria such as the level of co-operation between academia and industry, level of innovation of the proposed technology, market size and benefits to the local economy, amongst others. The simplicity of management and a competitive approach, as well as emphasis on co-operation, make this programme a very good example for strengthening R&D cooperation between academia and industry in Western Balkan economies.

Source: (Israel Innovation Authority, n.d.[22]), *MAGNET Consortiums*, https://innovationisrael.org.il/en/program/magnet-consortiums.

Conclusion

The region is beginning to catch up with EU and CEEC peers in STI policy development, although significant discrepancies among the economies remain. All economies have recognised the economic importance of creating an innovation-enabling environment; however, policy measures are often focused on short-term impacts instead of creating the foundations of a knowledge economy. STI continues to be underfunded, although all governments have increased budget allocations in recent years, which is a promising sign.

Some economies, notably Montenegro and Serbia, have adopted international good practice in STI policy making in recent years. If implemented thoroughly and provided with sufficient financial resources and operational capacity, impact is expected to become evident in the medium term. Although an adequate policy framework has been in place for several years in Montenegro, renewed commitment is required to maintain momentum. In contrast, Albania, Bosnia and Herzegovina and Kosovo will need to significantly step-up efforts to create an environment conducive to STI.

Providing sufficient financial support for research and human capital development, as well as leveraging regional and European integration, will be critical for the long-term prospects of STI in the Western Balkans. However, if the region manages to successfully unlock the full potential of science, technology and innovation, this field can become a key vehicle for long-term economic prosperity and help to tackle brain drain.

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Notes

[1] The Central and Eastern European Countries (CEEC) are Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia.

[2] EURAXESS - Researchers in Motion is a pan-European initiative delivering information and support services to professional researchers, backed by the EU, member states and associated countries. It supports researcher mobility and career development and enhances scientific collaboration. (https://euraxess.ec.europa.eu/)

[3] Eureka is the largest intergovernmental network for cooperation in R&D and innovation in the world. It is present in over 45 economies, where it provides access to public funding, promotes collaboration and innovation or offers advice, through various programmes (such as EUREKA Clusters, Globalstars, InvestHorizon). (https://www.eurekanetwork.org/)

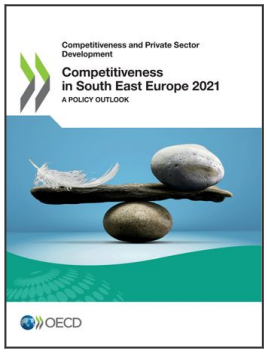
[4] Horizon 2020 is the EU's biggest framework programme for research and innovation. It provides funding for multi-national collaboration projects as well as for individual researchers, and supports SMEs with a special funding instrument. (https://ec.europa.eu/programmes/horizon2020//en/what-horizon-2020; https://www.euneighbours.eu/en/east/stay-informed/projects/horizon-2020)

[5] European Research Area (ERA) is the ambition to create a unified research area open to the world, based on the EU Internal Market, that enables free circulation of researchers, scientific knowledge and technology. (https://ec.europa.eu/info/research-and-innovation/strategy/era_en)

[6] Scientific output is defined as number of documents published in a given year.

[7] Marie Skłodowska-Curie Actions (MSCA) is an EU programme which provides grants to support research careers and encourages transnational, intersectoral and interdisciplinary mobility. (https://ec.europa.eu/programmes/horizon2020/en/h2020-section/marie-sklodowska-curie-actions; https://ec.europa.eu/research/mariecurieactions/msca-actions_en)

[8] Montenegro had a score of 22.41 relative to the EU average in 2012, whereas Serbia had a score of 23.62.



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