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Balkan Subnational Innovation Competitiveness Index

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For policymakers to bolster their regional innovation capacity and global competitiveness, they first must know where they stand. This report benchmarks 48 regions across Albania, Bosnia and Herzegovina, North Macedonia, and Serbia on 13 commonly available innovation indicators.

KEY TAKEAWAYS

- Belgrade leads the Subnational Innovation Competitiveness Index overall, while Serbia has 5 regions in the top 10 (including South Bačka, Nišava, Šumadija, and South Banat) and 5 regions in the bottom 10 (Raška, Pčinja, Zaječar, Jablanica, and Toplica).
- Skopje and the Southeastern region from North Macedonia claim the third and eighth place positions.
- Tirana, Albania, was the fourth-most-innovative region in the index, while Albania also claimed the bottom five regions (Gjirokastër, Lezhë, Berat, Kukës, and Dibër).
- The Federation of Bosnia and Herzegovina placed 10th in the index, the best-performing region of Bosnia and Herzegovina.
- Policymakers must continue to increase investment in research and development, build stronger connections between public and private innovation institutions, and support high-value-added manufacturing supply chains.
- Innovation and competitiveness initiatives must develop a territorial focus to reduce the regional variation in innovativeness between capital and peripheral regions.

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INTRODUCTION

Despite their smaller economies and less advanced industries, the Western Balkans have experienced significant growth over the past several years. The region—which includes Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia—has demonstrated its potential for economic development, reaching a combined gross domestic product (GDP) of about $183 billion in 2024 and growth levels that have exceeded those of the European Union for years.[1] Over the past two decades alone, GDP per capita has risen by 120 percent, and as a location for business, the region has strived to improve; foreign direct investment (FDI) reached 6.4 percent of GDP in 2024, more than quadruple the EU average.[2]

But the region still has a long way to go to reach parity with its EU neighbors. Private sector investment in research and development (R&D) accounts for just one-third of total R&D investment, half that of the EU, while the working-age population, which already faces a shortage of skilled researchers and scientists, is projected to decline by 20 percent by 2050.[3] And though FDI levels in the region are high, global uncertainty contributed to a 26 percent decline in greenfield project announcements from 2023 to 2024.[4] The region also still relies on less advanced industries, such as coal mining and tourism.[5]

The Western Balkans are now entering a more challenging phase of growth. The rapidly shifting global trade environment, set into motion by the sweeping tariffs implemented by the second Trump administration, is expected to increase the cost and complexities of trade. Nevertheless, the Western Balkans' low labor costs and proximity to EU markets make it a natural candidate for investment. Germany is by far the biggest European investor and trading partner of the region. German net FDI in the Western Balkans (excluding Montenegro) in 2023 stood at close to €4.6 billion, which was invested in 261 companies. However, not all Western Balkan economies profit equally from this investment. So far, net FDI is largely concentrated in Serbia, where nearly three-quarters (73.4 percent) of all net investments in the Western Balkan region are allocated. Notable investments have also been made in North Macedonia as well as in Bosnia and Herzegovina, while investments in Albania and Kosovo have been relatively low.[6] Germany, with €161.2 billion in exports to the United States in 2024, has faced the highest exposure to the negative impacts of U.S. tariffs—and, considering the dominance of Germany in economic affairs in the Western Balkans, the slowdown of the German economy will exert an effect on decline in the Western Balkan economies as well.[7]

The world is also entering an era of accelerated technological change. The rapid growth of artificial intelligence (AI) could rapidly increase the gap between rich and developing economies—Western Balkan countries could fall into the latter category if they continue to underinvest in innovation. On the other hand, AI has the potential to increase productivity in the region, fostering economic growth and innovation. Maintaining economic strength and international significance depends significantly on promoting innovation and embracing technological progress, which are essential for achieving growth in per capita GDP.[8]

The countries examined in this study—Albania, Bosnia and Herzegovina, North Macedonia, and Serbia—represent over 85 percent of the population in the region and 90 percent of its economic output, thus driving the region's economic trends.[9] To fully understand the dynamics of innovation in these countries, it's critical to explore the subnational factors that contribute to their landscapes. Regional differences in policy, industry, workforce skill levels, and geography,

which are often hidden by broad national analyses, influence the economic success and innovativeness of a region. Understanding these regional differences allows policymakers to develop more-targeted strategies with a greater chance of success.

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The Global Innovation Index (GII) is a prominent tool that provides comprehensive assessments of innovation performance on a global and regional scale. The GII offers a multidimensional perspective on innovation, evaluating factors such as R&D investment, human capital, and business sophistication, which collectively contribute to a country's innovation capacity.[10] In line with the GII, the Information Technology and Innovation Foundation (ITIF) has contributed significantly to the discourse on innovation competitiveness through its series of insightful subnational innovation competitiveness reports, produced within the Global Trade and Innovation Policy Alliance (GTIPA) network. These reports provide nuanced insights into the intricate relationships between innovation, economic development, and regional competitiveness, offering valuable perspectives for policymakers, businesses, and researchers alike

Previous editions of GTIPA subnational innovation competitiveness indexes have explored the subnational regions of North America, Latin America, Western Europe, and India. This study seeks to continue this series of analyses by showcasing the innovation capabilities, opportunities, and potential future direction of the largest countries in the Western Balkans: Albania, Bosnia and Herzegovina, North Macedonia, and Serbia.

THE INDEX

The Balkan Subnational Innovation Competitiveness Index (SICI) captures the innovation performance of 48 subnational regions across 4 countries: Albania (12 regions (qarqe)), Bosnia and Herzegovina (3 entities), North Macedonia (8 regions), and Serbia (25 districts). In this report, we refer to all subnational counties, entities, and districts as regions to simplify the comparative analysis.

This report consists of 13 indicators representing the relevant determinants of a successful innovation ecosystem, grouped into three categories:

- **Knowledge Economy:** Indicators measure the educational attainment of the workforce; immigration of knowledge workers; employment in professional, technical, and scientific (PTS) activities; and manufacturing sector productivity.
- **Globalization:** Indicators measure high-tech exports and inward FDI.
- **Innovation Capacity:** Indicators measure a region's share of households subscribing to broadband Internet, expenditures on R&D, the number of R&D personnel, the creation of new businesses, patent output, the extent of progress toward decarbonization, and venture capital (VC) investment.

The most heavily weighted category of the index is innovation capacity, which accounts for 55 percent of the index's eight, while knowledge economy indicators account for 33 percent, and globalization indicators account for the remaining 12 percent.

Due to variations in data availability across nations and regions, some indicators may include data from varying years by country.

Table 1: Regional performance in the Balkan Subnational Innovation Competitiveness Index

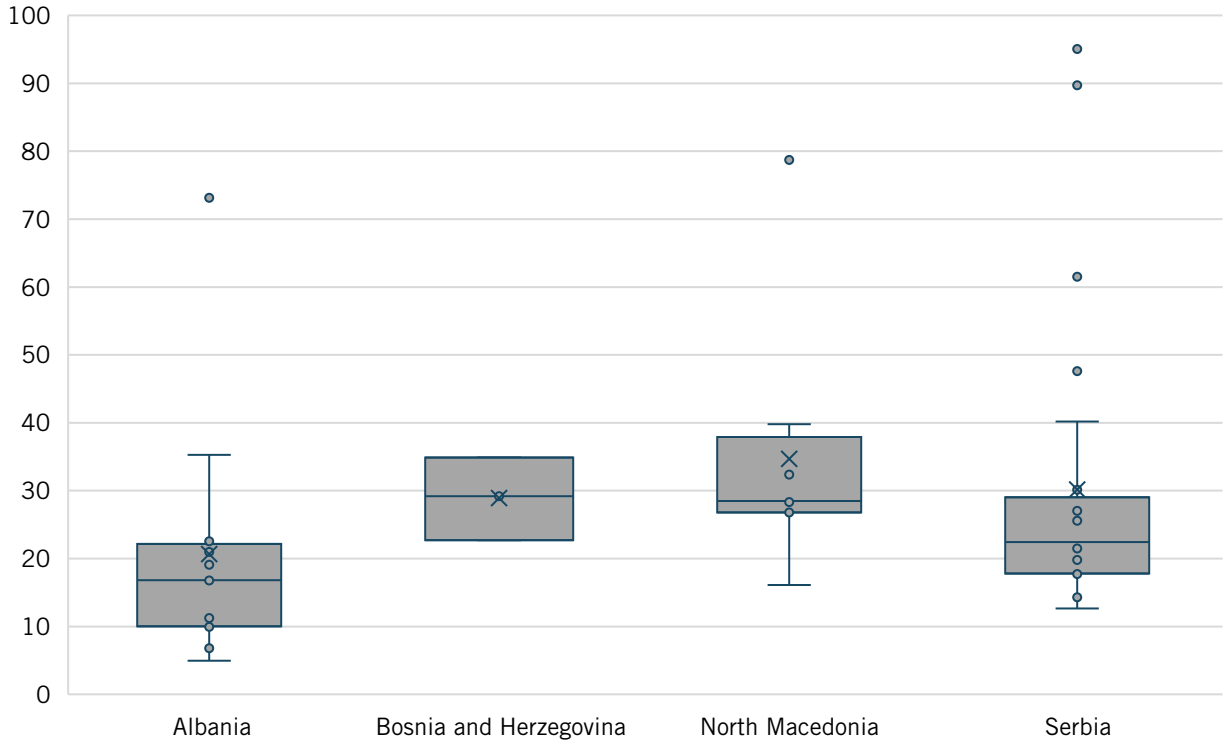
Overall Rank	Country	Region	Overall Score	Knowledge Economy		Globalization		Innovation Capacity	
				Score	Rank	Score	Rank	Score	Rank
1	Serbia	Belgrade	95.1	87.8	2	41.2	7	95.2	1
2	Serbia	South Bačka	89.7	95.1	1	35.0	12	83.9	2
3	North Macedonia	Skopje	78.7	81.1	3	83.8	2	62.1	4
4	Albania	Tirana	73.2	72.5	5	49.4	6	66.9	3
5	Serbia	Nišava	61.5	74.6	4	26.2	17	52.8	5
6	Serbia	Šumadija	47.6	61.5	6	27.4	16	37.9	6
7	Serbia	South Banat	40.2	54.2	8	32.3	14	29.1	8
8	North Macedonia	Southeastern	39.8	29.3	33	95.1	1	27.2	9
9	Albania	Durrës	35.3	32.3	28	39.6	9	32.2	7
10	Bosnia and Herzegovina	Federation of Bosnia and Herzegovina	34.9	53.7	9	36.6	11	19.7	14
11	North Macedonia	Pelagonia	32.4	39.5	19	63.1	4	17.3	22
12	Serbia	Bor	30.1	55.3	7	60.4	5	5.0	47
13	Bosnia and Herzegovina	Republika Srpska	29.2	42.0	15	23.8	20	20.7	12
14	North Macedonia	Vardar	28.6	24.9	36	72.9	3	17.4	21
15	North Macedonia	Southwestern	28.3	32.9	27	34.8	13	21.9	11
16	Serbia	Zlatibor	28.0	43.5	13	22.2	22	18.2	17
17	Serbia	Srem	27.9	43.9	12	21.2	24	18.1	18
18	Serbia	Moravica	27.0	47.2	10	19.0	26	15.4	26
19	North Macedonia	Polog	26.9	31.6	30	27.9	15	22.2	10
20	North Macedonia	Eastern	26.8	28.2	34	40.8	8	20.7	13

Overall Rank	Country	Region	Overall Score	Knowledge Economy		Globalization		Innovation Capacity	
				Score	Rank	Score	Rank	Score	Rank
21	Serbia	North Bačka	26.2	40.7	16	21.6	23	17.2	23
22	Serbia	Mačva	25.6	40.4	17	22.7	21	16.1	25
23	Bosnia and Herzegovina	Brčko District	22.7	38.7	20	17.4	30	13.8	27
24	Serbia	Podunavlje	22.6	44.9	11	14.0	40	10.8	37
25	Albania	Vlorë	22.5	23.8	37	36.8	10	17.4	20
26	Serbia	West Bačka	22.5	39.8	18	15.8	34	13.1	28
27	Serbia	Central Banat	21.5	37.2	23	18.4	27	12.5	30
28	Albania	Fier	21	22.3	39	25.5	19	18.7	16
29	Serbia	Rasina	20.8	37.3	22	16.1	33	11.9	31
30	Serbia	Pomoravlje	20.8	37.5	21	17.4	29	11.4	33
31	Serbia	Pirot	20.4	42.4	14	14.5	39	8.6	41
32	Serbia	Kolubara	19.8	37	25	18.1	28	10	39
33	Albania	Shkodër	19.1	17.7	42	20.8	25	19.6	15
34	Serbia	Braničevo	17.9	37.1	24	14.9	36	7.6	44
35	Serbia	North Banat	17.7	34.9	26	14.8	37	8.7	40
36	Albania	Elbasan	16.8	16.8	43	15.1	35	17.9	19
37	Albania	Korçë	16.8	17.8	41	16.2	32	16.9	24
38	North Macedonia	Northeastern	16.1	19	40	25.8	18	12.7	29
39	Serbia	Raška	15.5	23.7	38	14.7	38	11.7	32
40	Serbia	Pčinja	14.8	29.6	32	11.3	45	8	42
41	Serbia	Zaječar	14.4	31.8	29	16.3	31	4.8	48
42	Serbia	Jablanica	14.3	30.9	31	13.1	41	6	46
43	Serbia	Toplica	12.6	26.9	35	11.7	43	6	45
44	Albania	Gjirokastër	11.2	15.8	44	9.4	46	10.9	36
45	Albania	Lezhë	10.3	11.5	46	11.8	42	11.4	34
46	Albania	Berat	9.9	12.3	45	11.7	44	10.3	38
47	Albania	Kukës	6.8	4.9	48	4.9	47	11.4	35
48	Albania	Dibër	4.9	5.8	47	4.9	47	7.9	43

OVERALL

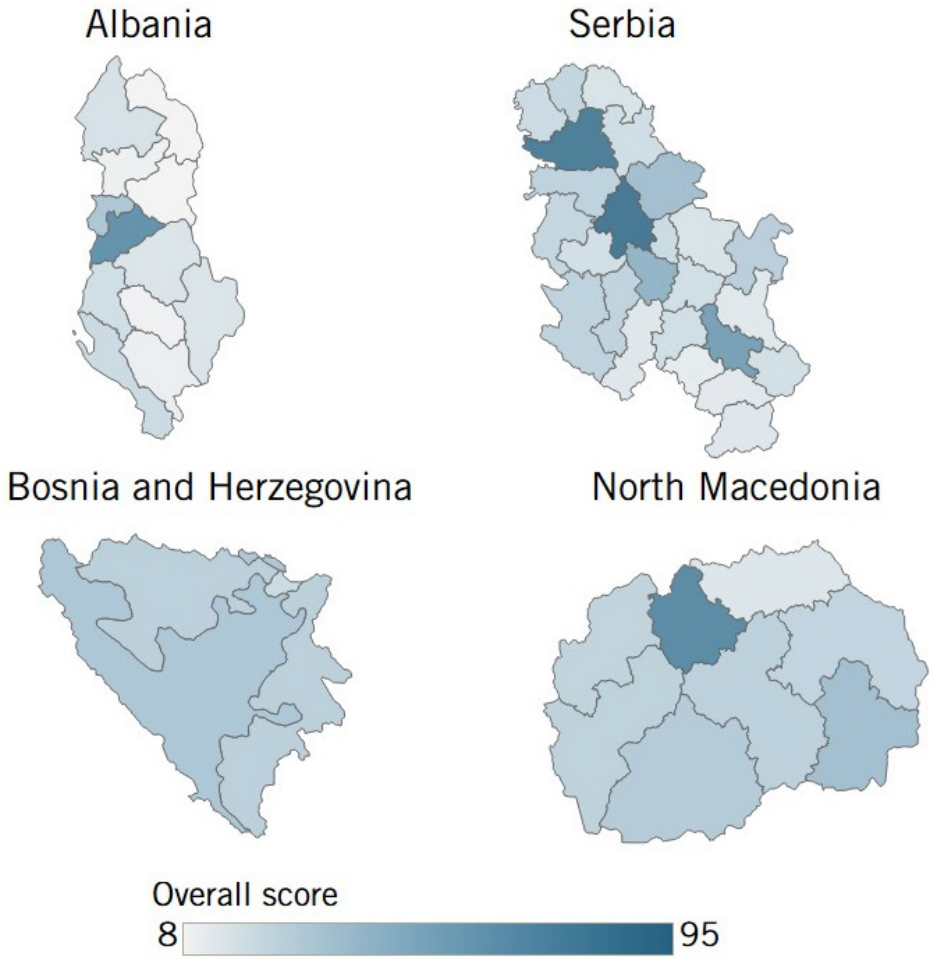
Serbia's capital city of Belgrade and the region of South Bačka lead in the Balkan SICI, with North Macedonia's capital of Skopje in third. Overall, Serbia exhibits the largest variation in scores, with 4 of its regions scoring in the top 6 overall, and five in the bottom 10. Albania, the country with the second highest variation in scores, also shows a large gap between its best-performing region, its capital Tirana, and its worst-performing regions, which account for the bottom five regions in the index. (See figure 1.)

Figure 1: Maximum, minimum, quartiles, and median of index scores[11]



The top-performing regions in the index fall into two main categories. The first—large urban areas with deep, highly skilled workforces—applies to the capital cities and regions of all four countries, including the Federation of Bosnia and Herzegovina, which houses the country's capital, Sarajevo. These areas are highly populated, with larger, more highly educated populations, better infrastructure, and a greater reliance on the knowledge economy. (See figure 2.) The second includes strong manufacturing centers such as Serbia's South Bačka and North Macedonia's Southeastern region, which depend on high-value manufacturing for economic growth. While the South Bačka region is powered by the first Eco-Industrial Park in the Balkans and the SDG Investors Map, the Macedonian Southeastern region is the only region in the country without foreign direct greenfield investments and depends solely on domestic companies.

Figure 2: Overall subnational innovation competitiveness scores[12]

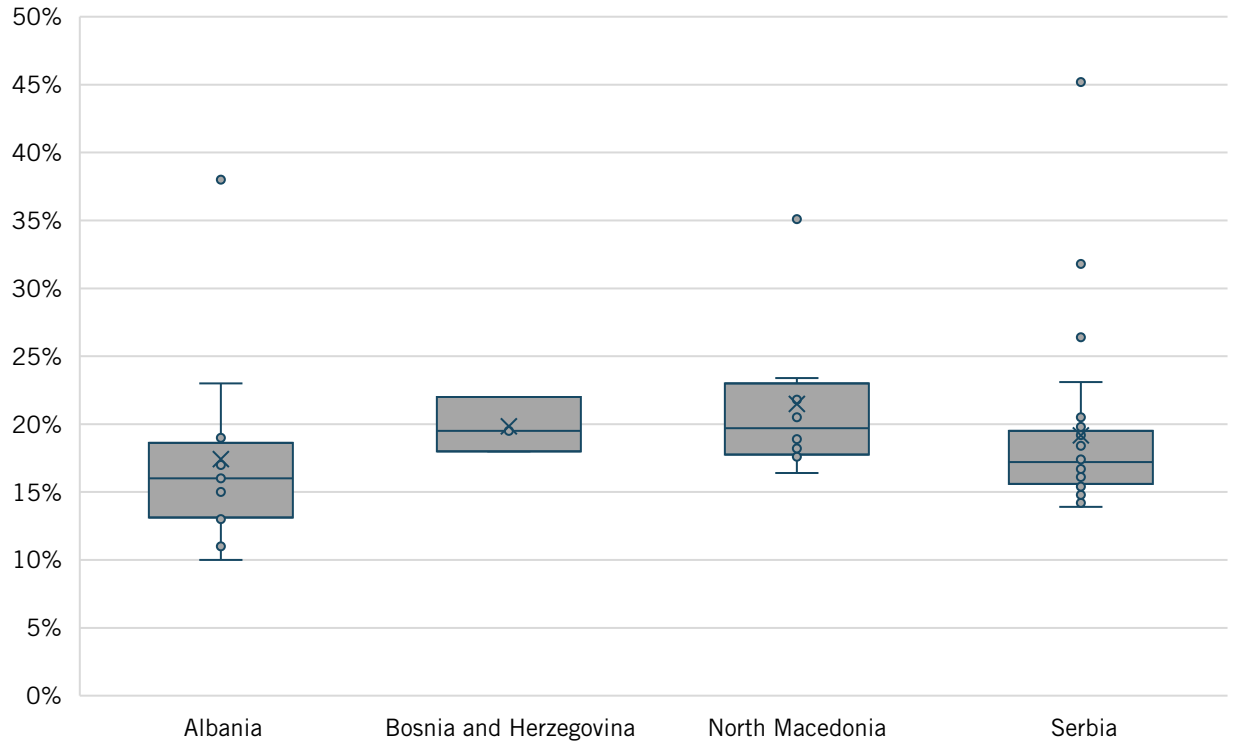


KNOWLEDGE ECONOMY

Highly Educated Population

Why is this important? Knowledge is a fundamental innovation input, and the proportion of a population that is highly educated is a strong indicator of human capital.[13] In addition, higher education levels correlate with a more dynamic economy, greater per capita income to scale innovations, and better-integrated economies with international supply chains.[14] Thus, this indicator measures the share of a region's 25- to 64-year-old ("working age") population with a bachelor's degree equivalent or higher. (See figure 3.)

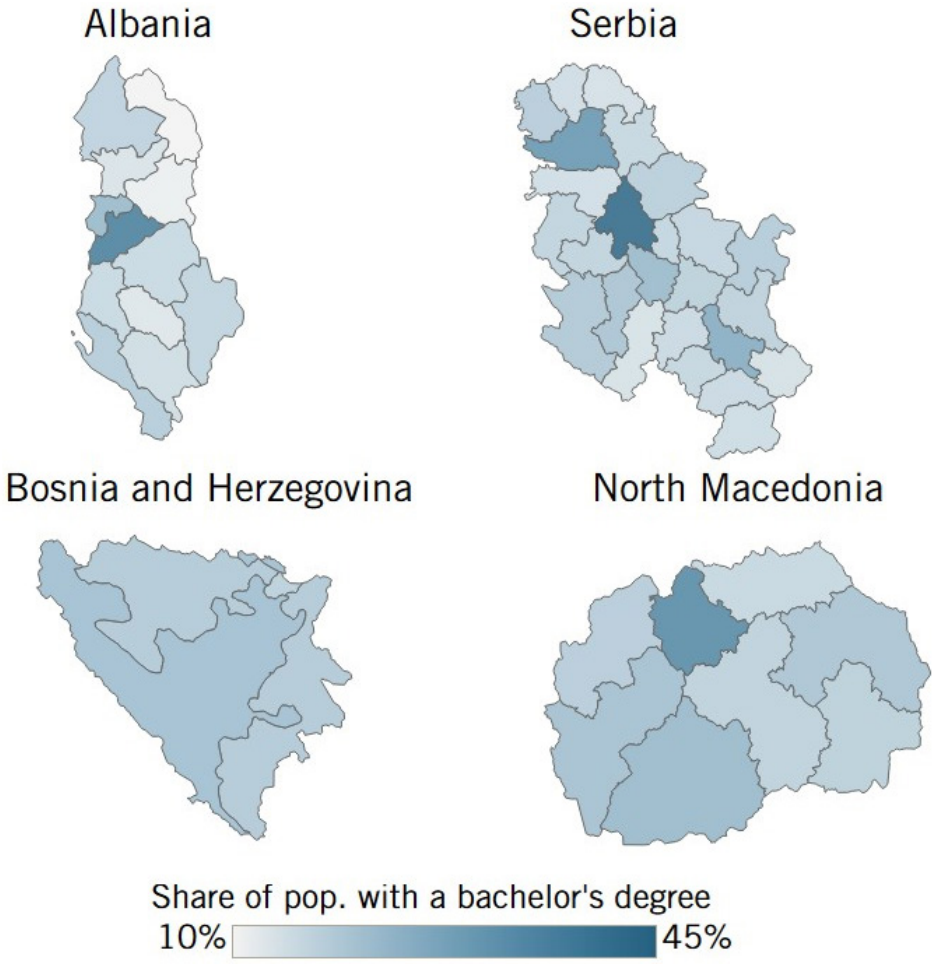
Figure 3: Share of 25- to 64-year-old population with a bachelor's degree (or equivalent) or higher, 2023–2024[15]



Highly populated urban areas tend to perform best in this indicator due to their concentration of knowledge industries. Belgrade, Serbia's capital, leads the index in highly educated population with over 45 percent of the working-age population having obtained a bachelor's degree equivalent or higher. Several other regions in Serbia also perform above the mean in the index, with South Bačka, a region with a strong advanced manufacturing sector, and Nišava, a university hub in the country, both placing in the top five. Tirana leads Albania with 38 percent of the population holding at least a bachelor's degree, more than 20 percentage points higher than the next-closest region, Vlorë, with 19 percent. Skopje leads North Macedonia, as 35 percent of its population is considered highly educated, followed by Pelagonia, which contains Bitola, one of the country's major educational and cultural centers. The Federation of Bosnia and Herzegovina also performs well, with over 22 percent of the population considered highly educated, and its worst-performing region, the administrative region of Brčko District, still performs about average with 18 percent of its population highly educated. (See figure 4.)

While urban centers perform well, rural and low-tech industrial areas demonstrate a lack of highly educated workers. Several regions in Albania see less than 15 percent of their workforce obtain a bachelor's degree, including the agricultural regions of Lezhë and Berat, while low-tech manufacturing regions in Serbia, such as Pirot, see similar levels of education attainment.

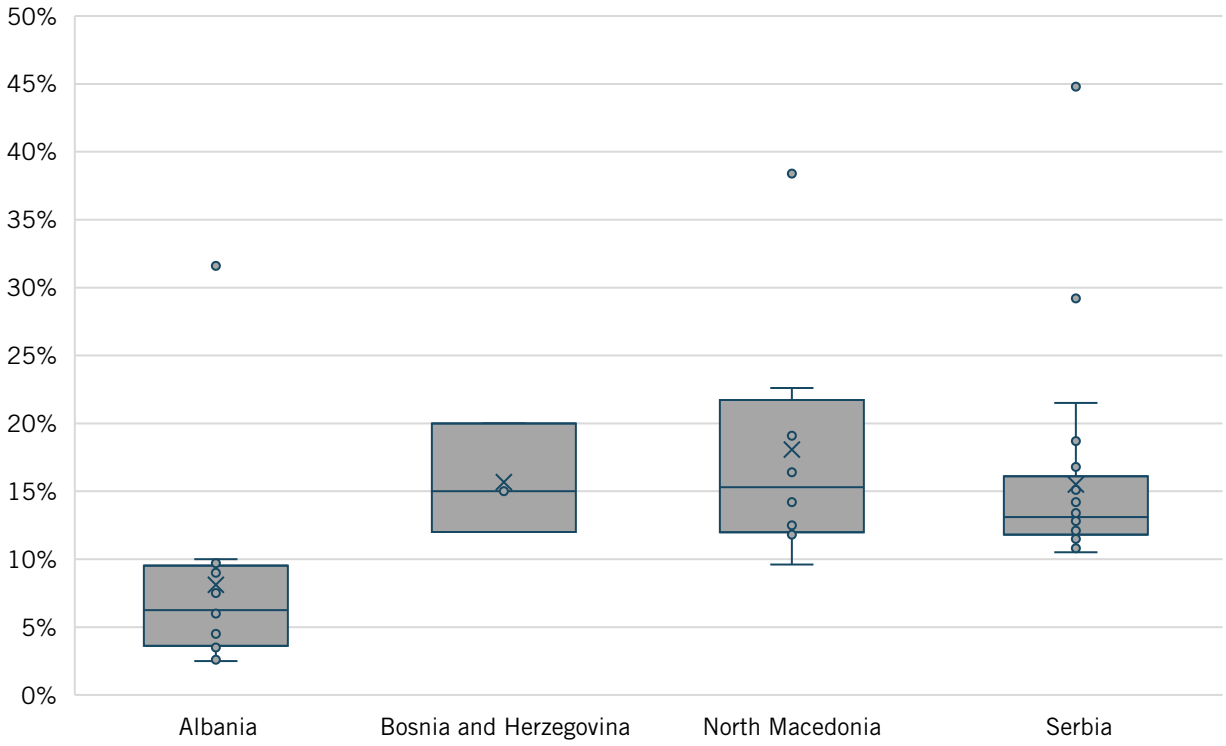
Figure 4: Performance in highly skilled workforce[16]



Skilled Immigration

Why is this important? Skilled immigration enables the collaboration of workers with unique educational experiences and backgrounds, driving innovation. As skill is a difficult variable to quantify, this indicator measures the educational attainment of immigrants, calculated as a region's share of foreign-born workers with at least some tertiary education relative to the total regional population. A 2022 study from the Institute for Progress found that over half of all science, technology, engineering, and mathematics (STEM) doctoral degree holders working in American defense industries are foreign born, while across all industries, foreign-born workers account for 19 percent of all STEM workers and 43 percent of doctorate-level scientists and engineers.[17] Conversely, a low level of skilled immigration, or even a net emigration of skilled workers, can be detrimental to a nation's innovation ecosystem.

Figure 5: Share of population that is foreign born and has some tertiary education, 2023–2024[18]

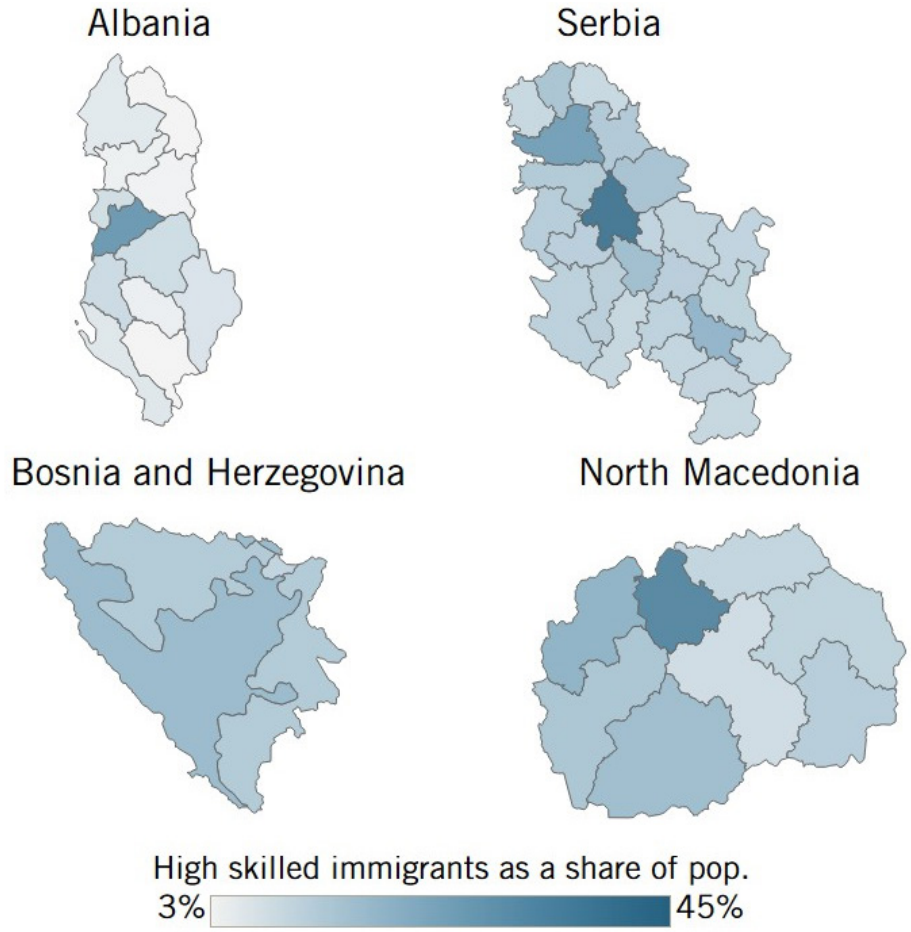


Overall, the Western Balkans experience a net emigration of skilled workers; nearly 25 percent of Western Balkan citizens live abroad. However, there are still several regions in the Western Balkans where skilled workers immigrate.

Capital cities and urban areas lead when it comes to attracting skilled immigration, with the capitals of Belgrade, Skopje, and Tirana leading the rankings with 45, 38, and 32 percent of their population made up of skilled immigrants, respectively. South Bačka in Serbia also performs well (29 percent) due to its strong manufacturing industry and its location on the border with Croatia and near Bosnia and Herzegovina. Similarly, Polog, North Macedonia (23 percent), which lies on the border of Kosovo and Albania, and the Federation of Bosnia and Herzegovina (20 percent), which shares a border with Croatia, both have relatively high-skilled immigrant populations. (See figure 5 and figure 6.)

Areas focused on agriculture or nonknowledge-economy industries are far less likely to attract skilled immigrants. As such, several rural and industrial areas in Albania fall to the bottom of the list, including Lezhë, Dibër, Kukës, and Gjirokastër, each of which have a skilled immigrant population of less than 5 percent.

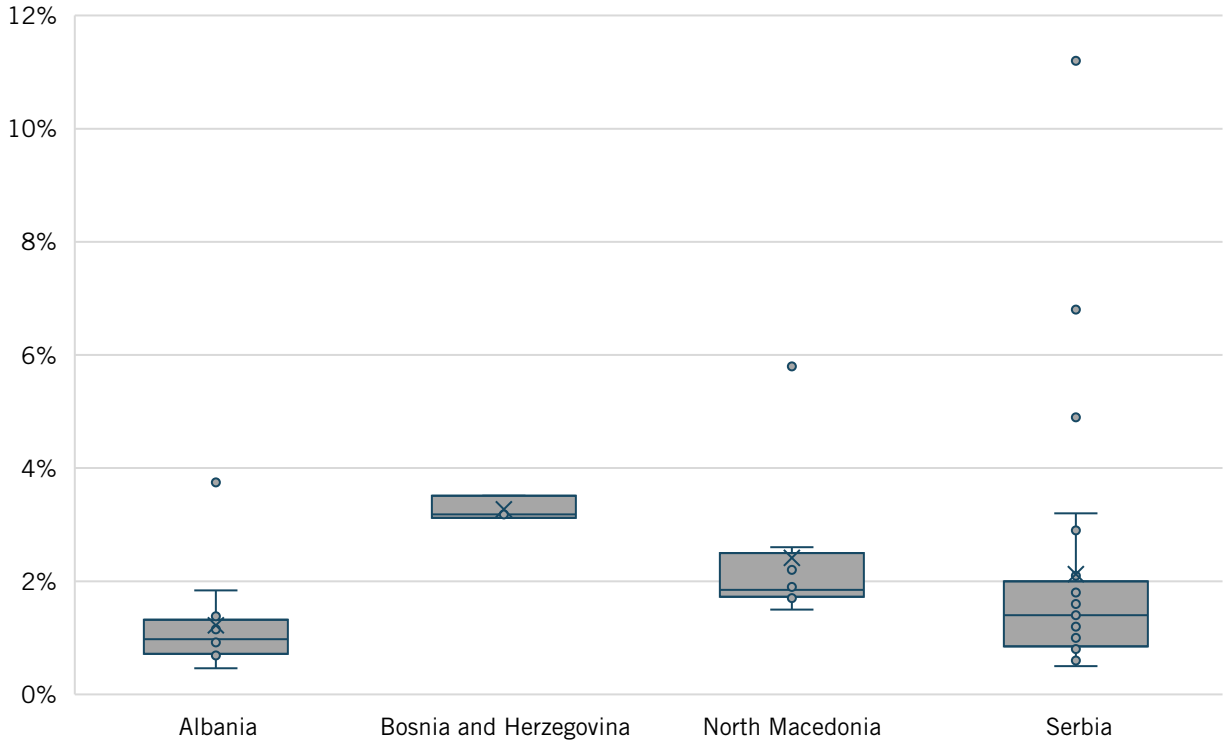
Figure 6: Performance in skilled immigration[19]



Professional, Technical, and Scientific Employment

Why is this important? This indicator measures the share of employees working in PTS activities in each region. This includes, for example, engineers, researchers, doctors, and lawyers. PTS services include those needed to facilitate the development, implementation, and commercialization of innovations. Automation and globalization also make high-value-added professional services increasingly important to the modern economy. These occupations are highly knowledge intensive and therefore harder to offshore, and they also pay significantly higher-than-average wages.[20]

Figure 7: Share of employees in PTS fields, 2024[21]

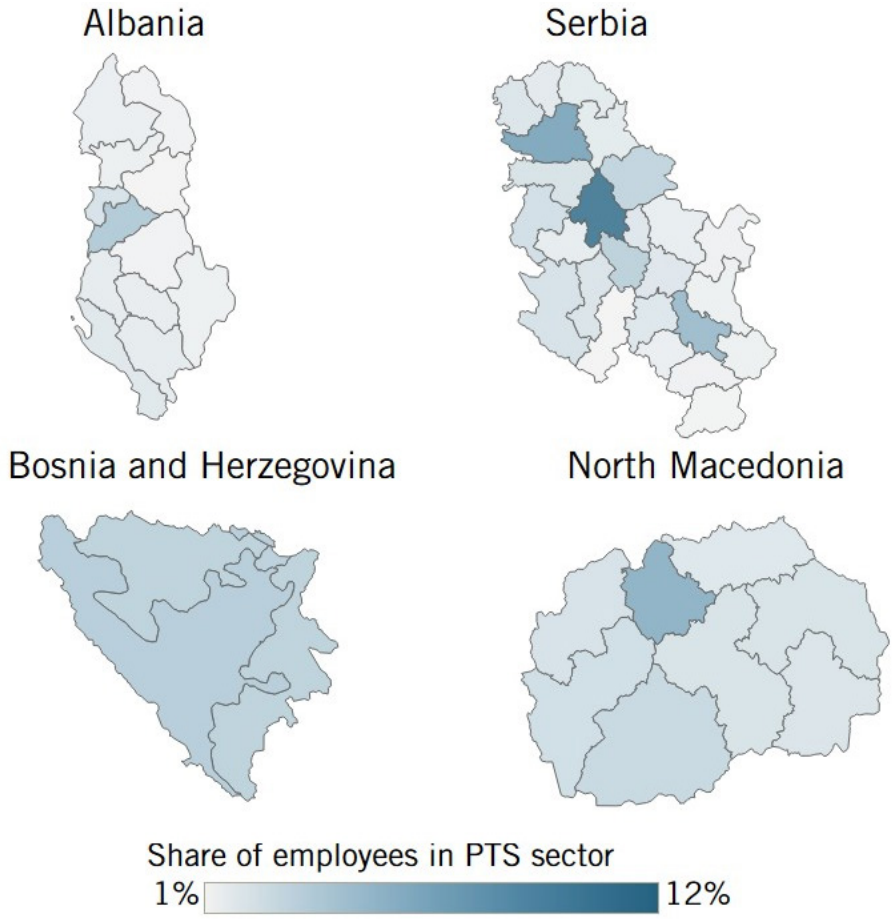


Bosnia has the least variation in this indicator and holds the highest national average, with over 3 percent of its workforce working in PTS fields. The Federation of Bosnia and Herzegovina leads the nation with 3.5 percent of the workforce employed in these fields, followed by the Brčko District (3.2 percent) and Republika Srpska (3.1 percent). (See figure 7.)

While it has a lower average employment in PTS fields nationwide, Serbia has several leading regions in this indicator. Belgrade and South Bačka lead with 11.2 and 6.8 percent of their workforce employed in PTS, respectively, while Skopje, Macedonia, employs 5.8 percent of its workforce in these occupations. Tirana leads Albania with 3.8 percent.

Rural regions of the Western Balkans have comparatively low levels of PTS employment due to the prevalence and need for farmers, miners, and machinists over technical professionals. Several regions in Serbia and Albania have workforces with less than 1 percent of the population employed in these positions, including Raška, Serbia, and Dibër, Albania. (See figure 8.)

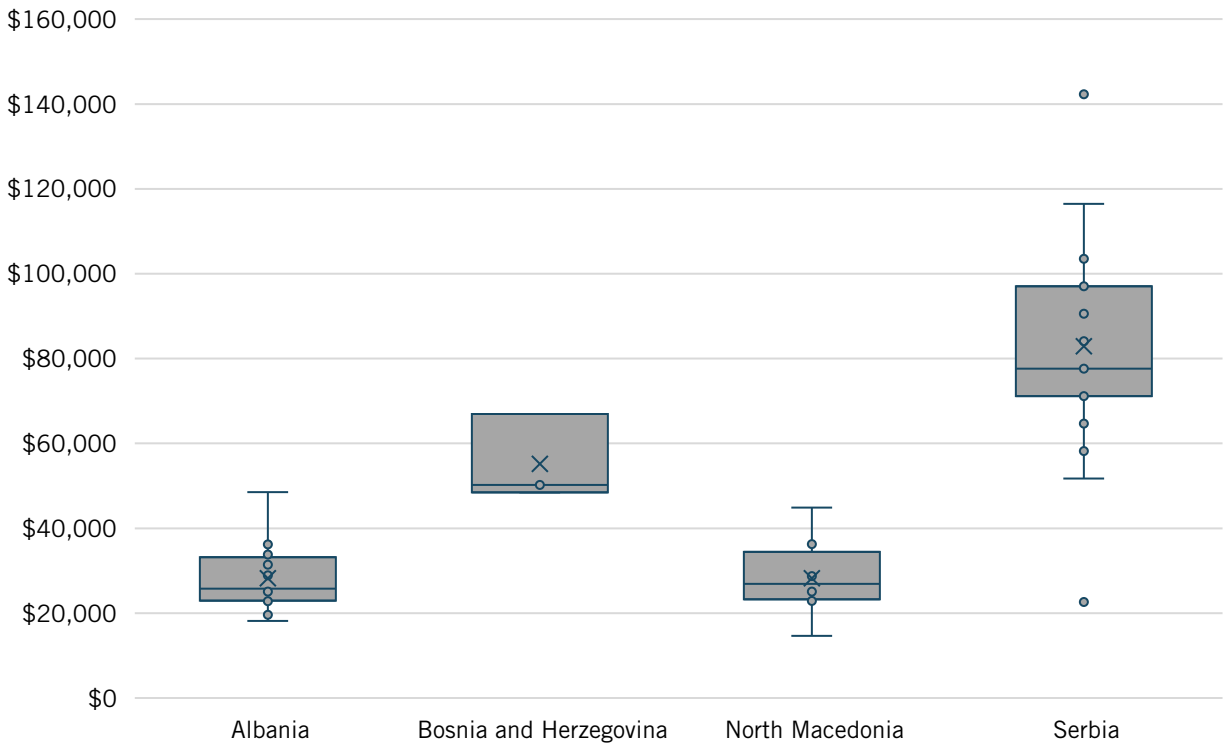
Figure 8: Performance in PTS employment[22]



Manufacturing Labor Productivity

Why is this important? Within manufacturing, high-value-added firms are most often capital intensive, producing more technologically complex products and organizing their workers to take better advantage of their skills. They are typically more productive, pay higher wages, and generate greater value for each hour worked. All else being equal, firms with higher value-added levels are more likely to be able to meet global competitiveness challenges. In this context, gross value added (GVA) measures the contribution to GDP made by an individual producer, industry, or sector. This indicator focuses on the manufacturing sector, and it measures the average GVA per worker on a purchasing power parity (PPP) basis.

Figure 9: PPP-adjusted GVA per worker in the manufacturing sector, 2024[23]



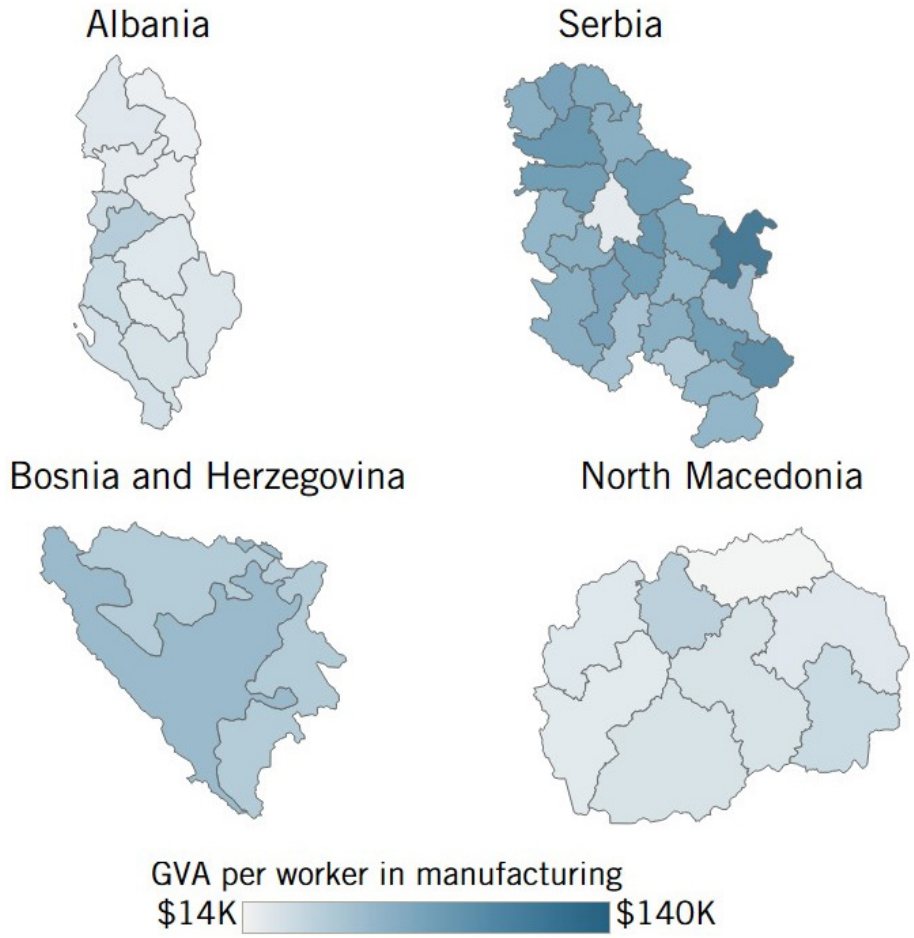
In most countries in the Western Balkans, manufacturing labor productivity is relatively standard with little variation; however, there are some outliers. (See figure 9.) In Serbia, Bor ($142,315) and Pirot ($116,440), both western regions of the country, lead the index, having greater manufacturing labor productivity than any other region. Both regions are manufacturing hubs in the country and sources of high levels of FDI. Bor is highly specialized in the mining and smelting industries, which are high-value industries, while Pirot is a rubber and tire manufacturing hub with significant foreign presence, including Michelin's Tigar Tyres. Serbian regions account for the top 21 regions for this indicator.

The Federation of Bosnia and Herzegovina is the next-best-performing region outside Serbia ($66,950) due to its strong industrial base. Overall, Bosnia has the second-highest average GVA in manufacturing of the countries assessed ($55,213). The country specializes in metal processing and lower-value manufacturing industries such as plastic products, sawmilling, and wood products, but also has some higher-value manufacturing from foreign FDI.[24] Specifically,

Bosnia has developed a strong auto parts industry, supplying major firms such as Mercedes-Benz, BMW, and Audi.

Albania and North Macedonia each exhibit low manufacturing labor productivity across all regions. North Macedonia, despite having a large manufacturing sector, is primarily focused on low-tech traditional sectors, while Albania demonstrates a high reliance on agriculture and low-value added industries such as garment manufacturing.[25] (See figure 10.)

Figure 10: Performance in manufacturing labor productivity[26]

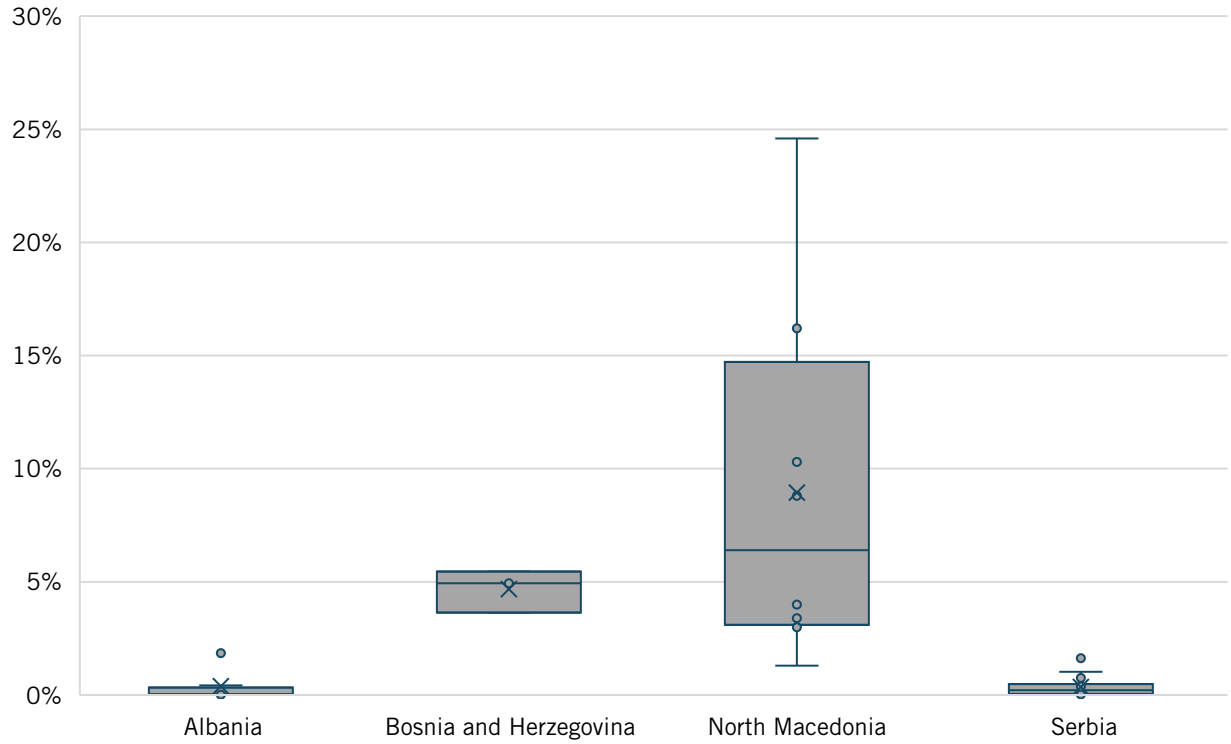


GLOBALIZATION

High-Tech Exports

Why is this important? This indicator measures a region's exports in the machinery manufacturing, computer and electronic products manufacturing, and electrical equipment, appliances, and components manufacturing industries (North American Industry Classification System "NAICS" 333–335, or equivalent) as a share of GDP. High-value-added manufactured goods such as these are crucial to the modern global economy, as they support supply chains for advanced and national power industries.[27] A region's exports of these goods as a share of GDP show to what extent a region has a comparative advantage in high-tech production and exportation.

Figure 11: Exports in NAICS 333–335 (or equivalent) as a share of GDP, 2024[28]



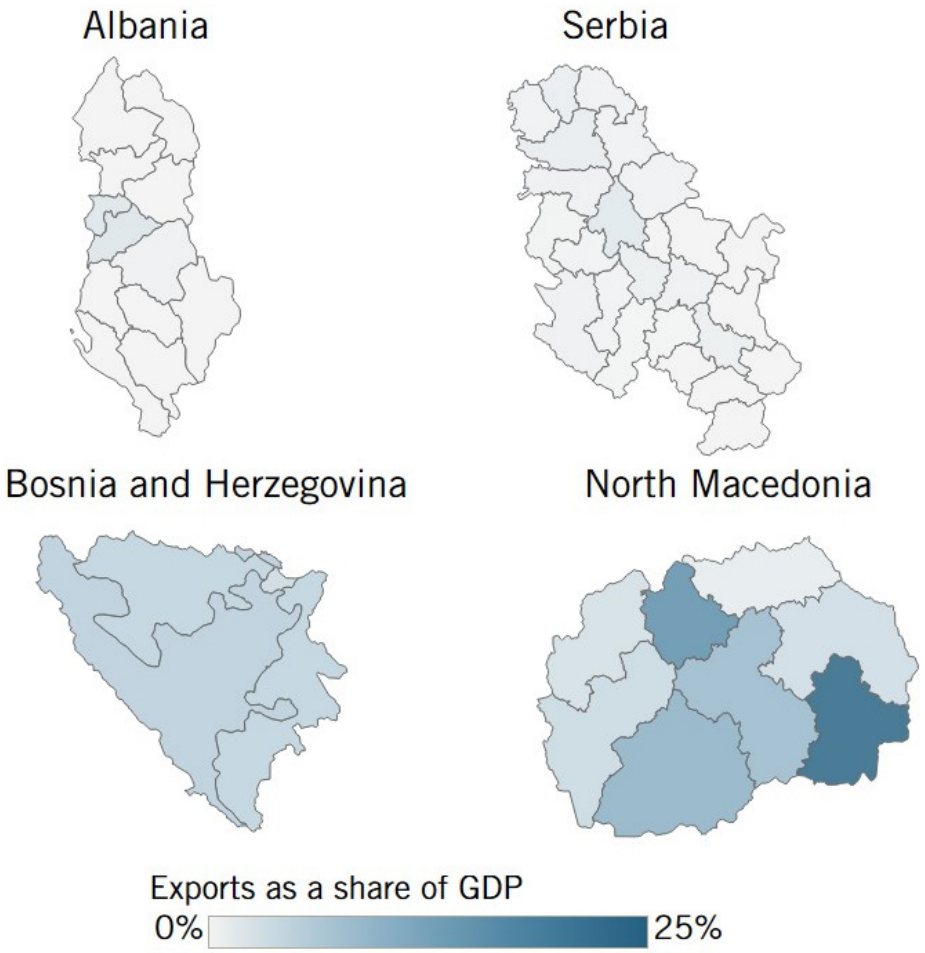
North Macedonia is the clear outlier when it comes to high-tech exports, with several regions being high outliers. (See figure 11.) Southeastern Macedonia leads the index, with high-tech exports valued at nearly 25 percent of GDP, 9 percentage points higher than the next-closest region, Skopje. Southeastern North Macedonia, which is located near the border of two EU member states, Bulgaria and Greece, has a strong agri-business and agricultural machinery industry. Since the development of its free economic zone policy, North Macedonia has opened itself up to much more domestic and foreign investment, attracting high-tech manufacturing firms to the country.[29]

Bosnia is the second-best performing country for this indicator, with high-tech exports valued at about 5 percent of GDP nationwide. The country is led by the Federation of Bosnia and Herzegovina (5.5 percent), followed by the Republika Srpska (4.9 percent). Bosnia has benefited

from its integration into European automotive supply chains to bolster its high-tech export performance.

Albania and Serbia are much more homogenous in this indicator across regions, with high-tech exports valued at about 2 percent of GDP or less for each region. Tirana leads Albania at 2.1 percent while Belgrade leads Serbia at 1.6 percent. (See figure 12.)

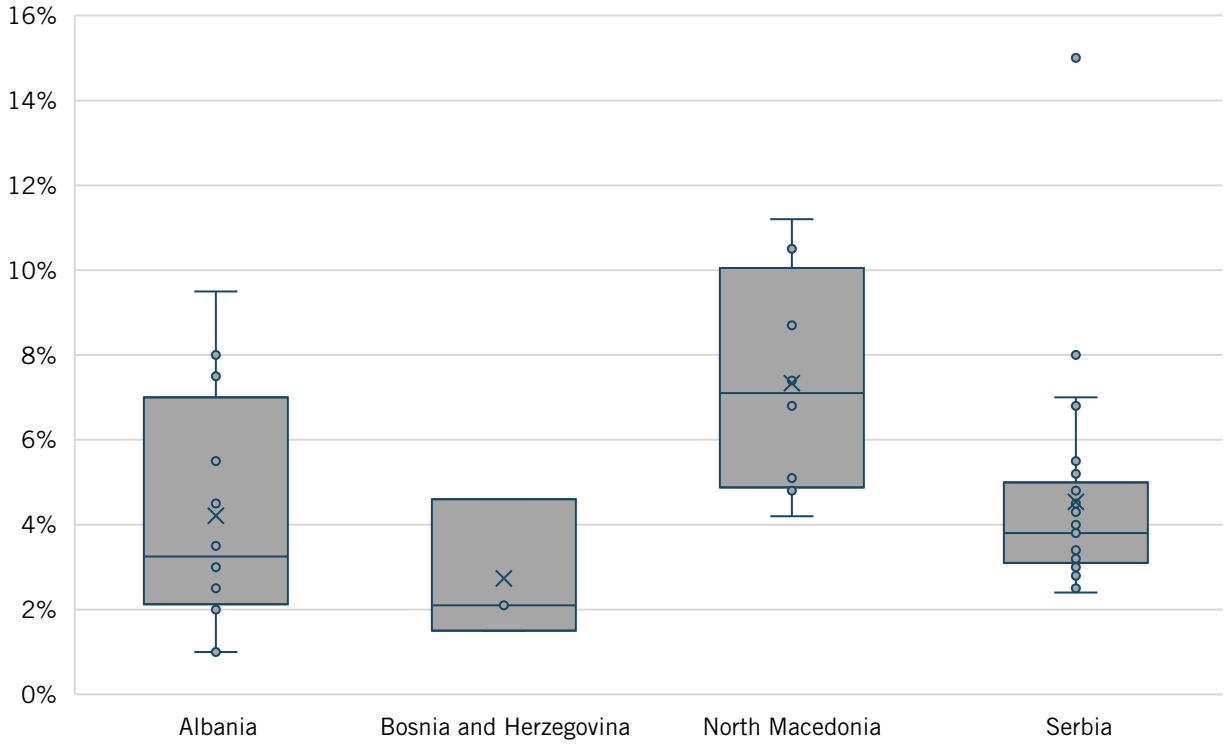
Figure 12: Performance in high-tech exports[30]



Inward FDI

Why is this important? Inward FDI is critical to spurring domestic economic activity and facilitating technology transfer between foreign-owned enterprises and local establishments. Foreign firms may also introduce domestic firms to new international markets and help regions carve out positions in global supply chains. Inward FDI has also been associated with greater economic growth in market economies and tends to be more productive, inducing greater investment by domestic firms.[31] This indicator measures the inward FDI a region receives from a foreign-based entity to purchase, establish, or expand enterprises relative to the region's GDP.

Figure 13: Inward FDI as a percentage of GDP, 2024[32]

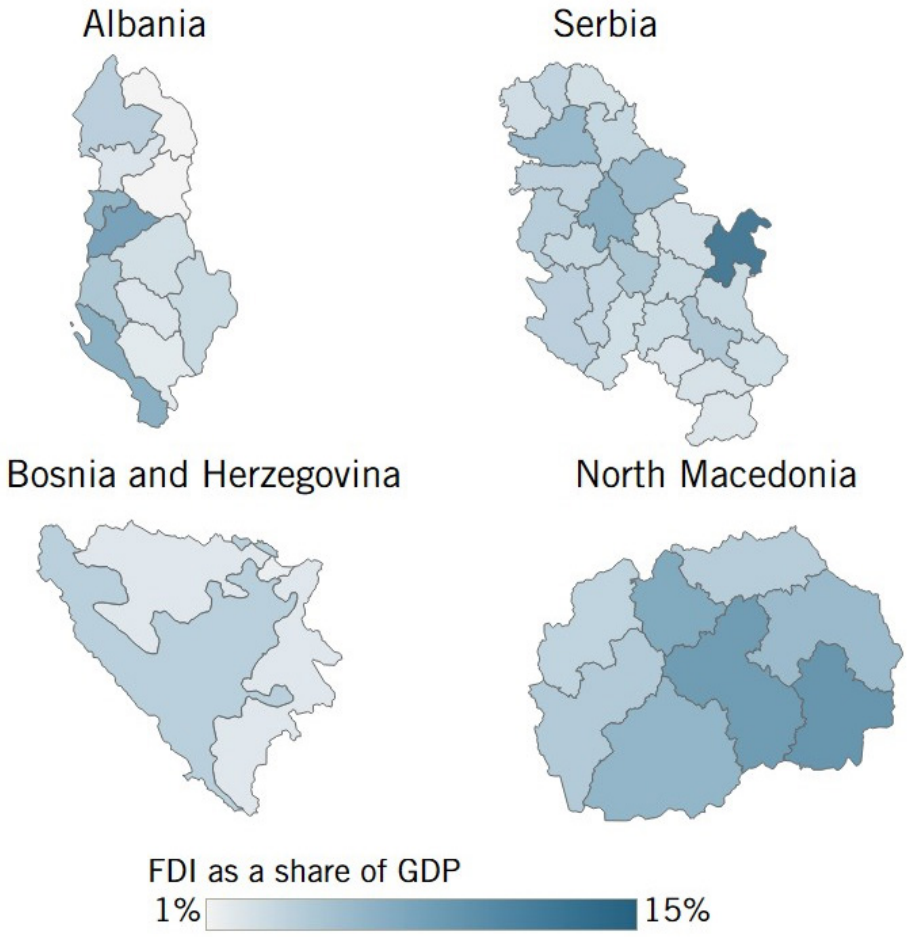


FDI is relatively evenly distributed across regions within each country, holding aside a few outliers. (See figure 13.) In most regions, FDI as a share of GDP sits between 2 and 6 percent, indicating that FDI is becoming an increasingly important part of the growth strategy for countries in the West Balkans. In Serbia and North Macedonia, regions bordering EU member states with strong manufacturing industries perform well, with Bor (15 percent) and the Southeastern region of North Macedonia (11 percent) leading the index. Regions with capital cities also perform well due to their greater concentration of knowledge economy workers and more developed infrastructure, with Tirana (10 percent), Skopje (9 percent), and Belgrade (8 percent) all above average.

Bosnia and Herzegovina lags behind the other countries in this indicator with inward FDI averaging about 2.7 percent of GDP nationally. The country has struggled to attract foreign business investment due to risks assessed in the country, including a lack of stable democratic institutions, which undermine the predictability of doing business.[33] The Federation of Bosnia and Herzegovina, the region in which the capital of Sarajevo is located, leads the country (5

percent), followed by Republika Srpska (2.1 percent), and Brčko District (1.5 percent). (See figure 14.)

Figure 14: Performance in inward FDI[34]

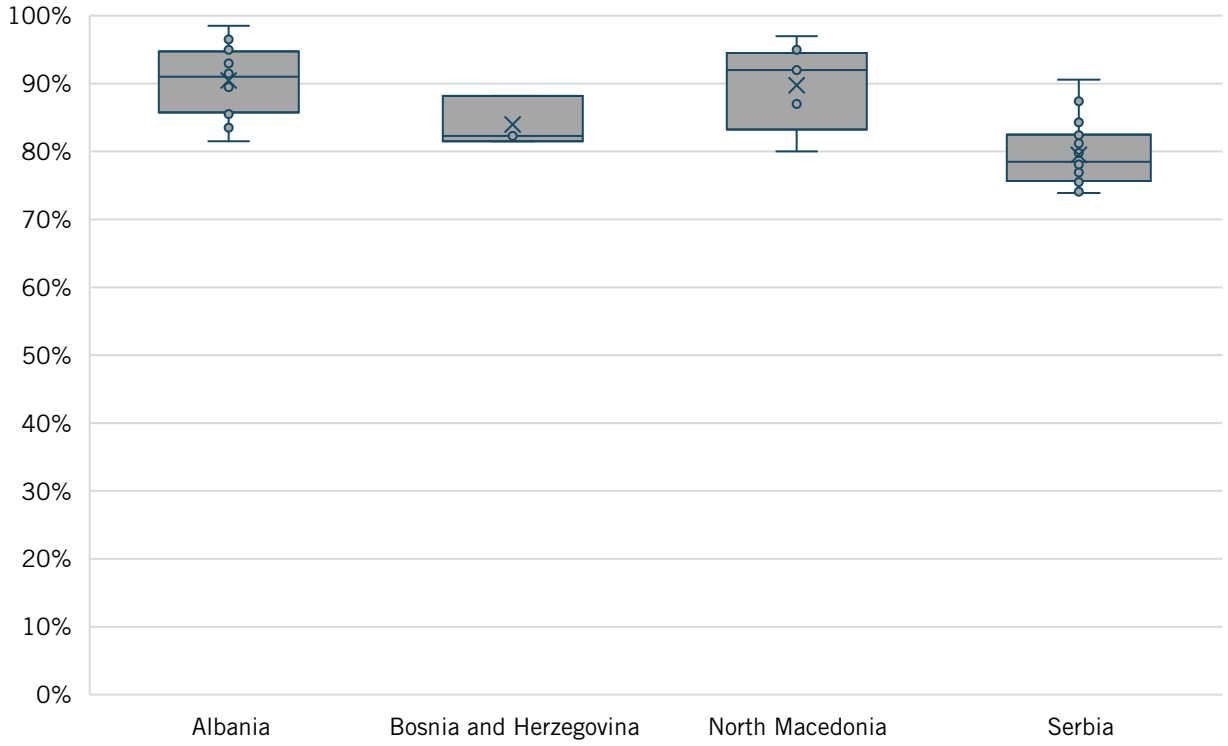


INNOVATION CAPACITY

Broadband Adoption

Why is this important? The Internet now represents an essential public good for participation in today's increasingly digitalized economy. Internet connectivity exerts positive externalities for productivity improvements, economic growth, job creation, and per capita income growth.[35] In addition, broadband adoption can enhance innovation capabilities by expanding the market reach of potential customers, reducing transaction and information costs, and accelerating the product development process.[36] This indicator measures broadband adoption at the consumer level—that is, the share of households with broadband Internet connection availability (including satellite adoption).

Figure 15: Share of households that have adopted broadband Internet, 2024[37]



Broadband adoption throughout the Western Balkans is relatively high by regional standards, supported in part by EU-backed digital connectivity initiatives aimed at improving cross-border integration, supporting broadband expansion, and enabling digital market integration.[38] (See figure 15.) These initiatives, including the Western Balkans Investment Fund, have invested over €1 billion in increasing digital connectivity and broadband adoption across the region.[39] Indeed, these programs have been successful in bridging the digital divide, as all regions in the index have broadband adoption levels of over 70 percent and an average of 84 percent.

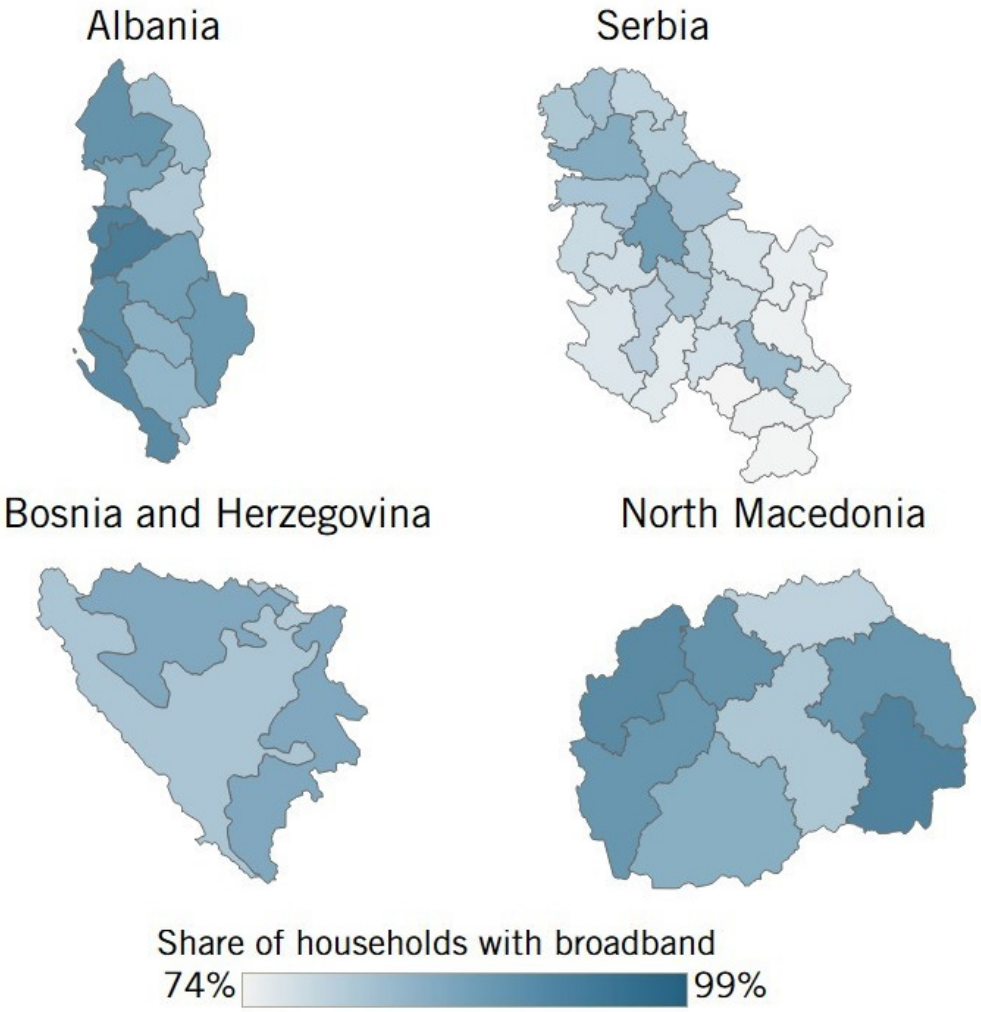
Albania has the highest average broadband adoption rate, led by the regions of Tirana (99 percent), Durrës (97 percent), and Vlorë (95 percent). North Macedonia also exhibits relatively high adoption rates on average, led by its Southeastern region (97 percent) and the region of Polog (95 percent). Broadband adoption across Bosnia and Herzegovina is relatively uniform,

varying between 88 percent in Republika Srpska and 82 percent in Brčko District. (See figure 16.)

Broadband adoption throughout the Western Balkans is relatively high by regional standards, supported in part by EU-backed digital connectivity initiatives aimed at improving cross-border integration, supporting broadband expansion, and enabling digital market integration.

While urban areas have the highest rates of adoption, rural areas have the lowest. Several of Serbia's poorest and more agriculturally focused regions fall to the bottom of the list, including Jablanica, Pčinja, and Toplica, all of which have broadband adoption rates of less than 75 percent. Though broadband adoption across the Western Balkans is relatively high, increasing broadband penetration must continue to be a top priority for policymakers due to its ability to strengthen economies and enable firms to compete in the modern global digital knowledge economy.

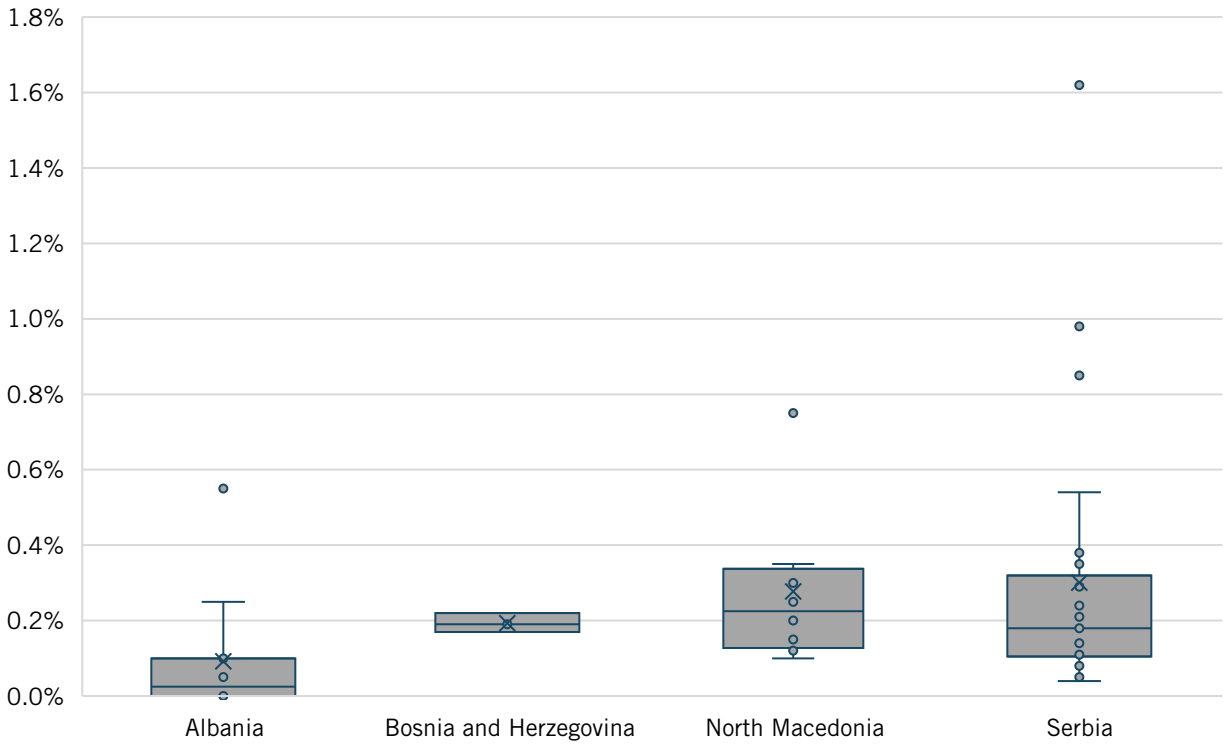
Figure 16: Performance in broadband adoption[40]



R&D Intensity

Why is this important? R&D expenditure represents a critical innovation input, as it measures the overall investment in new knowledge and the early stages of technological development within a region. While not all innovation is R&D based, R&D expenditure is highly correlated with innovation performance, as it reflects the investments to advance in scientific and technological frontiers. Additionally, R&D investment has been positively correlated with the number of patent applications filed by a firm, the establishment and growth rate of start-ups, and the ability of a firm to export.[41] This indicator measures R&D expenditures by all funding sources (business, government, and higher education) in a region relative to its GDP.

Figure 17: R&D expenditures as a share of GDP, 2023–2024[42]

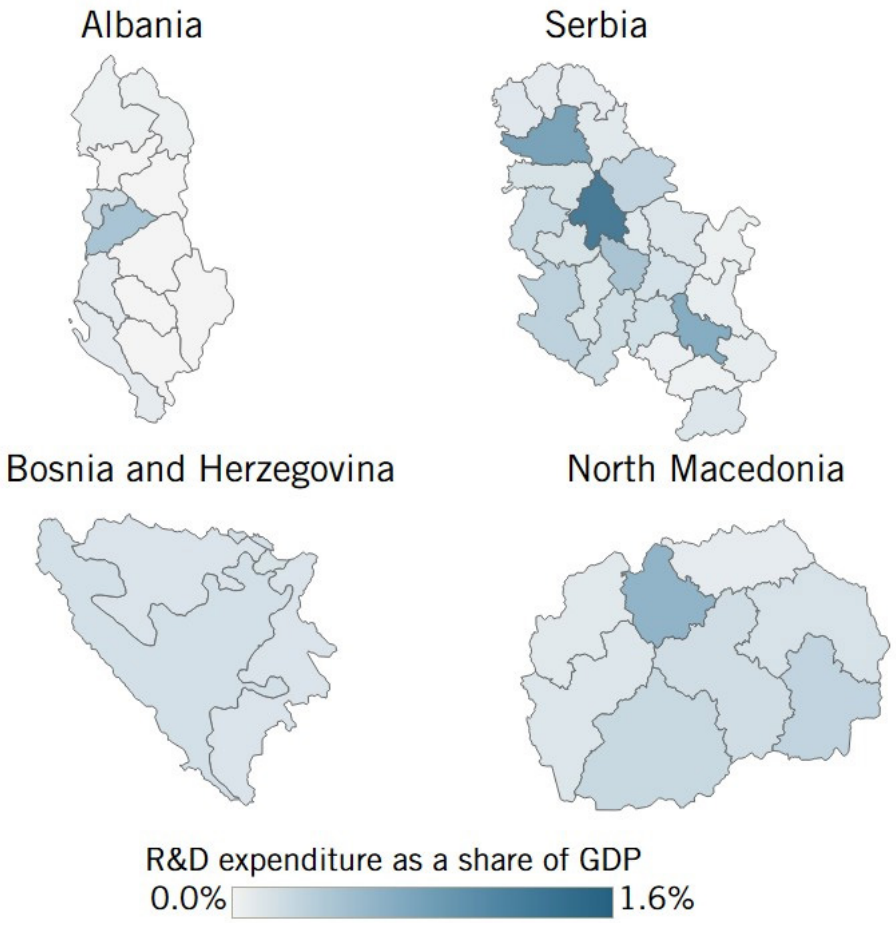


R&D investment in the Western Balkans is very low, with just one region's investment exceeding 1 percent of GDP. (See figure 17.) This region, Belgrade, has an R&D intensity of about 1.6 percent, over 50 percent greater than the next-closest region, South Bačka (0.98 percent), followed by Nišava (0.85 percent). Both Albania and North Macedonia have single outliers, with R&D intensity in Skopje and Tirana valued at 0.75 and 0.55 percent, respectively. The Federation of Bosnia and Herzegovina exhibits the highest subnational R&D intensity within Bosnia (0.22 percent) followed by Brčko District (0.19 percent). (See figure 18.)

Overall, national R&D intensity in the Western Balkan nations falls between 0.3 percent and 0.1 percent, less than that of comparable economies in Latin America, and far less than world leaders such as the United States and the EU nations, which have R&D intensities of 3.4 percent and 2.2 percent, respectively.[43] Considering the importance of R&D investment as an input for innovation, this data reveals how critical it is for Western Balkan nations to increase

their investment in R&D if they wish to compete more intensely in the global innovation economy.

Figure 18: Performance in R&D intensity[44]

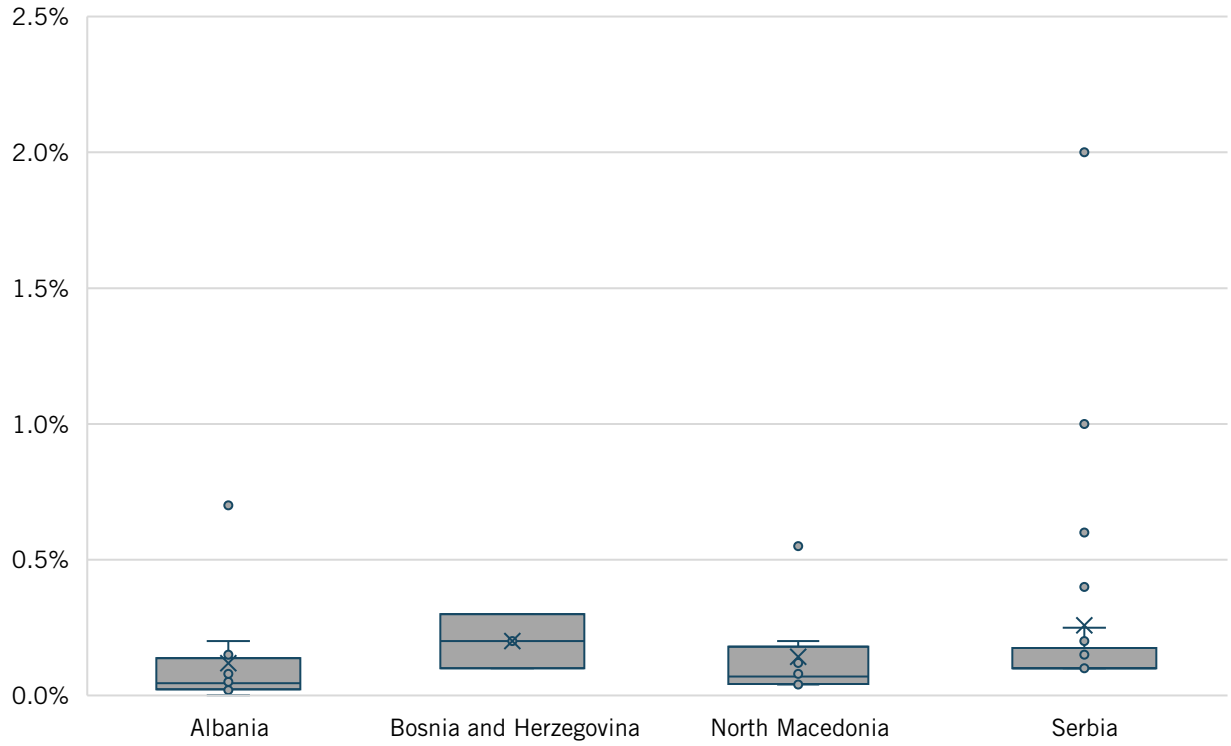


Overall, national R&D intensity in the Western Balkan nations falls between 0.3 percent and 0.1 percent, less than that of comparable economies in Latin America, and far less than world leaders such as the United States and EU nations.

R&D Personnel

Why is this important? R&D personnel are important for conducting R&D activities and turning investments into productivity-enhancing knowledge and commercializable technologies. The R&D workforce also creates spillovers because, as workers move to other jobs, their frontier knowledge is applied beyond the research itself.[45] This indicator measures the number of R&D personnel as a share of each region's total labor force.

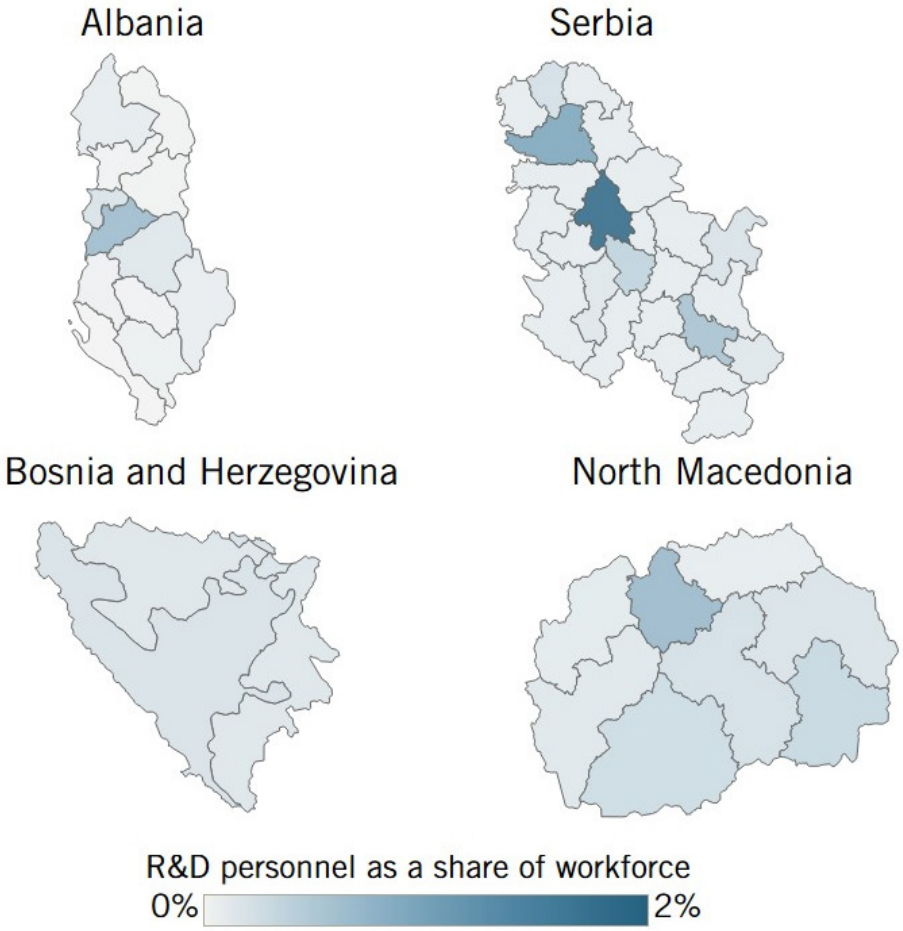
Figure 19: R&D personnel as a share of total employees, 2023–2024[46]



Correlated with the R&D intensity indicator, employment of R&D personnel across the Western Balkan region is very low, with almost all regions seeing employment of these workers below 0.5 percent. (See figure 19.) Serbia has several regions that lead with the highest employment rates for R&D professionals, including Belgrade (2 percent), South Bačka (1 percent), and Nišava (0.6 percent).

Among the remaining countries, Bosnia and Herzegovina shows the second-highest average R&D personnel employment rate (0.2 percent), led by the Federation of Bosnia and Herzegovina (0.3 percent). Albania and North Macedonia have comparatively lower rates of R&D personnel employment nationwide, but their respective capitals, Tirana and Skopje, each perform above average in this indicator with rates of 0.7 percent and 0.6 percent, respectively. (See figure 20.)

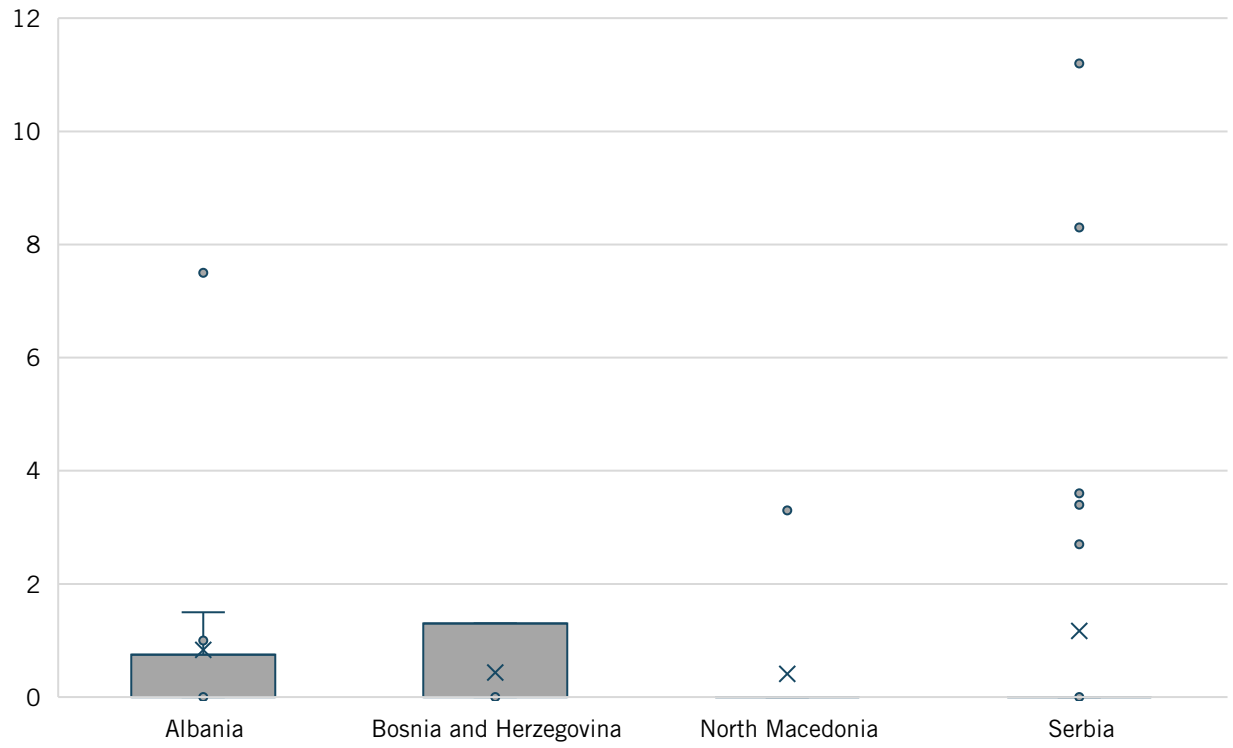
Figure 20: Performance in R&D personnel[47]



Patent Applications

Why is this important? A patent represents an innovation output that protects or licenses an invention. Patents also secure private returns on investment in R&D activities, which are necessary to incentivize these activities and their socially desirable spillover effects. Patent applications per million inhabitants of a region measure the "inventiveness" of its residents. This indicator focuses on internationally filed patents under the Patent Cooperation Treaty (PCT) to mitigate differences in patent qualifications between countries' patent offices.[48]

Figure 21: PCT patent applications per million residents, 2024[49]



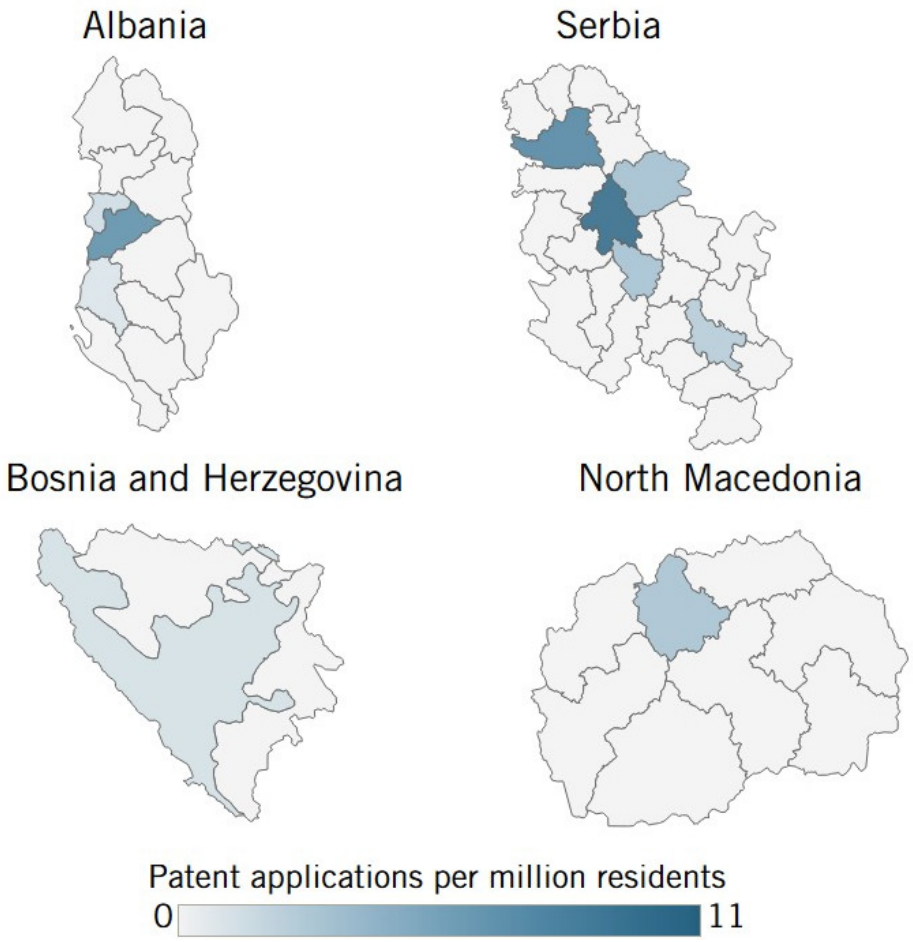
In most subnational regions in the Western Balkans, no patent applications were filed to the PCT in 2024, underscoring the lack of innovation activity occurring in regions that are predominantly focused on low-technology manufacturing and agriculture. (See figure 21.) However, the data demonstrates that there exists a clear concentration of patent activity in urban areas with stronger knowledge economies. There is also a clear correlation between this indicator and both R&D intensity and R&D personnel, as R&D is an input to patents.

In Serbia, Belgrade led the country with 11.2 applications per million residents, the most of any region in the index, followed by South Bačka (8.3 applications), and South Banat (3.6 applications). All three of these regions are largely urban with fast growing information technology (IT) and manufacturing sectors. In Albania, Tirana led with 7.5 patent applications, five times more than the next-closest region, Durrës, with 1.5 applications. (See figure 22.)

Both in North Macedonia and Bosnia and Herzegovina, only one region had more than 0 patent applications per million residents, with Skopje in North Macedonia seeing 3.3 patent

applications per million residents, while the Federation of Bosnia and Herzegovina filed 1.3 applications per million residents.

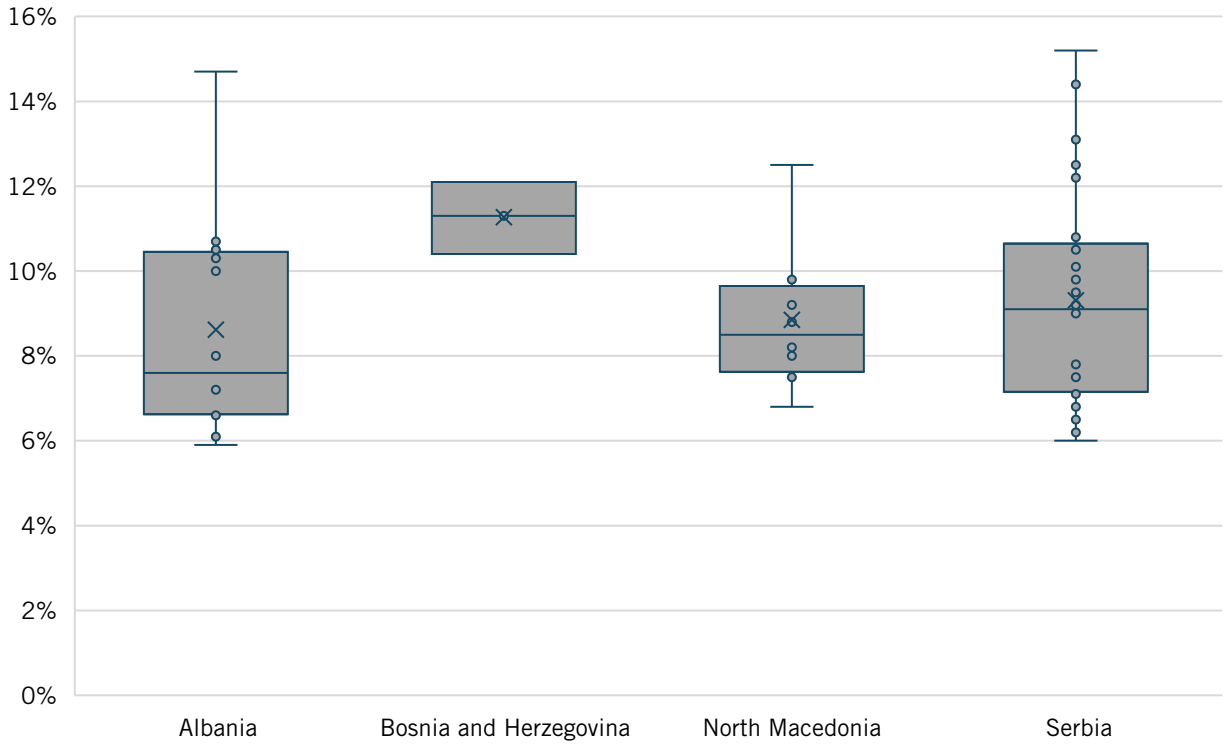
Figure 22: Performance in patent applications[50]



Business Creation

Why is this important? Newcomer firms capable of challenging incumbents are essential for a business environment that rewards innovation and competitiveness. Start-up businesses often drive outside-the-box thinking in both established and emerging industries, accelerating the development of new technologies.[51] This indicator measures the share of a region's business enterprises that were established in the previous period; however, this indicator is limited, as it does not capture business turnover, does not differentiate among industries with low or high knowledge intensity, and does not distinguish between subsistence-driven and competition-driven start-ups. Absent a better alternative at the cross-national regional level, this indicator reflects a region's overall economic resilience and regional competitiveness.

Figure 23: Economy-wide enterprise birth rate, 2024[52]

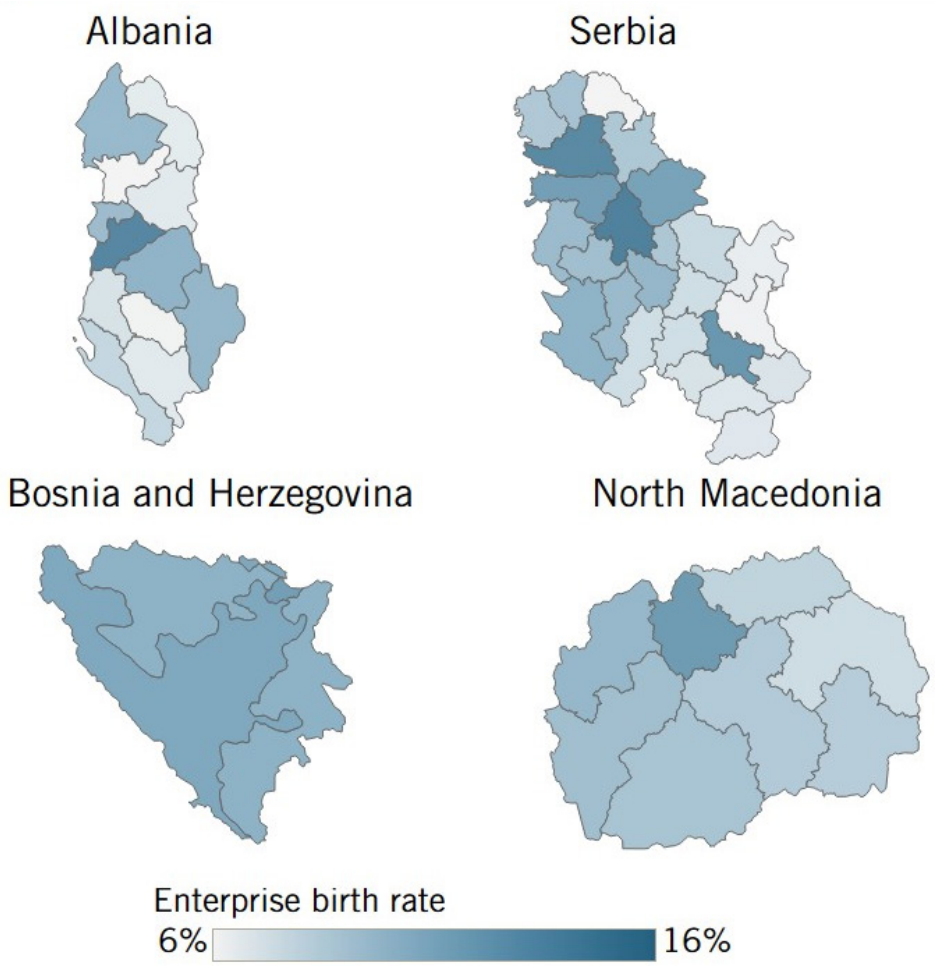


Bosnia and Herzegovina has the highest business creation rates among the countries assessed, with an average enterprise birth rate of over 11 percent. (See figure 23.) The Brčko District leads the country at 12.1 percent, likely supported by the region's status as a special administrative district and its location near the borders of Croatia and Serbia. The Federation of Bosnia and Herzegovina (11.3 percent) posted the second-highest rate in the country in 2024, followed by the Republika Srpska (10.4 percent).

For Albania, Serbia, and North Macedonia, two key trends emerge. Urban areas with budding technology, services, or manufacturing industries see heightened enterprise birth rates, while older industrial regions or those reliant on mining tend to perform worse. In Serbia, Belgrade leads the country (15.2 percent), followed by South Bačka (14.4 percent) and Nišava (13.1 percent).

Tirana leads Albania with the highest enterprise birth rate of 14.7 percent, followed by Elbasan (10.7 percent). In late 2025, Elbasan, which has traditionally been a strong steel manufacturing region, received substantial investment to develop the first green steel plant in Europe.[53] This influx of investment may generate greater business creation in the future in the region. Skopje leads North Macedonia with an enterprise birth rate of 12.5 percent, followed by Polog (9.8 percent). (See figure 24.)

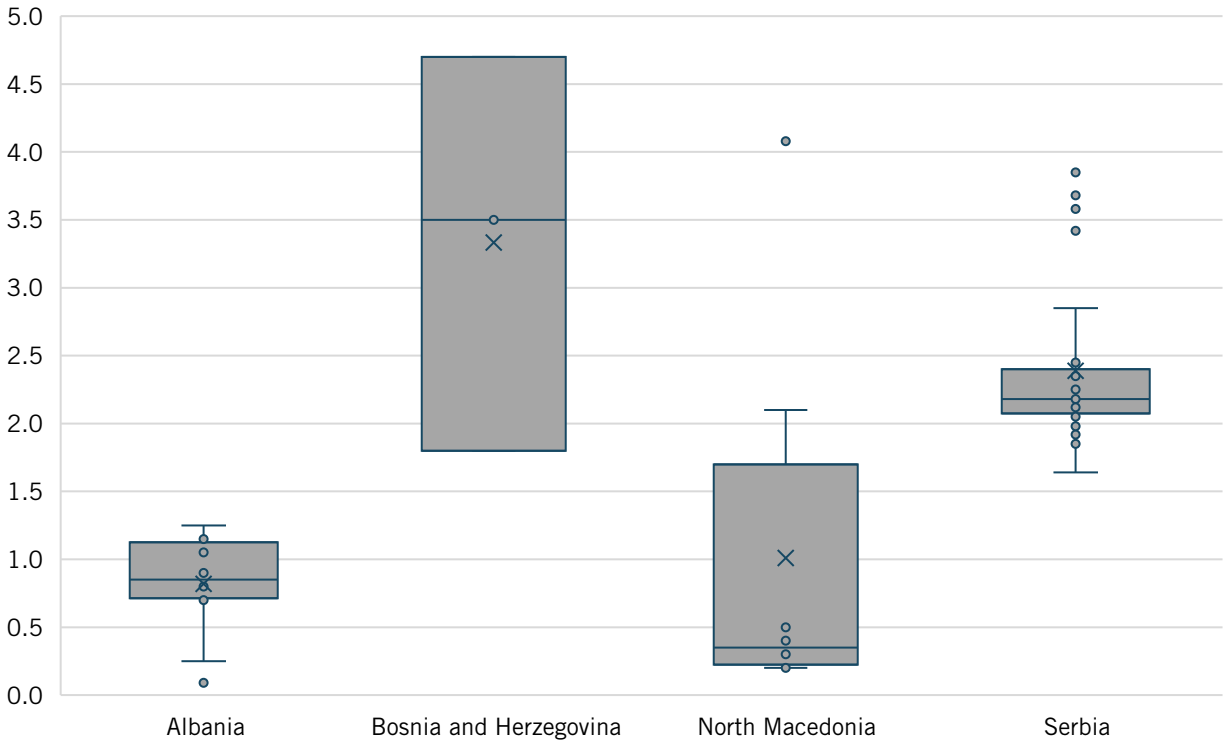
Figure 24: Performance in business creation[54]



Carbon Efficiency

Why is this important? A region's ability to innovate sustainably to achieve a reduction in and the efficient use of carbon and other greenhouse gases will determine its long-term competitiveness, as well as its economic prosperity. This indicator measures carbon dioxide (CO_2) emissions per $10,000 of PPP-adjusted GDP. It is noted that more-developed regions may have a slight advantage in this indicator due to their somewhat more service-oriented economies and higher incomes to invest in higher-cost, low-emission capital.

Figure 25: Metric tons of CO_2 emissions per $10,000 of PPP-adjusted GDP, 2024[55]

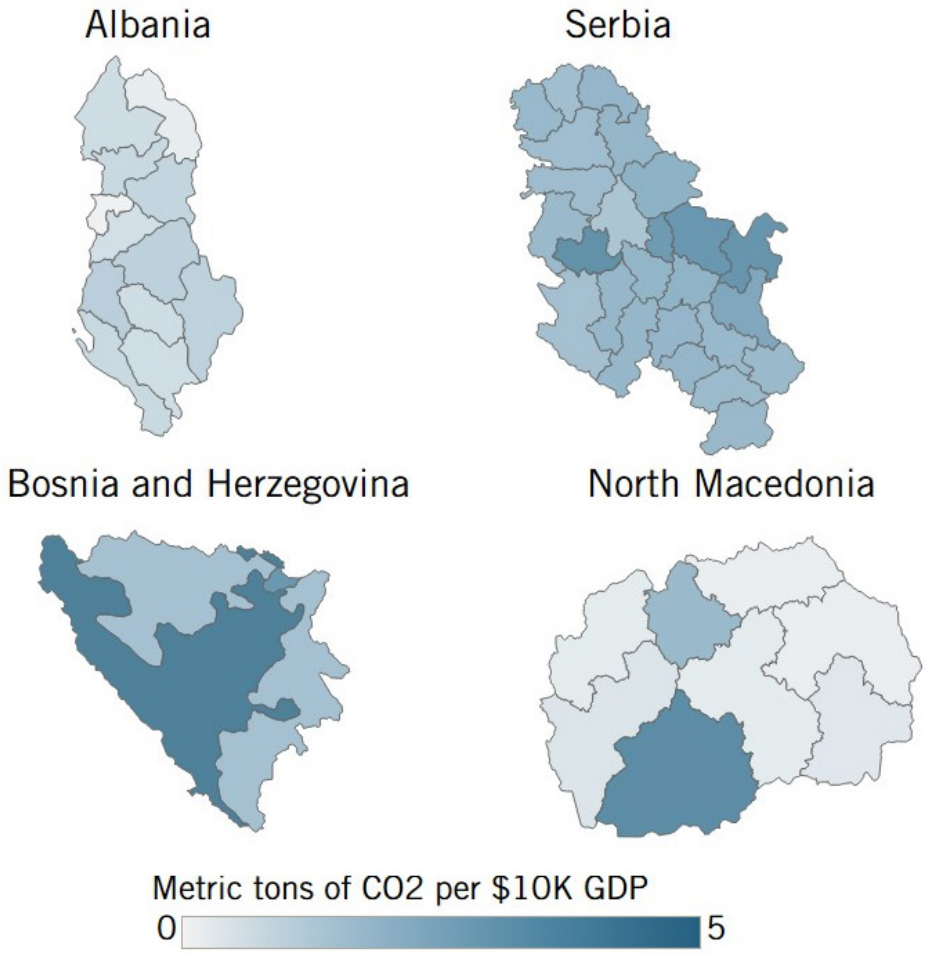


The regional distribution of emissions intensity across the Western Balkans broadly reflects an inverted-U relationship between industrialization and environmental efficiency, with high-emission regions often being industrial, middle-stage economies. (See figure 25.) These regions are often dependent on high-emissions industries such as coal mining and steel and rubber manufacturing and often rely on dirtier forms of fuel for energy. This is the case for the Federation of Bosnia and Herzegovina, which leads the index with the highest emissions intensity (4.7 metric tons per $10,000 of GDP). In North Macedonia, Pelagonia demonstrates the highest emission rates (4.1), due to the coal plant REK Bitola being located there, while in Serbia, Kolubara (3.9) leads, also largely due to a coal mining complex located there. Both regions are crucial to energy production for the countries, driving emission rates up.

Conversely, sparsely populated regions with little heavy industry and larger service-based economies have lower emissions rates. As such, Albania, which is far less reliant on high-emission industries and instead relies heavily on agriculture and hydroelectric power, has the lowest average emissions intensity. Durrës (0.1) has the lowest emissions intensity in the country, followed by Kukës (0.3) and Tirana (0.7). In North Macedonia, the Northeastern region

has the lowest emissions intensity (0.2), while Belgrade, with its more service-oriented economy, has the lowest emissions intensity in Serbia (1.64). (See figure 26.)

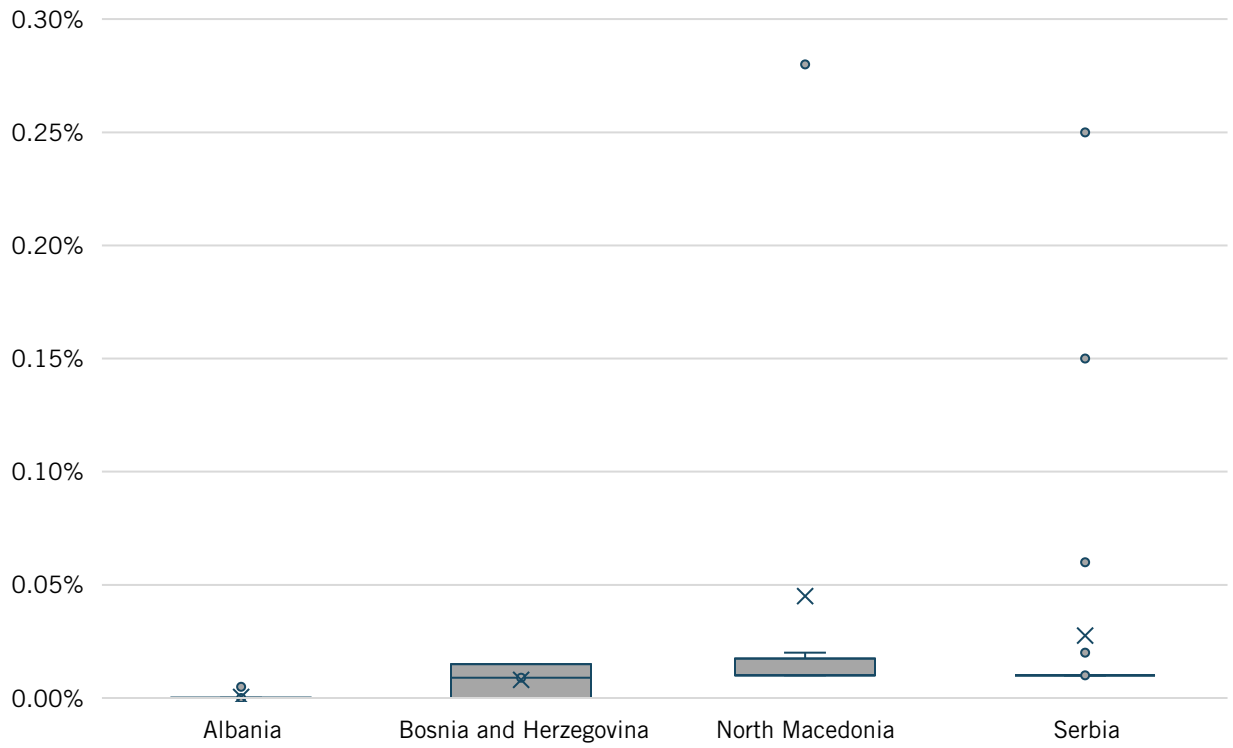
Figure 26: Performance in carbon efficiency[56]



Venture Capital

Why is this important? VC is a form of business financing in which investors provide funds to early-stage companies in exchange for equity in those firms, making it a critical input to develop a strong and innovative start-up ecosystem. Given the considerable uncertainty regarding start-ups' potential for success, VC investment entails higher risk than other forms of investment do. A region's level of VC investment reflects both the innovativeness of its start-up ecosystem and the commitment of its firms to lead in crucial technologies such as AI, biotechnology, clean energy, advanced manufacturing, and robotics. This indicator measures a region's total VC investment as a share of its GDP.

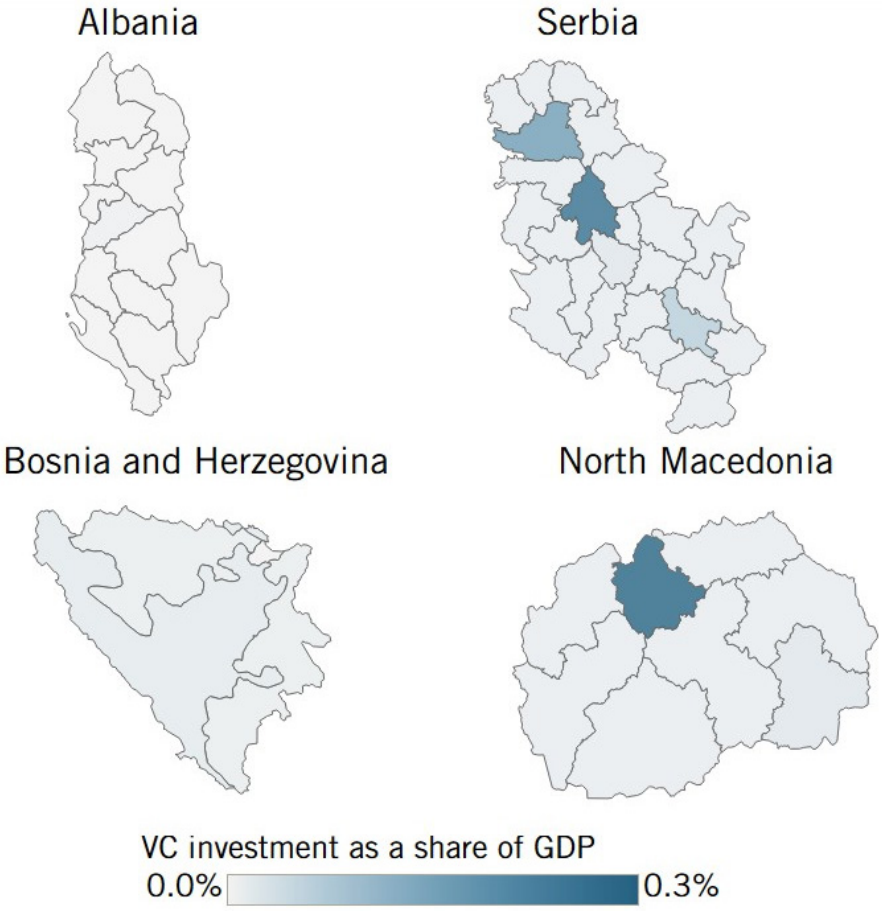
Figure 27: VC investment received as a percentage of GDP, 2024–2025[57]



Most regions in the Western Balkans report virtually no activity in VC investment, with any VC activity concentrated in large urban areas or strong manufacturing regions. (See figure 27.) In North Macedonia, only Skopje receives investment greater than 0.2 percent of GDP, indicating that the national VC ecosystem is clustered largely in the capital city. Albania and Bosnia and Herzegovina have virtually no measurable VC penetration, with their most active VC locations being the Federation of Bosnia and Herzegovina and Tirana, with VC investment equal to 0.02 percent and 0.01 percent of GDP, respectively.

Serbia stands out as the most heterogeneous VC landscape within the Western Balkans, with three regions—Belgrade, South Bačka, and Nišava—each receiving VC investment equivalent to more than 0.05 percent of GDP. Though these shares are still modest by global standards, they show that Serbia's VC market has achieved a degree of growth unseen by many other countries in the region. (See figure 28.)

Figure 28: Performance in venture capital[58]



POLICY ANALYSIS AND RECOMMENDATIONS

Albania

Competitiveness Policy

Albania's competitiveness policy is mainly framed through the Business and Investment Development Strategy 2021–2027, aligned with the National Plan for European Integration, the Economic Reform Program, the Common Regional Market Action Plan, and the European Union SME (small- to medium-sized enterprise) Strategy. This document largely responds to the findings of the Balkan SICI, as it focuses on SME development, export promotion, investment attraction, digital transition, and integration into regional and EU value chains. However, the report shows that Albania's competitiveness challenge is not only national but also strongly territorial: Tirana ranks fourth overall and Durrës ninth, while the five lowest-ranked regions in the whole index are Albanian regions: Gjirokastër, Lezhë, Berat, Kukës and Dibër. The competitiveness policy of Albania to this end does not offer an adequate response, as it addresses the national competitiveness agenda, and it does not yet sufficiently differentiate support according to the severe subnational gaps in skills, productivity, high-tech exports, VC, and innovation capacity identified by the report.

Innovation Policy

Albania's innovation policy is increasingly structured around the Smart Specialization Strategy, which positions innovation as a driver of economic growth, entrepreneurship, and EU alignment. This responds well to the report's core finding that Albania has low-value-added sectors and lacks strong knowledge-based growth. The report finds that Tirana is Albania's clear innovation pole, with the highest national performance in highly educated population; professional, scientific, and technical employment; patenting; enterprise creation; and broadband adoption, while most other regions remain weak in innovation inputs and outputs. To this end, the Smart Specialization Strategy as a policy framework has been instrumental, as it can identify priority domains where Albania has realistic economic and research potential. However, its response will remain incomplete unless it explicitly targets noncapital regions with weak R&D intensity, negligible VC penetration, and limited skilled labor attraction.

Regional Development Policy

Albania's regional development framework is linked to the Law on Regional Development and Cohesion, approved in 2020, and to the National Strategy for Development and European Integration 2022–2030, which places territorial development within the wider sustainable development and EU integration agenda. The report shows one of the sharpest capital–periphery divides in the index: Tirana and Durrës perform comparatively well, while northern, interior, and agricultural regions perform poorly. The policy response this policy framework provides is not effective, as it is more directed to cohesion and balanced regional development, rather than provisioning measures of targeted support for knowledge workers, digital services, productivity upgrading, local enterprise growth, and sectoral specialization outside Tirana.

Recommendations

- Revise the Business and Investment Development Strategy and Smart Specialization Strategy to create a territorially targeted competitiveness package for the lowest-performing regions, especially Dibër, Kukës, Berat, Lezhë, and Gjirokastër. Add regional-

level indicators for monitoring and evaluation of the strategies (on R&D expenditure, patents, VC, high-tech exports, PTS employment, and skilled migration.)

- Use the EU's best-performing instruments to support innovation, such as regional innovation vouchers for SMEs, cofinancing for technology upgrading in agro-processing and light manufacturing, and export-readiness support outside Tirana and Durrës.
- Support stronger links between universities, vocational schools, and local firms through dedicated regional R&D, science, and technology parks.
- Set up a start-up fund for noncapital regions, with small grants for applied research, proof-of-concept projects, and local business accelerators.

Bosnia and Herzegovina

Competitiveness Policy

Bosnia and Herzegovina does not have a fully integrated state-level competitiveness policy comparable to a single national industrial or competitiveness strategy. Instead, competitiveness is addressed through entity-level and cross-government frameworks, including the Development Strategy of the Federation of Bosnia and Herzegovina 2021–2027, the SME Development Strategy of Republika Srpska 2021–2027, and the wider Sustainable Development Goals (SDGs) Framework in Bosnia and Herzegovina, which define "Smart Growth" as one of the country's development pathways. This fragmented policy architecture shows that the policies of the Federation of Bosnia and Herzegovina perform better, as this entity is ranked best in the country, but still 10th overall. The development strategy encompasses measures from digitalization and AI application, transfer of development technology, support to enterprises, and creating and exporting high-value products. This results in solid PTS employment and manufacturing productivity compared with Albania and North Macedonia, as depicted by the report. Therefore, policy responses to the lagging innovation ecosystem in Bosnia and Herzegovina identified in the Balkan SICI exist, but they are dispersed and do not yet provide a coordinated national competitiveness agenda capable of turning manufacturing capacity in the country into higher-value, innovation-led growth.

Innovation Policy

This SICI report shows weak innovation capacity, low R&D intensity, weak patenting activity, and limited FDI attraction in Bosnia and Herzegovina. As was the case with competitiveness policy, innovation policy remains institutionally fragmented as well. The country's Smart Specialization process has been reported as still in preparation, while Republika Srpska has a dedicated Strategy for the Development of Science and Technology, Higher Education and Information Society 2023–2029, and SME innovation is also addressed in the region's RS SME Development Strategy 2021–2027. This only partially responds to the report's results. The index finds that Bosnia and Herzegovina has some foundations for innovation—especially in the Federation, which has the strongest national performance in education, PTS employment, R&D intensity, and patenting—but the country remains weak in innovation outputs, VC, R&D investment, and FDI attraction. Without a stronger state-wide or at least harmonized innovation framework, Bosnia and Herzegovina risks leaving innovation support dependent on entity capacity, donor projects, and isolated SME schemes rather than building a coherent national innovation ecosystem.

Regional Development Policy

Bosnia and Herzegovina's regional development response is mainly organized through entity and district strategies rather than a single national territorial development policy. The SDGs Framework in Bosnia and Herzegovina provides a common development direction around smart growth, human capital, and "leave no one behind," while the Development Strategy of the Federation of Bosnia and Herzegovina 2021–2027 gives the Federation a clearer planning framework. This responds only partly to the report because the index shows that the country's internal gap is not as wide as Albania's or Serbia's, but its overall scores remain modest and innovation capacity is weak across all three regions. The main regional development challenge is therefore not only reducing disparities between the Federation, Republika Srpska, and Brčko District, but also raising the innovation floor everywhere through coordinated infrastructure, R&D investment, SME innovation, digitalization, and investment attraction.

Recommendations

- Create a joint innovation and competitiveness coordination mechanism across the state, entities, and Brčko District, linked to the SDGs Framework and the Smart Specialization process.
- Create a harmonized set of indicators and support instruments for R&D, patents, VC, SME digitalization, high-tech exports, and skilled labor retention.
- Use the strong industrial and PTS base in the Federation to build value-chain upgrading programs in automotive components, metal processing, and advanced business services.
- Develop targeted support in Republika Srpska and the Brčko District for SME innovation, technology adoption, and applied research cooperation with universities.
- Consider creating a small competitive innovation fund accessible across all entities, with transparent criteria and regional quotas, so innovation support is not captured only by better-performing administrative centers.
- Accelerate the Smart Specialization process and ensure that it becomes a practical investment and funding tool, not only a planning document.

North Macedonia

Competitiveness Policy

North Macedonia's competitiveness policy is primarily framed by the Industrial Strategy 2018–2027, which aims to increase manufacturing productivity, strengthen industrial competitiveness, support SMEs, improve export capacity, and encourage industrial modernization. This policy document does not distinguish between regions or have a territorial development focus, resulting in variable performances across regions. Skopje ranks third overall and the Southeastern region eighth, while the Northeastern region ranks lowest within the country. The report also finds that, driven by FDI policy, which is very much regionally determined, North Macedonia performs strongly in globalization indicators, particularly high-tech exports in selected regions. However, the low manufacturing labor productivity and weak innovation capacity outside Skopje remain a problem. The Industrial Strategy, to this end, needs stronger regional targeting and a clearer focus on innovation, R&D personnel, and productivity enhancement, especially in regions where industrial activity exists but value added remains low.

Innovation Policy

North Macedonia's current innovation framework is the Smart Specialization Strategy 2024–2027, adopted in December 2023, with priority domains including smart agriculture and food with higher value added, ICT, Industry 4.0, and sustainable materials, with energy and tourism as horizontal priorities. This responds well to the report's finding that North Macedonia has identifiable sectoral and regional strengths but weak R&D depth and heavy concentration of innovation activity in Skopje. The report shows that Skopje leads the country in education, PTS employment, R&D, patents, and VC, while several regions have low innovation capacity despite export or manufacturing potential. The Smart Specialization Strategy is therefore the right policy instrument, but it must be implemented as a regional innovation policy, not only as a sectoral strategy, by linking priority domains to the specific strengths of Skopje, Pelagonia, Polog, and East, and utilizing existing university-linked infrastructure: Business Accelerator UKIM in Skopje can function as the national start-up and technology-commercialization hub; SEEU TechPark/Business and Innovation Center in Tetovo can serve as the Polog innovation node; Goce Delčev University in Štip can anchor an Eastern/Southeastern innovation node; and St. Kliment Ohridski University–Bitola (UKLO) can support a Pelagonia innovation node, particularly through its technical, ICT, engineering, tourism, food, and applied research capacities.

Regional Development Policy

North Macedonia's regional development policy is regulated by the Strategy for Regional Development 2021–2031 and is reinforced by the National Development Strategy 2024–2044. The regional development framework is particularly relevant because, as the report shows, a large gap exists between Skopje and the rest of the country. The report also identifies noncapital potential, especially in selected manufacturing/export-oriented regions. Existing regional development policy focuses on balanced development, rational use of regional resources, and improved living standards, but it does not yet sufficiently integrate innovation indicators such as R&D personnel, high-tech exports, patenting, VC, and skilled migration. To respond to the report's findings, regional development policy should become more innovation sensitive and should finance region-specific productivity and technology upgrading, not only infrastructure and general local development.

Recommendations

- Integrate the Smart Specialization Strategy, Industrial Strategy, and Regional Development Strategy into one operational pipeline of regional innovation projects.
- Support Skopje as the national R&D and start-up hub, but direct public funding to other regions through university-industry consortia, applied research centers, and regional technology extension services.
- The Southeastern region's reported high export performance, especially in terms of food processing, should be supported through export upgrading, supplier development across the country, and domestic firm innovation.
- Strengthen domestic productive capacity and avoid overreliance on assumed FDI effects. The Southeastern region should serve as an example of competitiveness without greenfield investments and public policy support.
- Pelagonia should receive green industrial transition support due to its carbon-intensive energy profile, while Polog, Vardar, and Eastern regions should be targeted for SME

digitalization, skilled workforce retention, and applied innovation in food, logistics, manufacturing, and tourism.

- Future monitoring of FDI and regional development funds should include innovation indicators.

Serbia

Competitiveness Policy

Serbia's competitiveness policy is strongly framed by the Industrial Policy Strategy 2021–2030, adopted to improve the competitiveness of Serbian industry, strengthen its international market position, coordinate industrial development policy, and improve implementation instruments. This corresponds closely to the report's findings because Serbia dominates the top of the index: Belgrade ranks first, South Bačka second, Nišava fifth, Šumadija sixth, and South Banat seventh. At the same time, Serbia also has 5 regions in the bottom 10, including Raška, Pčinja, Zaječar, Jablanica, and Toplica. The Industrial Policy Strategy is therefore well aligned with Serbia's leading industrial and innovation regions, especially Belgrade and South Bačka, but less adequate as a territorial cohesion instrument because, as the report shows, Serbia's competitiveness advantage is highly concentrated and coexists with deep regional underperformance in southern and eastern districts.

Innovation Policy

Serbia's innovation policy is regulated by the Smart Specialization Strategy 2020–2027, one of the key documents for developing a knowledge-based economy and society. Its priority domains include food for the future, future machines and manufacturing systems, ICT development, and creative industries. This report's findings show that Serbia is the only country in the index with several regions showing meaningful innovation capacity beyond the capital: Belgrade, South Bačka, and Nišava perform strongly in R&D investment, R&D personnel, patent applications, VC, and knowledge-economy indicators. The policy response is therefore stronger than in the other countries because Serbia has developed a network of science and technology parks and innovation infrastructure in Belgrade, Novi Sad, Niš, and Čačak, with further innovation infrastructure linked to Kragujevac and the wider national research and innovation system. These parks are important because they allow Smart Specialization to be implemented not only as a sectoral strategy, but also through territorial innovation nodes: Belgrade for ICT, start-ups, creative industries, and advanced research; Novi Sad/South Bačka for ICT, food, agritech, and advanced manufacturing; Niš/Nišava for electronics, ICT, and engineering; Čačak/Moravica for technical sciences, SMEs, and manufacturing innovation; and Kragujevac/Šumadija for industrial innovation, automotive-related capabilities, and engineering. The remaining gap is due to this infrastructure still not sufficiently reaching Serbia's weakest districts, where the report records much lower innovation capacity, broadband adoption, R&D intensity, and enterprise dynamism.

Regional Development Policy

Serbia's regional development policy is less clearly consolidated than its industrial and innovation policies. The policy framework includes the Law on Regional Development, territorial and cross-border cooperation programs, and development instruments implemented through the Ministry of Economy and other agencies. But analyses of Serbia's regional development system consistently point to very large regional disparities and limited effectiveness of subsidy-based regional policy. This directly matches this report's finding that Serbia has the widest internal

variation in the index: it contains the two best-performing regions, Belgrade and South Bačka, but also several of the weakest-performing regions. The current regional development response therefore needs to move from general subsidies and infrastructure support toward place-based innovation and productivity policy, especially for southern and eastern districts that do not benefit automatically from Serbia's national industrial and innovation growth.

Recommendations

- Keep investing in leading innovation poles—Belgrade, South Bačka, and Nišava; but redesign regional development policy so these centers become engines of diffusion rather than isolated winners.
- Include territorial targets for lagging districts—particularly Raška, Pčinja, Zaječar, Jablanica, and Toplica—as part of the Industrial Policy Strategy and Smart Specialization Strategy.
- Use the science and technology park network as the main delivery mechanism for turning Smart Specialization into a regional innovation policy.
- Mandate tech parks to not only support start-ups in their own cities, but also provide technology-extension services to weaker districts, especially Raška, Pčinja, Zaječar, Jablanica, and Toplica.
- Utilize local Chambers of Commerce and introduce a mandate to help SMEs adopt digital tools, improve productivity, access export markets, and connect to advanced manufacturing value chains.
- Condition future subsidies on technology transfer, local supplier development, worker training, and measurable productivity gains in less-developed districts.
- Expand broadband and digital business services in the weakest regions and create incentives for R&D personnel, engineers, and start-ups to work with firms outside Belgrade and Novi Sad.

CONCLUSION

As geopolitical fragmentation, economic uncertainty, and technological competition intensify, the Western Balkans must pursue policies that strengthen their resilience and long-term competitiveness in an increasingly fiercely contested global innovation economy. For the region, improving innovativeness is essential for not only accelerating economic convergence with the European Union, but also reducing regional disparities and creating sustainable, high-value growth. Policymakers should complement national innovation strategies with targeted subnational policies tailored to the distinct economic structures and development levels of individual regions.

This report has highlighted 13 indicators that together measure subnational innovation competitiveness across the Western Balkans. By analyzing the performance of subnational regions, policymakers can better identify regional strengths and weaknesses and develop targeted policy interventions to support lagging regions while reinforcing emerging innovation hubs.

APPENDICES

Appendix A: Composite and Category Scores Methodology

For each indicator, regions' scores were converted to a standardized score, which was capped at ±3 to avoid an outlier performance on a single indicator from too heavily influencing the composite score. For composite and category scores, a weighted-average capped standardized score (WACSS) was calculated for each indicator, wherein the weights used are those listed in the table below (normalized such that an indicator's applied weight is equal to its listed weight divided by the sum of the listed weights—i.e., applied weights sum to one). For the composite score, this was calculated by including all indicator weights; for the category scores, this was achieved by including only the weights for the indicators that fall under that category. WACCSs are rescaled to a 100-point scale via min-max normalization, in which the "maximum" parameter is the maximum WACCS plus one-quarter standard deviation of WACCS, and the "minimum" parameter is the minimum WACCS minus one-quarter standard deviation of WACCS.

Mathematically, the WACCS of region s is calculated as:

$$WACSS_s = \sum_i \omega_i CSS_{s,i}$$

wherein i denotes the indicator, $CSS_{s,i}$ denotes the capped standardized score for region s in indicator i, and ω_i is the applied weight of indicator i, defined as:

$$\omega_i = \frac{(listed\ weight)_i}{\sum_i (listed\ weight)_i}$$

such that:

$$\sum_i \omega_i = 1.$$

The scaled score for region/UT s is then calculated as:

$$Score_s = \frac{\left[WACSS_s - \left(min_{WACSS} - \frac{1}{4}\sigma_{WACSS}\right)\right]}{\left[\left(max_{WACSS} + \frac{1}{4}\sigma_{WACSS}\right) - \left(min_{WACSS} - \frac{1}{4}\sigma_{WACSS}\right)\right]} \cdot 100$$

Appendix B: Indicator Methodologies and Weights

Table A1: Indicator weights and descriptions

Indicator	Weight	Years	Description	Category
Broadband Adoption	0.75	2023–24	Share of households subscribing to broadband Internet	Innovation Capacity
Business Creation	0.50	2023–24	Enterprise birth rate in share of employer enterprises	Innovation Capacity
Carbon Efficiency	0.50	2024	Metric tons of CO_2e emitted per $10,000 of PPP-adjusted GDP	Innovation Capacity
High-Tech Exports	0.75	2024	Exports in NACIS codes 333–335 (or equivalent) as a share of GDP	Globalization
Highly Educated Population	1.00	2024	Share of 25–64-year-old population with a bachelor's degree (or equivalent) or higher	Knowledge Economy
Inward FDI	0.75	2024	FDI inflow as a share of GDP	Globalization
Manufacturing Labor Productivity	1.25	2024	PPP-adjusted GVA per worker in the manufacturing sector	Knowledge Economy
Patent Applications	1.25	2024	PCT patent applications per million residents	Innovation Capacity
Professional, Technical, and Scientific Employment	1.25	2024	Share of employees in professional, technical, and scientific activities sector	Knowledge Economy
R&D Intensity	1.50	2023–24	R&D expenditures as a share of GDP	Innovation Capacity
R&D Personnel	1.50	2023–24	R&D personnel as a share of total employees	Innovation Capacity
Skilled Immigration	0.50	2024	Share of population that is foreign born and has at least some tertiary education (ISEC 5–8)	Knowledge Economy
Venture Capital Received	0.75	2024-25	Venture capital investments received as a share of GDP	Innovation Capacity

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ENDNOTES

1. World Bank Open Data (Data for Serbia, Kosovo, Bosnia and Herzegovina, Albania, Montenegro, and North Macedonia; accessed May 5, 2026), https://data.worldbank.org/?locations=RS-XK-BA-AL-ME-MK.
2. Organization for Economic Cooperation and Development (OECD), "Economic Convergence Scoreboard for the Western Balkans 2025" (Paris, France: OECD, June 10, 2025), https://www.oecd.org/en/publications/economic-convergence-scoreboard-for-the-western-balkans-2025_bc0babf3-en/full-report/business-environment-cluster_5d7aef9e.html.
3. "World Bank Sees Better Growth For Western Balkans But More Work Needed on Jobs," *Reuters*, October 7, 2025, https://www.reuters.com/world/world-bank-sees-better-growth-western-balkans-more-work-needed-jobs-2025-10-07/; OECD, "Economic Convergence Scoreboard for the Western Balkans 2025."
4. Mario Holzner, "The Western Balkans' Paradoxical Resilience" (The Vienna Institute for International Economic Studies, October 23, 2025), https://wiiw.ac.at/the-western-balkans-paradoxical-resilience-n-701.html.
5. "World Bank Sees Better Growth For Western Balkans But More Work Needed on Jobs," *Reuters.*
6. Deutsche Bundesbank Eurosystem, "Inflation, pensions and the digital euro: an interview with Bundesbank President Joachim Nagel," May 13, 2026, https://www.bundesbank.de/en.
7. Ed Frankl, "German Exports to U.S. Reached Highest Proportion in Two Decades in 2024," *The Wall Street Journal*, April 14, 2025, https://www.wsj.com/economy/trade/german-exports-to-u-s-reached-highest-proportion-in-two-decades-in-2024-5beca571; Dr. Goran Miladinov, "Trump's Tariffs Shockwave: Will the Western Balkan Feel The Heat?" (CRPM, 2025), https://crpm.org.mk/product/policy-brief-on-trump-tariffs/.
8. Robert D. Atkinson, "Why Federal R&D Policy Needs to Prioritize Productivity to Drive Growth and Reduce the Debt-to-GDP Ratio" (ITIF, September 2019), https://www2.itif.org/2019-federal-rd-productivity.pdf.
9. World Bank Open Data (Data for Serbia, Kosovo, Bosnia and Herzegovina, Albania, Montenegro, and North Macedonia; accessed May 5, 2026).
10. World Intellectual Property Organization (WIPO), "Global Innovation Index 2022, 15th Edition" (WIPO, 2022), https://www.wipo.int/publications/en/details.jsp?id=4626&plang=EN.
11. Authors' calculation. For further information please see the methodology section in the Appendix.
12. Ibid.
13. OECD, "Education GPS," accessed September 12, 2025, https://gpseducation.oecd.org/revieweducationpolicies; National Science Foundation (NSF), "Science & Engineering Indicators 2018," January 2018, https://www.nsf.gov/statistics/2018/nsb20181/report/sections/invention-knowledge-transfer-and-innovation/introduction.
14. Christian Daude and Virginia Robano, "On Intergenerational (Im)mobility in Latin America" *Latin American Economic Review* Vol. 24, No. 9 (2015), https://latinaer.springeropen.com/articles/10.1007/s40503-015-0030-x; Tommaso Agasisti and Alice Bertoletti, "Higher Education and Economic Growth: A Longitudinal Study of European Regions 2000-2017," *Socio-Economic Planning Sciences* 81 (June 2022), https://www.sciencedirect.com/science/article/abs/pii/S0038012119306809; Jaehyuk Park et al., "Global Labor Flow Network Reveals the Hierarchical Organization and Dynamics of Geo-Industrial Clusters in the World Economy" (working paper, March 19, 2019), https://arxiv.org/abs/1902.04613.

15. Institute of Statistics of Albania (INSTAT) (Share of 25–64-year-old population with a bachelor's degree (or equivalent) or higher, 2024; accessed April 2026); Agency of Statistics of Bosnia and Herzegovina (ASB&H) (Labor Force Survey, 2023; accessed April 2026); Statistical Office of the Republic of Serbia (SORS) (Share of 25–64-year-old population with a bachelor's degree (or equivalent) or higher, 2024; accessed April 2026); European Commission (EC) (Share of 25–64-year-old population with a bachelor's degree (or equivalent) or higher; accessed April 2026); North Macedonia State Statistical Office (SSO) (Share of 25–64-year-old population with a bachelor's degree (or equivalent) or higher, 2024; accessed April 2026).
16 . Ibid.
17. Marcelo Jauregui-Volpe, "New Data Show U.S. Retains Significant Share of Foreign Science and Engineering Talent Upon Graduation," Association of American Universities, April 18, 2025, https://www.aau.edu/newsroom/leading-research-universities-report/new-data-show-us-retains-significant-share-foreign.
18. INSTAT (Share of population that is foreign born and has at least some tertiary education, 2023; accessed April 2026); Ministry of Security of Bosnia and Herzegovina, International Labor Organization, the World Bank (Share of population that is foreign born and has at least some tertiary education, 2024; accessed April 2026); SORS and United National Economic Commission for Europe (Share of population that is foreign born and has at least some tertiary education, 2024; accessed April 2026); SSO (Share of population that is foreign born and has at least some tertiary education, 2024; accessed April 2026).
19. Ibid.
20. "Professional, Scientific, and Technical Services," DataUSA, accessed May 6, 2026, https://datausa.io/profile/naics/professional-scientific-technical-services.
21. INSTAT (Share of employees in professional, technical, and scientific activities sectors, 2024; accessed April 2026); ASB&H (Share of employees in professional, technical, and scientific activities sectors, 2023; accessed April 2026); SORS (Share of employees in professional, technical, and scientific activities sectors, 2024; accessed April 2026); SSO (Share of employees in professional, technical, and scientific activities sectors, 2024; accessed April 2026).
22. Ibid.
23. INSTAT (PPP adjusted GVA per worker in the manufacturing sector, 2024; accessed April 2026); CEIC data (PPP adjusted GVA per worker in the manufacturing sector, 2024; accessed April 2026); SORS (PPP adjusted GVA per worker in the manufacturing sector, 2024; accessed April 2026); SSO (PPP adjusted GVA per worker in the manufacturing sector, 2024; accessed April 2026).
24. Milos Sipragic, "From Volume to Value: What Bosnia and Herzegovina's Industrial Structure Tells Us," EDA, April 3, 2026, https://edabl.org/from-volume-to-value-what-bosnia-and-herzegovinas-industrial-structure-tells-us/.
25. "Albania Last in Region for Labor Productivity," *Albanian Daily News*, April 28, 2026, https://albaniandailynews.com/news/albania-last-in-region-for-labor-productivity.
26. Ibid.
27. Robert D. Atkinson, "Marshaling National Power Industries to Preserve America's Strength and Thwart China's Bid for Global Dominance" (ITIF, November 17, 2025), https://itif.org/publications/2025/11/17/marshaling-national-power-industries-to-preserve-us-strength-and-thwart-china/.
28. INSTAT, CEIC, EC (Exports in NAICS codes 333-335 as a share of GDP, 2024; accessed April 2026); ASB&H (Exports in NAICS codes 333-335 as a share of GDP, 2024; accessed April 2026); SORS (Exports in NAICS codes 333-335 as a share of GDP, 2024; accessed April 2026); SSO (Exports in NAICS codes 333-335 as a share of GDP, 2024; accessed April 2026).

29. "North Macedonia," Henley & Partners, accessed May 6, 2026, https://www.henleyglobal.com/countries/north-macedonia.
30. Ibid.
31. Eduardo Borensztein, Jose De Gregorio, and Jong-Wha Lee, "How Does Foreign Direct Investment Affect Economic Growth?" NBER Working Paper Series, No. 5057 (March 1995), https://www.sciencedirect.com/science/article/abs/pii/S0022199697000330; W.N.M. Azman-Saini, Ahmad Zubaidi Baharumshah, and Siong Hook Law, "Foreign Direct Investment, Economic Freedom and Economic Growth: International Evidence," Economic Modelling No. 27 (2010): 1079–1089, https://www.sciencedirect.com/science/article/abs/pii/S0264999310000635.
32. INSTAT (FDI inflow as a share of GDP, 2024; accessed April 2026); Central Bank of Bosnia and Herzegovina (FDI inflow as a share of GDP, 2024; accessed April 2026); SORS (FDI inflow as a share of GDP, 2024; accessed April 2026); SSO (FDI inflow as a share of GDP, 2024; accessed April 2026).
33. Nemanja Plotan, "High Representative and Low FDI: Foreign Authority as the Cause of Bosnia's Economic Paralysis" (Center for International Relations and Sustainable Development), https://cirsd.org/horizon-article/high-representative-and-low-fdi-foreign-authority-as-the-cause-of-bosnias-economic-paralysis/.
34. Ibid.
35. Nina Czernich et al., "Broadband Infrastructure and Economic Growth," *The Economic Journal* No. 121 (May 2011), 505–532, https://doi.org/10.1111/j.1468-0297.2011.02420.x; Banu Demir and Arti Grover, "Do Investments in Digital Infrastructure Improve Employment Outcomes? Evidence from Türkiye" (policy research working paper 11314, World Bank Group, February 2026), https://documents1.worldbank.org/curated/en/099550002172617975/pdf/IDU-c781ea45-9b40-40bd-b4ff-0c5f6271ae39.pdf.
36. Zhixiong Yand and Jishun Zhang, "Digital Infrastructure Construction and the Development of New-Quality Productive Forces in Enterprises," Scientific Reports 15 (2025), https://www.nature.com/articles/s41598-025-09897-w; Wolfgang Briglauer et al., "Economic Benefits of New Broadband Network Coverage and Service Adoption: Evidence from OECD Member States" *Industrial and Corporate Change* (January 21, 2025), https://academic.oup.com/icc/advance-article/doi/10.1093/icc/dtae043/7965758.
37. INSTAT, Electronic and Postal Communications Authority (Share of households subscribing to broadband Internet, 2024; accessed April 2026); ASB&H (Share of households subscribing to broadband Internet, 2024; accessed April 2026); SORS (Share of households subscribing to broadband Internet, 2024; accessed April 2026); SSO (Share of households subscribing to broadband Internet, 2024; accessed April 2026).
38. "EU-Western Balkans: Boosting Digital Connectivity" (Brussels: European Commission, July 1, 2019), https://digital-strategy.ec.europa.eu/en/library/eu-western-balkans-boosting-digital-connectivity.
39. Western Balkan Investment Framework, "Connectivity Agenda," https://www.wbif.eu/sectors/connectivity-agenda.
40. Ibid.
41. Meghan Ostertag, "How Reducing Federal R&D Reduces GDP" (ITIF, September 15, 2025), https://itif.org/publications/2025/09/15/how-reducing-federal-rd-reduces-gdp-growth/.
42. INSTAT (R&D expenditures as a share of GDP, 2024; accessed April 2026); Republika Srpska Institute of Statistics (R&D expenditures as a share of GDP, 2024; accessed April 2026); SORS (R&D expenditures as a share of GDP, 2024; accessed April 2026); SSO (R&D expenditures as a share of GDP, 2023; accessed April 2026).

43. Western Balkans Investment Framework, "Connectivity Agenda," https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20251204-2; Meghan Ostertag, "China Overtakes the United States in R&D Investment" (ITIF, May 6, 2026), https://itif.org/publications/2026/05/06/china-overtakes-the-united-states-in-rd-investment/.
44. Ibid.
45. Anders Akerman and Kerstin Holzheu, "The Role of Workers In Knowledge Diffusion Across Firms" (Science Po Economics Discussion Paper, No. 2024-04, November 6, 2024), https://www.sciencespo.fr/department-economics/sites/sciencespo.fr.department-economics/files/2024_v2_akerman_holzheu_the_role_of_workers_in_knowledge_diffusion_across_firms.pdf; Victoria Castillo et al., "The Effects of Knowledge Spillovers Through Labor Mobility" (MPRA Paper 69141, University Library of Munich, Germany, 2016), https://ideas.repec.org/p/pra/mprapa/69141.html.
46. INSTAT, EC (R&D personnel as a share of total employees, 2024; accessed April 2026); ASB&H and EC (R&D personnel as a share of total employees, 2024; accessed April 2026); SORS (R&D personnel as a share of total employees, 2024; accessed April 2026); SSO (R&D personnel as a share of total employees, 2023; accessed April 2026).
47. Ibid.
48. World Intellectual Property Organization (WIPO), "PCT – The International Patent System," https://www.wipo.int/en/web/pct-system.
49. WIPO (PCT patent applications per million residents, 2024; accessed April 2026).
50. Ibid.
51. Miranda Fraraccio, "How Startups Contribute to Innovation in Emerging Industries," U.S. Chamber of Commerce, April 15, 2024, https://www.uschamber.com/co/start/strategy/startup-ingenuity-and-innovation.
52. INSTAT (Enterprise birth rate in share of employer enterprises, 2024; accessed April 2026); ASB&H, (Enterprise birth rate in share of employer enterprises, 2023; accessed April 2026); SORS (Enterprise birth rate in share of employer enterprises, 2024; accessed April 2026); SSO (Enterprise birth rate in share of employer enterprises, 2024; accessed April 2026).
53. "Kurum International Invests EUR 150 Million in Green Steel Production," *Albania Daily News*, December 23, 2025, https://albaniandailynews.com/news/kurum-international-invests-eur-150m-in-green-steel-production.
54. Ibid.
55. INSTAT (Metric tons of CO2e emitted per $10,000 of PPP-adjusted GDP, 2024; accessed April 2026); CEIC and the International Monetary Fund (Metric tons of CO2e emitted per $10,000 of PPP-adjusted GDP, 2024; accessed April 2026); SORS (Metric tons of CO2e emitted per $10,000 of PPP-adjusted GDP, 2024; accessed April 2026); SSO and Ministry of the Environment (Metric tons of CO2e emitted per $10,000 of PPP-adjusted GDP, 2024; accessed April 2026).
56. Ibid.
57. European Bank for Reconstruction and Development (Venture capital investments received as a share of GDP, 2024; accessed April 2026); EC (Venture capital investments received as a share of GDP, 2024/2025; accessed April 2026); SORS (Venture capital investments received as a share of GDP, 2024; accessed April 2026); SSO (Venture capital investments received as a share of GDP, 2024; accessed April 2026).
58. Ibid.